



Aerospace Medicine  
and Biology  
A Continuing  
Bibliography  
with Indexes

NASA SP-7011(265)  
December 1984



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Aerospace Medicine and Biology

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IAA (A-10000 Series)      A84-42708 - A84-46525

# **AEROSPACE MEDICINE AND BIOLOGY**

## **A CONTINUING BIBLIOGRAPHY WITH INDEXES**

**(Supplement 265)**

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 November 1984 in

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



Scientific and Technical Information Branch

**National Aeronautics and Space Administration**

Washington, DC

1984

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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 197 reports, articles and other documents announced during November 1984 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.

Six indexes -- subject, personal author, corporate source, 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 1984 Supplements.

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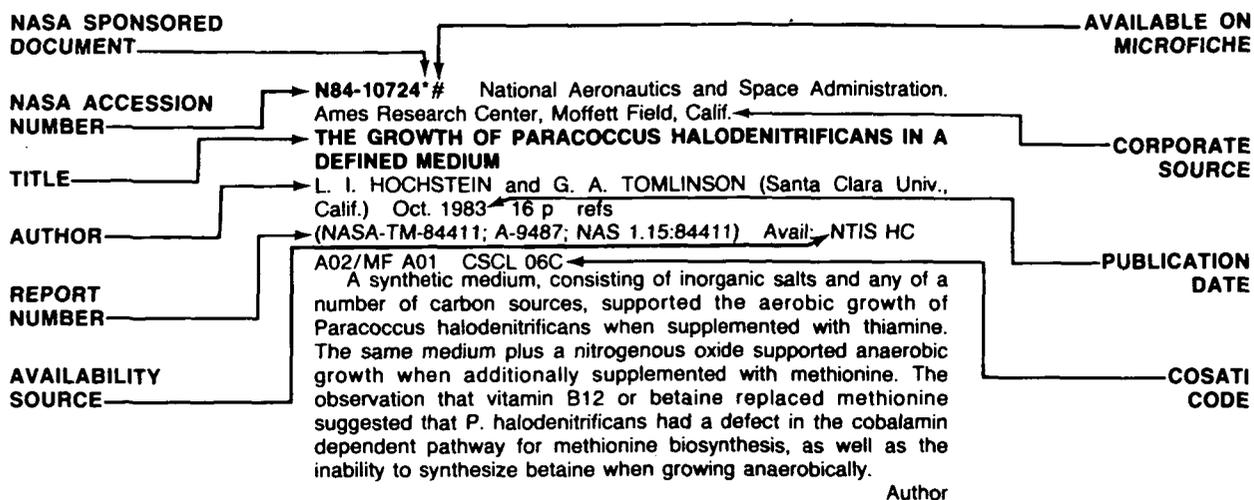
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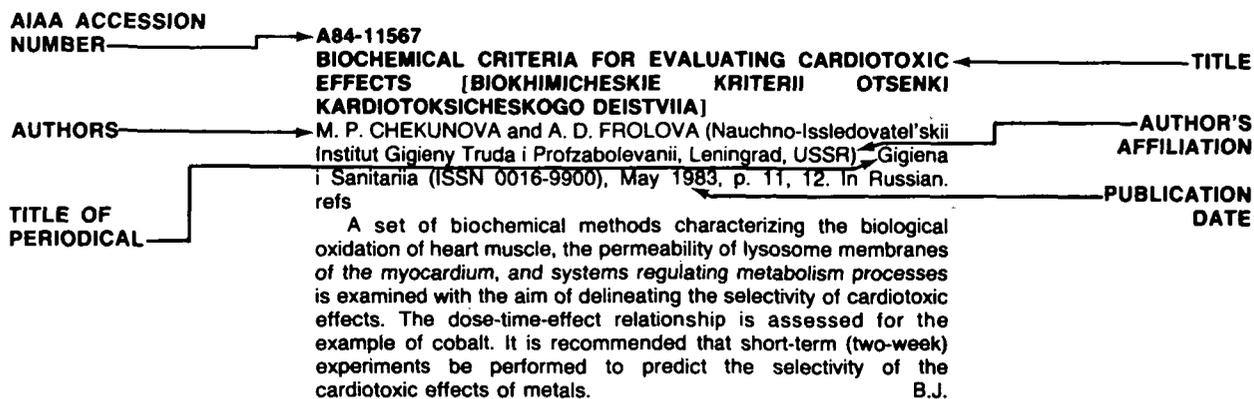
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# AEROSPACE MEDICINE AND BIOLOGY

(A Continuing Bibliography (Suppl. 265))

DECEMBER 1984

51

## LIFE SCIENCES (GENERAL)

Includes genetics.

**A84-42954**

**A DETERMINATION OF THE LEVEL OF DNA DAMAGE IN HUMAN AND MAMMALIAN CELLS [OPREDELENIE UROVNIA SPONTANNYKH POVREZHENII DNK KLETOK CHELOVEKA I MLEKOPITAISHCHIKH]**

E. F. DAVIDENKOVA, M. V. FILATOV, E. I. SHVARTS, L. A. NOSKIN, A. N. TRELIAKOV, KH. A. GEKSADZE (Akademiia Nauk SSSR, Leningradskii Institut Iadernoi Fiziki, Gatchina, USSR), and S. E. BRESLER Radiobiologiya (ISSN 0033-8192), vol. 24, May-June 1984, p. 291-295. In Russian. refs

A technique is proposed for measuring the amount of spontaneous damage to DNA molecules in intact mammalian cells (human skin fibroblasts and embryonic rat fibroblasts). Arabinoside cytosine and Hydroxurea are shown to inhibit the repair of spontaneously formed gaps in DNA which may lead to double-strand breaks and cell death. The rate of spontaneous damage to the strands is found to vary in different animal species and in different types of tissue. The results of the experiment are considered important to the more general study of the biological aspects of aging. I.H.

**A84-42955**

**PROLIFERATIVE ACTIVITY AND FREQUENCY OF CHROMOSOME ABERRATIONS IN THE FIRST MITOSIS IN 50-, 60-, AND 70-HOUR CULTURES OF IRRADIATED LYMPHOCYTES AND IN MIXED CULTURES OF IRRADIATED AND NONIRRADIATED CELLS [PROLIFERATIVNAIA AKTIVNOST' I CHASTOTA ABERRATSII KHROMOSOM V PERVOM MITOZE V 50-, 60- I V SMESHANNYKH KULTURAKH OBLUCHENNYKH I NEOBLUCHENNYKH KLETOK]**

E. K. PIATKIN, V. IU. NUGIS, and V. N. POKROVSKAIA (Ministerstvo Zdravookhraneniia SSR, Institut Biofiziki, Moscow, USSR) Radiobiologiya (ISSN 0033-8192), vol. 24, May-June 1984, p. 310-314. In Russian. refs

**A84-42956**

**VARIATION IN THE METABOLIC POOL OF FREE AMINO ACIDS IN THE PERIPHERAL BLOOD AND THE SPLEEN FOLLOWING TOTAL-BODY UNIFORM GAMMA IRRADIATION [IZMENENIE METABOLICHESKOGO FONDA SVOBODNYKH AMINOKISLOT PERIFERICHESKOI KROVI SELEZENKI POD DEISTVIEM OBSHEGO RAVNOMERNOGO GAMMA-OBLUCHENIIA]**

L. A. KONNOVA and V. E. KOMAR (Ministerstvo Zdravookhraneniia SSSR, Tsentral'nyi Nauchno-Issledovatel'skii Rentgeno-Radiologicheskii Institut, Leningrad, USSR) Radiobiologiya (ISSN 0033-8192), vol. 24, May-June 1984, p. 330-333. In Russian. refs

**A84-42957**

**A GENERAL SCHEME FOR THE MODIFICATION OF REPRODUCTIVE CELL DEATH [OBSHCHAIA SKHEMA MODIFIKATSII REPRODUKTIVNOI GIBELI KLETOK]**

L. KH. EIDUS and IU. N. KORYSTOV (Akademiia Nauk SSSR, Institut Biologicheskoi Khimii, Pushchino, USSR) Radiobiologiya (ISSN 0033-8192), vol. 24, May-June 1984, p. 337-340. In Russian. refs

A general scheme for changes in the process of reproductive cell death is described. The process is divided into two stages. In the first (physicochemical) stage, changes occur in the consumption of oxygen within the cell which may be the result of variations in the concentrations of thiols, indolyl-alkylamines, oxygen, and substances affecting oxygen consumption within a cell. In the second stage, modifications occur in the enzymatic repair of potential damages, which are associated with mitosis delay, decreases in repair inhibitors and hyperthermia. I.H.

**A84-42958**

**A QUANTITATIVE ANALYSIS OF RADIATION DAMAGE TO THROMBOCYTOPOIESIS [KOLICHESTVENNAIA OTSENKA RADIATSIONNOGO PORAZHENIIA TROMBOTSITOPOEZA]**

V. A. SELIVANOV and V. G. TIAZHELOVA (Akademiia Nauk SSSR, Institut Biologicheskoi Fiziki, Pushchino, USSR) Radiobiologiya (ISSN 0033-8192), vol. 24, May-June 1984, p. 355-359. In Russian. refs

From a comparison of results from theoretical and experimental investigations of the kinetics of thrombocytopoietic functions have been determined qualitatively. The parameters are: (1) the percentage of cells killed during the interphase; and (2) the duration of mitosis delay and the rise in abortive activity following irradiation. In experiments with rats and mice, the duration of mitosis delay and the level of abortive activity were found to decrease by factors ranging from 1.3 to 1.5 and 2 to 3, respectively. I.H.

**A84-42959**

**IRON CONTENT OF BLOOD AND IRON SATURATION OF BLOOD SERUM TRANSFERRIN FOLLOWING X-RAY IRRADIATION [SODERZHANIE ZHELEZA V KROVI I NASYSHCHENNOST' ZHELEZOM TRANSFERRINA SYVOROTKI KROVI PRI VOZDEISTVII RENTGENOVYKH LUCHEI]**

L. E. GOTSULIAK (Odesskii Meditsinskii Institut, Odessa, Ukrainian SSR) Radiobiologiya (ISSN 0033-8192), vol. 24, May-June 1984, p. 362-364. In Russian. refs

**A84-42960**

**VARIATIONS IN THE ABSORPTION CAPACITY OF THE RETICULO-ENDOTHELIAL SYSTEM UNDER THE COMBINED EFFECT OF RADIATION AND BURN [IZMENENIIA POGLOTITEL'NOI SISTEMY PRI KOMBINIROVANNOM RADIATSIONNO-TERMICHESKOM PORAZHENII]**

R. S. BUDAGOV and Z. K. BUDAGOVA (Akademiia Meditsinskikh Nauk SSSR, Obninsk, USSR) Radiobiologiya (ISSN 0033-8192), vol. 24, May-June 1984, p. 383-385. In Russian. refs

A84-42961

**THYROID GLAND HYPERFUNCTION AS A RESULT OF THE SEPARATE AND COMBINED EFFECTS OF RADIATION AND HEAT [GIPOFUNKTSIIA SHCHITOVIDNOI ZHELEZY PRI IZOLIROVANNYKH I KOMBINIROVANNYKH RADIATIONNO-TERMICHESKIKH PORZHENIARKH]**

L. N. CHUREEVA, R. S. BUDAGOV, and V. E. ZAICHIK (Akademiia Meditsinskikh Nauk SSSR, Obninsk, USSR) Radiobiologiya (ISSN 0033-8192), vol. 24, May-June 1984, p. 390-394. In Russian. refs

A84-42962

**THE EFFECT OF MICROWAVES OF NONTHERMAL INTENSITY ON THE NUMBER OF ABERRANT HEPATOCYTES IN RATS [VLIANIE MIKROVOLN NETEPLOVOI INTENSIVNOSTI NA CHISLO ABERRANTNYKH GEPATOTSITOV U KRYS]**

E. N. ANTIPENKO, I. V. KOVESHNIKOVA, and O. I. TIMCHENKO (Kievskii Nauchno-Issledovatel'skii Institut Obshchei i Kommunal'noi Gigieny, Kiev, Ukrainian SSR) Radiobiologiya (ISSN 0033-8192), vol. 24, May-June 1984, p. 403-405. In Russian. refs

A84-42963

**THE ROLE OF THE THYROID GLAND IN THE DEVELOPMENT OF GENETIC EFFECTS OF MICROWAVES OF NONTHERMAL INTENSITY [O ROLI SHCHITOVIDNOI ZHELEZY V RAZVITII GENETICHESKIKH EFFEKTOV MIKROVOLN NETEPLOVOI INTENSIVNOSTI]**

E. N. ANTIPENKO, I. V. KOVESHNIKOVA, and O. I. TIMCHENKO (Kievskii Nauchno-Issledovatel'skii Institut Obshchei i Kommunal'noi Gigieny, Kiev, Ukrainian SSR) Radiobiologiya (ISSN 0033-8192), vol. 24, May-June 1984, p. 406-408. In Russian. refs

A84-42964

**AN INVESTIGATION OF THE ABSORBING CAPACITY OF THE GASTROINTESTINAL TRACT OF IRRADIATED ANIMALS TREATED WITH RADIOPROTECTIVE AGENTS [IZUCHENIE VSASYVATEL'NOI AKTIVNOSTI ZHELUDOCHNO-KISHECHNOGO TRAKTA U OBLUCHENNYKH ZHIVOTNYKH V USLOVIAKH ZASHCHITY RADIOPROTEKTORAMI]**

N. G. CHIGAREVA and V. M. TESLENKO (Voenno-Meditsinskaya Akademiia, Leningrad, USSR) Radiobiologiya (ISSN 0033-8192), vol. 24, May-June 1984, p. 408-410. In Russian.

A fluorescent uranine detector was used to study the absorbing capacity of the gastrointestinal tracts of irradiated mice and dogs. The animals were subjected to a range of dosages and exposure times from 4 to 7.5 gr, and 3 to 12 hours, respectively. The radioprotective agents used were cystamine, para-aminopropiophenon, and S-2(3-aminopropylamino)ethylthiophosphate. The agents are found to have a favorable effect on the functioning of the gastrointestinal tract of the irradiated mice. I.H.

A84-42965

**CHARACTERIZATION OF THE ROLE OF THE SEROTONIN HYDROXYL GROUP IN THE PHARMACOLOGICAL AND RADIOPROTECTIVE ACTION OF SEROTONIN [K KHARAKTERISTIKE ROLI GIDROKSIL'NOI GRUPPY SEROTONINA V FARMAKOLOGICHESKOM I PROTIVOLUCHEVOM EFFEKTE SEROTONINA]**

M. V. VASIN, V. V. ANTIPOV, N. N. SUVOROV, M. M. ABRAMOV, and N. V. GORELOVA Radiobiologiya (ISSN 0033-8192), vol. 24, May-June 1984, p. 411-414. In Russian. refs

A84-43051

**EARTH'S EARLIEST BIOSPHERE: ITS ORIGIN AND EVOLUTION**

J. W. SCHOPF, ED. (California, University, Los Angeles, CA) Princeton, NJ, Princeton University Press, 1983, 565 p. For individual items see A84-43052 to A84-43066.

Some of the subjects discussed are related to the early biogeologic history, the nature of the earth prior to the oldest known rock record, the early earth and the Archean rock record,

the prebiotic organic syntheses and the origin of life, Precambrian organic geochemistry, the biochemical evolution of anaerobic energy conversion, the isotopic inferences of ancient biochemistries, Archean stromatolites providing evidence of the earth's earliest benthos, Archean microfossils, the geologic evolution of the Archean-Early Proterozoic earth, and the environmental evolution of the Archean-Early Proterozoic earth. Other topics examined are concerned with geochemical evidence bearing on the origin of aerobiosis, biological and biochemical effects of the development of an aerobic environment, Early Proterozoic microfossils, the evolution of earth's earliest ecosystems, and geographic and geologic data for processed rock samples. Attention is given to a processing procedure for abiotic samples and calculation of model atmospheric compositions, and procedures of organic geochemical analysis. G.R.

A84-43052

**EARLY BIOGEOLOGIC HISTORY - THE EMERGENCE OF A PARADIGM**

P. CLOUD (California, University, Santa Barbara, CA) IN: Earth's earliest biosphere: Its origin and evolution. Princeton, NJ, Princeton University Press, 1983, p. 14-31.

It is pointed out that a study of the origin and evolution of the earth's earliest biosphere involves the blending of biology and geology. This situation provides the basis for a new interdisciplinary science. The most descriptive name for this science appears to be 'biogeology'. The present investigation is concerned with a new biogeological 'paradigm'. The term 'paradigm', as used in this investigation, denotes a dramatic shift of previously prevailing views. The main elements of this paradigm are examined. The emergence of the new biogeological paradigm involves four stages. The first stage is the gestational or embryonic century, 1850-1950. The following stages include the emergent decade of the 1950s, the breakthrough decade of the 1960s, and the take-off decade, the 1970s. A survey is provided of the main elements of the four stages, and some remarks about current views and future prospects are presented. G.R.

A84-43056\* Indiana Univ., Bloomington.

**PRECAMBRIAN ORGANIC GEOCHEMISTRY - PRESERVATION OF THE RECORD**

J. M. HAYES, K. W. WEDEKING (Indiana University, Bloomington, IN), and I. R. KAPLAN (California, University, Los Angeles, CA) IN: Earth's earliest biosphere: Its origin and evolution. Princeton, NJ, Princeton University Press, 1983, p. 93-134. (Contract NGR-05-007-221; NGR-15-003-118)

A review of earlier studies is presented, and new results in Precambrian organic geochemistry are discussed. It is pointed out that two lines of evidence can be developed. One is based on structural organic chemistry, while the other is based on isotopic analyses. In the present investigation, the results of both structural and isotopic investigations of Precambrian organic matter are discussed. Processes and products related to organic geochemistry are examined, taking into account the carbon cycle, an approximate view of the principal pathways of carbon cycling associated with organic matter in the present global ecosystem, processes affecting sedimentary organic matter, and distribution and types of organic matter. Attention is given to chemical fossils in Precambrian sediments, kerogen analyses, the determination of the structural characteristics of kerogen, and data concerning the preservation of the Precambrian organic geochemical record. G.R.

A84-43057

**BIOCHEMICAL EVOLUTION OF ANAEROBIC ENERGY CONVERSION - THE TRANSITION FROM FERMENTATION TO ANOXYGENIC PHOTOSYNTHESIS**

H. GEST (Indiana University, Bloomington, IN) and J. W. SCHOPF (California, University, Los Angeles, CA) IN: Earth's earliest biosphere: Its origin and evolution. Princeton, NJ, Princeton University Press, 1983, p. 135-148. (Contract NSF PCM-79-10747)

The search for primary direct evidence of the origin and evolution of earth's earliest biosphere has been largely based on

the preserved rock record. However, there exists another basis for studies of biochemical evolution. This basis is provided by evidence found within the biochemistry and molecular biology of living organisms. A utilization of such a basis involves the sorting out of biochemical and molecular biological features, occurring in living systems, which accurately reflect the evolutionary history. The present chapter provides a summary of results of one approach to this problem. Attention is given to the metabolic characteristics of the earliest forms of life and, in particular, the development of anaerobic photosynthetic prokaryotes from their more primitive fermentative ancestors. Sugars in the primeval soup and early fermentations are considered along with more complex fermentations, sugar fermentation dependent on an 'accessory oxidant', accessory oxidant-dependent fermentation in photosynthetic bacteria, and the origin of anaerobic photophosphorylation. G.R.

**A84-43058\*** Max-Planck-Inst. fuer Chemie, Mainz (West Germany).

**ISOTOPIC INFERENCE OF ANCIENT BIOCHEMISTRIES - CARBON, SULFUR, HYDROGEN, AND NITROGEN**

M. SCHIDLOWSKI (Max-Planck-Institut fuer Chemie, Mainz, West Germany), J. M. HAYES (Indiana University, Bloomington, IN), and I. R. KAPLAN (California, University, Los Angeles, CA) IN: Earth's earliest biosphere: Its origin and evolution. Princeton, NJ, Princeton University Press, 1983, p. 149-186. Sponsorship: Deutsche Forschungsgemeinschaft.

(Contract DFG-SFB-73; NGR-05-007-221; NGR-15-003-118)

In processes of biological incorporation and subsequent biochemical processing sizable isotope effects occur as a result of both thermodynamic and kinetic fractionations which take place during metabolic and biosynthetic reactions. In this chapter a review is provided of earlier work and recent studies on isotope fractionations in the biogeochemical cycles of carbon, sulfur, hydrogen, and nitrogen. Attention is given to the biochemistry of carbon isotope fractionation, carbon isotope fractionation in extant plants and microorganisms, isotope fractionation in the terrestrial carbon cycle, the effects of diagenesis and metamorphism on the isotopic composition of sedimentary carbon, the isotopic composition of sedimentary carbon through time, implications of the sedimentary carbon isotope record, the biochemistry of sulfur isotope fractionation, pathways of the biogeochemical cycle of nitrogen, and the D/H ratio in naturally occurring materials. G.R.

**A84-43059**

**ARCHEAN STROMATOLITES - EVIDENCE OF THE EARTH'S EARLIEST BENTHOS**

M. R. WALTER (Baas Beeking Geobiological Laboratory, Canberra, Australia) IN: Earth's earliest biosphere: Its origin and evolution. Princeton, NJ, Princeton University Press, 1983, p. 187-213.

In terms of the main objectives considered in the present volume, stromatolites are of importance primarily as a source of biological information. Stromatolites constitute a prime source of data for Archean paleobiology. New data are gradually allowing the formulation of a theoretical 'model' or framework for the interpretation of stromatolites. It has been found that the construction of a stromatolite with a uniform fabric requires a consistent and repeatable set of behavioral responses from a particular relatively invariant, microbial community. That set of responses can be referred to as a syndrome. Counted by major stratigraphic units, eleven occurrences of stromatolites (and possible stromatolites) are known from Archean sequences dating back to 3.5 Ga ago. Early Archean stromatolites were constructed by filamentous prokaryotes and possibly also by unicellular prokaryotes. During the Early Proterozoic, benthonic microbial communities constructed stromatolites in peritidal and relatively deep subtidal environments in the oceans, down to the base of the photic zone. G.R.

**A84-43060**

**ARCHEAN MICROFOSSILS - NEW EVIDENCE OF ANCIENT MICROBES**

J. W. SCHOPF (California, University, Los Angeles, CA) and M. R. WALTER (Baas Beeking Geobiological Laboratory, Canberra, Australia) IN: Earth's earliest biosphere: Its origin and evolution. Princeton, NJ, Princeton University Press, 1983, p. 214-239.

The disparity between evidence of ancient microbes related to the Archean and the Early Proterozoic is considered, taking into account the fact that the Archean rock record includes only about 10 percent as many established microfossiliferous units as the Early Proterozoic. It is pointed out that as a result of the historical development of the field and of chiefly geologically imposed limitations inherent in its study, the search for cellularly preserved remnants of Archean life has met with only limited success. During the past half-century, some 43 categories of microfossils and microfossil-like objects have been reported from at least 28 geologic units of Archean age. In recent years, useful progress has been made both in terms of critical evaluation of the early fossil record, and of the discovery of new evidence. Attention is given to the criteria for establishing the authenticity of Archean microfossils. G.R.

**A84-43063\*** Indiana Univ., Bloomington.

**GEOCHEMICAL EVIDENCE BEARING ON THE ORIGIN OF AEROBIOSIS, A SPECULATIVE HYPOTHESIS**

J. M. HAYES (Indiana University, Bloomington, IN) IN: Earth's earliest biosphere: Its origin and evolution. Princeton, NJ, Princeton University Press, 1983, p. 291-301.

(Contract NGR-15-003-118)

It is pointed out that the atmosphere and hydrosphere of the early Archean earth were essentially anoxic. The paleontological record shows that life existed in spite of the absence of oxygen. The present investigation is concerned with the presentation of a plausible sequence of events, linking features in the carbon isotopic record to the origin of oxygenic photosynthesis. The investigation takes into account that the record of carbon isotopic abundances in sedimentary organic matter displays marked variations about 2.8 Ga before the present. At least by 2.8 Ga before the present, if not before, something in the carbon cycle began to allow the incorporation in sediments of organic material extraordinarily depleted in C-13. Attention is given to a model for the development of C-13 depleted kerogens, conclusions regarding the late Archean carbon cycle, and the transition in the global ecosystem. G.R.

**A84-43064**

**BIOLOGICAL AND BIOCHEMICAL EFFECTS OF THE DEVELOPMENT OF AN AEROBIC ENVIRONMENT**

D. J. CHAPMAN and J. W. SCHOPF (California, University, Los Angeles, CA) IN: Earth's earliest biosphere: Its origin and evolution. Princeton, NJ, Princeton University Press, 1983, p. 302-320.

(Contract NSF GB-42461; NSF PCM-78-25852)

Oxygen, in a combined state, is an abundant constituent of all the inner planets and their satellites. However, only the earth has uncombined molecular oxygen as a major atmospheric component, one for which there is no known primary source. Two principal questions about biologic oxygen relations are considered, taking into account the origin of 'aerobic biology', and the possibility of using quantitative aspects of the aerobic biochemistry of modern organisms as a basis to obtain information regarding the pO<sub>2</sub> of the earth's early environment. The first question is concerned with those biochemical processes involved in intracellular protection from, and the photosynthetic production and metabolic biosynthetic use of, molecular oxygen. It is concluded that the origin of oxygenic photosynthesis and the evolution of biologic oxygen relations together have been responsible for the development of the anaerobic-aerobic ecosystem which currently characterizes the planet. G.R.

A84-43065

**EARLY PROTEROZOIC MICROFOSSILS**

H. J. HOFMANN (Montreal, Université, Montreal, Canada) and J. W. SCHOPF (California, University, Los Angeles, CA) IN: Earth's earliest biosphere: Its origin and evolution. Princeton, NJ, Princeton University Press, 1983, p. 321-360.

A summary and an evaluation regarding the previously available data concerning the Early Proterozoic fossil record are provided. Attention is given to the relatively better known assemblages of the 2.5 to 1.6 Ga period, and a description is presented of newly detected fossils from four Early Proterozoic formations. Aspects of paleobiology are discussed, taking into account morphologic categories of Early Proterozoic microfossils, biological affinities and level of organization, and Early Proterozoic paleobiology. It is pointed out that during the past 60 years, microfossils and microfossil-like objects have been reported from at least 40 Early Proterozoic geologic units from North America, Europe, Africa, Australia, and Asia. Nearly 90 percent of the more than 160 publications dealing with these occurrences have appeared since 1965. G.R.

A84-43066

**EVOLUTION OF EARTH'S EARLIEST ECOSYSTEMS - RECENT PROGRESS AND UNSOLVED PROBLEMS**

J. W. SCHOPF (California, University, Los Angeles, CA), J. M. HAYES (Indiana University, Bloomington, IN), and M. R. WALTER (Baas Becking Geological Laboratory, Canberra, Australia) IN: Earth's earliest biosphere: Its origin and evolution. Princeton, NJ, Princeton University Press, 1983, p. 361-384.

It is the ultimate goal of Precambrian paleobiology to decipher and document both the timing and nature of major events in the early history of life. However, many questions which arise in connection with such an objective are still unanswered. The present investigation is concerned with an attempt to order the facts and to bring into focus the present status of the field and the areas of uncertainty. Attention is given to limitations of the early fossil record, major benchmarks in Archean-Early Proterozoic evolution, the categories of evidence, and the assessment of the evidence. A current 'best guess scenario' for the early history of life is provided, taking into account the primitive anaerobic ecosystem, the advanced anaerobic ecosystem, the transitional (anaerobic-amphibiotic) ecosystem, and the onset of the 'modern' (anaerobic-amphibiotic-aerobic) ecosystem. G.R.

A84-43726

**A MODEL OF SPINAL CORD DYSBARISM TO STUDY DELAYED TREATMENT. II - EFFECTS OF TREATMENT**

D. R. LEITCH and J. M. HALLENBECK (Institute of Naval Medicine, Alverstoke, Hants., England; U.S. Navy, Naval Medical Research Institute and Naval Medical Center; Uniformed Services University of the Health Sciences, Bethesda, MD) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 55, Aug. 1984, p. 679-684. refs

(Contract NAVY TASK M0099,PN001,1151)

Using the spinal cord decompression sickness model described in Part I, the effects of delay to treatment on the recovery of spinal evoked potentials (SEP) are explored. The primary treatments of oxygen at 60 fsw (2.8 bar) and air at 165 fsw (6.0 bar) were studied. In this exploratory study the results were surprisingly poor in all treatments applied. There is evidence that in this model a delay of 15-18 min between diagnosis and start of therapy would generally allow some recovery of SEP, which would rarely be complete. Supporting experiments involving cord ischemia are described. The results from this study make it possible to design a set of practicable experimental criteria for the purpose of discovering the optimal combinations of oxygen and pressure for the treatment of spinal cord decompression sickness. Author

A84-43727

**FLUID-ELECTROLYTE METABOLISM AND RENAL FUNCTION OF WHITE RATS IN EXPERIMENTS ABOARD COSMOS BIOSATELLITES**

O. G. GAZENKO, I. V. NATOCHIN, E. A. ILIN, N. A. ILIUSHKO, I. I. KONDRATIEV, E. A. LAVROVA, and E. I. SHAKHMATOVA (Ministerstvo Zdravookhraneniia SSSR, Institut Mediko-Biologicheskikh Problem, Moscow, USSR) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 55, Aug. 1984, p. 685-691. refs

Rat experiments on the Cosmos biosatellites demonstrated that the percentage of renal excretion of consumed water after flight was lower than after synchronous experiment. This can be attributed not only to water retention but also to a different level of extrarenal losses postflight. Weightless rats showed increased sodium excretion after water load tests and increased potassium excretion after potassium load tests. The sodium, potassium, and calcium balance was positive after weightlessness. Analysis of the electrolyte composition of different kidney zones revealed a decreased potassium content in the medulla, which is considered to be one of the causes of changed renal iono- and osmoregulatory function in weightlessness. The normalizing effect of artificial gravity on the natri- and kaliuretic renal function was demonstrated.

Author

A84-43731

**THE ENDOTOXIN-PRETREATED, OXYGEN-ADAPTED RAT MODEL IN HYPERBARIC HYPEROXIA**

R. M. JACKSON and J. B. PISARELLO (Pennsylvania, University, Philadelphia, PA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 55, Aug. 1984, p. 709-714. refs

Rats pretreated with 500 micrograms/kg endotoxin are resistant to the pulmonary toxic effects of normobaric hyperoxia exceeding 95 percent O<sub>2</sub>. After endotoxin-pretreatment and exposure to 1.0 ATA O<sub>2</sub> for 72 h, such rats are found to have elevated total superoxide dismutase, glutathione peroxidase, and catalase activities in homogenates of whole lungs. Despite increases in these protective antioxidant enzymes which persist in 2.0 ATA O<sub>2</sub> (4 h) and 4.0 ATA O<sub>2</sub> (1.0 h), such rats do not have improved survival in hyperbaric hyperoxia. Likewise, endotoxin-pretreatment immediately prior to 2.0 or 4.0 ATA O<sub>2</sub> exposure does not prolong survival compared to controls. It is likely that lung injury during the normobaric oxygen preexposure and the central nervous system toxicity of hyperbaric oxygen interact to limit survival. Author

A84-43733

**EFFECTS OF CONSTANT MAGNETIC FIELDS ON RATS AND MICE - A STUDY OF WEIGHT**

A. BELLOSSI, M. TH. SUTTER-DUB, and B. CH. J. SUTTER (Rennes I, Université, Rennes, France) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 55, Aug. 1984, p. 725-730. refs

Variations in the growth of animals from exposure to a magnetic field have been reported by several authors. In this study, young rats and mice were exposed daily to constant uniform magnetic fields. The strength of the field was 400, 600 or 800 mT. Rats were exposed for four weeks and mice for 250 d or more. Some mice were exposed in a permanent way to a nonuniform magnetic field of 4.6 mT. No significant effect on the growth was observed.

Author

A84-43790

**A NOVEL COLD-TOLERANT INSECT FOUND IN A HIMALAYAN GLACIER**

S. KOHSHIMA (Kyoto University, Kyoto, Japan) Nature (ISSN 0028-0836), vol. 310, July 19, 1984, p. 225-227. refs

The discovery of a new species of cold-tolerant midge (Chironomidae, *Diamesa Meigen* sp.) in a high-altitude glacier of the Nepal Himalayas is reported. The adult insect, characterized by reduced wings and antennae, is unable to fly, and is found walking on the surface of the glacier and in small cavities beneath it. The larvae grow in melt-water drainage channels under the ice and feed on blue-green algae and bacteria. The insect is the first

to be found which spends its entire life cycle in the snow and ice of a glacier - the coldest insect habitat ever recorded. The insect was active at temperatures as low as -16 C, well below those at which activity has been seen in insects living in other cold habitats, including Antarctic ones. The study also reveals a previously unsuspected ecosystem based on the algae and bacteria growing on glacial ice. Author

A84-43796

**RESPONSE OF THE AUDITORY ANALYZER TO THE COMBINED EFFECT OF NOISE, HIGH TEMPERATURE, AND CARBON MONOXIDE [REAKTSIIA ZVUKOVOGO ANALIZATORA NA KOMBINIROVANNOE VOZDEISTVIE SHUMA, POVYSHENNOI TEMPERATURY I OKISI UGLERODA]**

IU. K. REVSKOI, O. V. DAVYDOV, and G. M. ZHERDEV (Voenno-Meditsinskaia Akademiia, Leningrad, USSR) Vestnik Otorinolaringologii (ISSN 0042-4668), July-Aug. 1984, p. 14-17. In Russian. refs

The results of experiments performed on ocean vessels to study the combined effect of high-temperature, noise, and CO on aural sensitivity are reported. The subjects of the experiments included 51 sailors and 126 porpoises and test parameters consisted of noise levels between 10 and 127 dB (1000-4000 Hz), temperatures between 20 and 40 C, and CO concentrations of 50, 500 and 5000 mg/sq m. It is found that noise sensitivity was altered in the presence of stable acoustic noise accompanied by the remaining stressors. The applicability of mathematical methods for analyzing the effects of noise, high temperature, and CO exposure is also discussed. I.H.

A84-43817

**CALCIUM SOURCE FOR EXCITATION-CONTRACTION COUPLING IN MYOCARDIUM OF NONHIBERNATING AND HIBERNATING CHIPMUNKS**

N. KONDO (Mitsubishi-Kasei Institute of Life Sciences, Tokyo, Japan) and S. SHIBATA (Hawaii, University, Honolulu, HI) Science (ISSN 0036-8075), vol. 225, Aug. 10, 1984, p. 641-643. refs

The amplitude of the early plateau phase of the action potential and the slow action potential of cardiac muscle were much lower in hibernating chipmunks than in nonhibernating chipmunks. The frequency-dependent contraction was decreased in hibernating animals but increased in nonhibernating animals. Caffeine caused a negative inotropic effect in hibernating animals but a positive inotropic effect in nonhibernating animals. Ryanodine caused greater inhibition in hibernating animals than in nonhibernating animals. These results suggest that the respective roles of the sources of calcium for cardiac excitation-contraction coupling are changed during hibernation. Author

A84-43821

**BUBBLE FORMATION IN CRABS INDUCED BY LIMB MOTIONS AFTER DECOMPRESSION**

P. M. MCDONOUGH and E. A. HEMMINGSEN (California, University, La Jolla, CA) Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology (ISSN 0161-7567), vol. 57, July 1984, p. 117-122. refs (Contract NIH-HL-16855)

A84-44078

**CORONARY VASCULAR RESPONSE TO ADRENERGIC STIMULATION IN EXERCISE-CONDITIONED DOGS**

P. A. GWIRTZ (Texas College of Osteopathic Medicine, Fort Worth, TX) and H. L. STONE (Oklahoma, University, Oklahoma City, OK) Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology (ISSN 0161-7567), vol. 57, Aug. 1984, p. 315-320. refs (Contract NIH-HL-22154-01; NIH-HL-31144-01)

A84-44079

**PLASMA CATECHOLAMINES AND THEIR EFFECT ON BLOOD LACTATE AND MUSCLE LACTATE OUTPUT**

W. N. STAINSBY, C. SUMNERS (Florida, University, Gainesville, FL), and G. M. ANDREW (Queen's University, Kingston, Ontario, Canada) Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology (ISSN 0161-7567), vol. 57, Aug. 1984, p. 321-325. refs (Contract NIH-AM-30187)

The effect of infused epinephrine (E) or norepinephrine (NE) at 1.5 microgram/kg body weight min on the O<sub>2</sub> uptake and net lactate output (L) of the surgically isolated resting or contracting (4/sec) gastrocnemius-plantaris muscles is investigated experimentally in dogs. Plasma E and NE concentrations are increased by the surgical procedure and then tripled by the infusions. Infusion of E causes a continuous increase in venous and arterial lactate concentration at rest, but NE infusion has no effect. During the first 10 min of contractions, either infusion leads to a significant increase in peak L compared to controls without infusion, but O<sub>2</sub> uptake is unaffected. T.K.

A84-44080

**BIOCHEMICAL ALTERATIONS IN HEART AFTER EXHAUSTIVE SWIMMING IN RATS**

G. N. PIERCE, M. J. B. KUTRYK, K. S. DHALLA, R. E. BEAMISH, and N. S. DHALLA (Manitoba, University, Winnipeg, Canada) Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology (ISSN 0161-7567), vol. 57, Aug. 1984, p. 326-331. Research supported by the Manitoba Heart Foundation, Medical Research Council and Canadian Heart Foundation. refs

The effect of daily exhaustive swimming for 1, 3, or 7 days on heart and skeletal-muscle glycogen (G), plasma and heart epinephrine (E) and norepinephrine (NE), the uptake and binding of Ca(2+) by the cardiac sarcoplasmic reticulum (SR) and mitochondria (M), and the function of the sarcolemmal membrane (SM) is investigated experimentally in male Sprague-Dawley rats weighing 250-300 g. Measurements are obtained immediately after exercise on the days indicated. G is significantly depleted in both heart and skeletal muscles at day 1 but recovers to control levels by day 7 in all but the plantaris muscle. Plasma and cardiac E and NE are found to be elevated and depressed, respectively, after each exercise period. SR Ca(2+) binding is depressed at day 3 only; SR Ca(2+) uptake is depressed at days 1 and 3; M Ca(2+) binding and uptake are enhanced at day 3 and depressed at day 7. SM function is unaffected by the exercise program. T.K.

A84-44081

**EFFECTS OF ADDITION OF NITROGEN DURING RAPID COMPRESSION OF BABOONS**

J. C. ROSTAIN, J. C. DUMAS, B. GARDETTE, J. P. IMBERT (CNRS, Groupement d'Interet Scientifique de Physiologie Hyperbare; Compagnie Maritime d'Expertise, Centre Experimental Hyperbare, Marseille, France), and C. LEMAIRE (Octares, Marseille, France) Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology (ISSN 0161-7567), vol. 57, Aug. 1984, p. 332-340. Research supported by the Centre National pour l'Exploitation des Oceans, Direction des Recherches, Etudes et Techniques and Compagnie Maritime d'Expertise. refs

The development of the high-pressure nervous syndrome (HPNS) is monitored in baboons breathing either He-O<sub>2</sub> or He-O<sub>2</sub> + 8 percent N<sub>2</sub> during linear compression at 200 m/h to 800 m sea water or exponential 2-h compression to 600 m sea water. The results are presented in tables and graphs. Addition of N<sub>2</sub> to the mixture at the beginning of linear compression has no effect on HPNS and leads to more severe EEG changes, but HPNS symptoms are less severe in an exponential dive with the N<sub>2</sub> mixture and become less severe when N<sub>2</sub> is added at the end of compression. Progressive addition of N<sub>2</sub> during exponential compression reduces the behavioral symptoms but does not affect the EEG. The implications for the mechanism of HPNS onset are discussed. T.K.

A84-44082

**HPNS OF BABOONS DURING HELIUM-NITROGEN-OXYGEN SLOW EXPONENTIAL COMPRESSIONS**

J. C. ROSTAIN, B. GARDETTE, M. C. GARDETTE-CHAUFFOUR (CNRS, Groupement d'Interet Scientifique de Physiologie Hyperbare; Compagnie Maritime d'Expertise, Centre Experimental Hyperbare, Marseille, France), and C. FORNI (Institut de Neurophysiologie et Psychophysiologie, Marseille, France) *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology* (ISSN 0161-7567), vol. 57, Aug. 1984, p. 341-350. Research supported by the Centre National pour l'Exploitation des Oceans, Direction des Recherches, Etudes et Techniques and Compagnie Maritime d'Expertise. refs

A84-44084

**ARTERIAL BLOOD ACID-BASE REGULATION DURING EXERCISE IN RATS**

R. F. FREGOSI and J. A. DEMPSEY (Wisconsin, University, Madison, WI) *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology* (ISSN 0161-7567), vol. 57, Aug. 1984, p. 396-402. Army-supported research. refs (Contract NIH-HL-15469)

O<sub>2</sub> consumption, CO<sub>2</sub> production, arterial blood gases and lactate concentration, and rectal temperature are measured during 10-min moderate and maximal treadmill exercise in male Wistar rats. The results are presented in graphs and tables and discussed. Mild exercise is accompanied by increases in arterial PO<sub>2</sub> (4.1 + or - 1.5 torr), arterial pH (0.034 + or 0.006), and rectal temperature (0.6 + or - 0.1 C) and a decrease in arterial PCO<sub>2</sub> (5.5 + or - 0.6 torr). The transition to heavy exercise is marked by progressive hyperventilation (to PCO<sub>2</sub> 28.5 + or - 1.4 torr), which precedes the onset of metabolic acidosis (with a 3.4-fold increase in O<sub>2</sub> consumption, a 4.5-fold increase in CO<sub>2</sub> production, a 9-fold increase in lactate concentration, and arterial pH 7.31 + or - 0.02) and is not affected by preventing the associated temperature increase. T.K.

A84-44088

**MORPHOLOGICAL AND PHYSIOLOGICAL RESPONSES OF THE LUNGS OF DOGS TO ACUTE DECOMPRESSION**

P. W. CATRON, E. T. FLYNN, JR., L. YAFFE, M. E. BRADLEY, L. B. THOMAS, D. HINMAN, S. SURVANSKI, J. T. JOHNSON, and J. HARRINGTON (U.S. Navy, Medical Research Institute, Bethesda, MD) *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology* (ISSN 0161-7567), vol. 57, Aug. 1984, p. 467-474. refs (Contract NR TASK-M0099.PN001.1170)

The effects of rapid decompression (60 ft/min) from simulated air dives to 300 ft sea water on the function and structure of the lung are investigated in dogs anesthetized with pentobarbital sodium. The results are presented in graphs, tables, and micrographs and discussed in detail. Decompression is found to produce pulmonary hypertension, systemic hypotension, hemoconcentration, arterial hypoxemia, decreased dynamic compliance, and pulmonary edema. No regular changes in pulmonary resistance, left-ventricular end-diastolic pressure, or the appearance of the airway mucosa on bronchoscopic or histologic inspection are detected. Noncardiac pulmonary edema, possibly resulting from increased microvascular permeability of the lungs due to venous bubble emboli or from an injury to the central nervous system, is identified as the primary response of the lung to this level of rapid decompression. T.K.

A84-44484

**ULTRASTRUCTURAL ORGANIZATION OF CELLS OF CHLORELLA VULGARIS BEIJER, STRAIN LARG-1, GROWN IN AUTOTROPHIC CONDITIONS ON SALYUT-6 [UL'TRASTRUKTURNA ORGANIZATSIIA KLITIN CHLORELLA VULGARIS BEIJER, SHTAM LARG-1, SHCHO VIROSLI V AVTOTROFNIKH UMOVAKH NA BORTU NAUKOVOI ORBITAL'NOI STANTSII 'SALIUT-6']**

E. L. KORDIUM, A. F. POPOVA, and O. L. MASHINSKII (Akademiiia Nauk Ukrain's'koi RSR, Institut Botaniki, Kiev, Ukrainian SSR) *Ukrains'kii Botanichnii Zhurnal* (ISSN 0372-4123), vol. 41, 1984, p. 30-34. In Ukrainian. refs

Electron-microscope data are presented on *Chlorella vulgaris* Beijer (strain LARG-1) cells grown on Salyut-6 in the IFS-2 apparatus with illumination during 4.5 days. The similarity of ultrastructural organizations of the test and control variants is noted. A tendency to a decrease in the reserve carbohydrate synthesis in the *Ch. vulgaris* cells of the test variant is manifested at the structural level in the absence of starch grains in the chloroplasts or in a decrease of the volume of starch grains. A morphometric analysis confirms these data. B.J.

A84-44498

**THE MYSTERY OF MOTION OR WHAT REGULATES THE WORK OF THE MUSCLES AND HOW IS THIS REGULATION EFFECTED [TAINSTVO DVIZHENIIA ILI CHTO I KAK REGULIRUET RABOTU MYSHTS]**

A. A. BOLDYREV (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR) *Nauka v SSSR*, no. 1, 1984, p. 39-45. In Russian.

The current understanding of neuromuscular processes of excitation and contraction on the level of biochemistry is examined. Particular attention is given to the role of dipeptides in muscle regulation and to the functioning of ion pumps and their ensembles in membranes. Also examined is recent work done on muscle contraction and dysfunction in Scotland. B.J.

A84-45106

**HYDROLYTIC STABILITY OF BIOMOLECULES AT HIGH TEMPERATURES AND ITS IMPLICATION FOR LIFE AT 250 C**

R. H. WHITE (Virginia Polytechnic Institute and State University, Blacksburg, VA) *Nature* (ISSN 0028-0836), vol. 310, Aug. 2, 1984, p. 430-432. Research supported by the Jeffress Foundation. refs (Contract NSF PCM-82-17072)

An attempt is made to establish rates for the hydrolysis and/or decomposition of critical biomolecules in order to determine their ability to exist at 250 C. The results clearly indicate that organisms composed of proteins and nucleic acids could not survive at this temperature, due to the very rapid rate of decomposition of such molecules. The 'black smoker' bacteria reported to have been isolated from deep-sea hydrothermal vents, may be nonliving material related to coacerates and microspheres which form when hot solutions of proteins and nucleic acids are cooled. C.D.

A84-45399\* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

**THE GROWTH OF PARACOCCLUS HALODENITRIFICANS IN A DEFINED MEDIUM**

L. I. HOCHSTEIN (NASA, Ames Research Center, Extraterrestrial Research Div., Moffett Field, CA) and G. A. TOMLINSON (Santa Clara, University, Santa Clara, CA) *Canadian Journal of Microbiology* (ISSN 0008-4166), vol. 30, 1984, p. 837-840. Previously announced in STAR as N84-10724 refs (Contract NCA2-OR-685-902)

A synthetic medium, consisting of inorganic salts and any of a number of carbon sources, supported the aerobic growth of *Paracoccus halodenitrificans* when supplemented with thiamine. The same medium plus a nitrogenous oxide supported anaerobic growth when additionally supplemented with methionine. The observation that vitamin B12 or betaine replaced methionine suggested that *P. halodenitrificans* had a defect in the cobalamin dependent pathway for methionine biosynthesis, as well as the

inability to synthesize betanine when growing anaerobically.

(Author)

**A84-45549\*** Michigan State Univ., East Lansing.

**BETA-INTERFERON INHIBITS CELL INFECTION BY TRYPANOSOMA CRUZI**

F. KIERSZENBAUM (Michigan State University, East Lansing, MI) and G. SONNENFELD (Louisville, University, Louisville, KY) *Journal of Immunology* (ISSN 0022-1767), vol. 132, Feb. 1984, p. 905-908. refs

(Contract NIH-AI-14848; NIH-AI-17041; NCC2-213)

Beta interferon has been shown to inhibit the capacity of bloodstream forms of the flagellate *Trypanosoma cruzi*, the causative agent of Chagas' disease, to associate with and infect mouse peritoneal macrophages and rat heart myoblasts. The inhibitory effect was abrogated in the presence of specific antibodies to the interferon. Pretreatment of the parasites with interferon reduced their infectivity for untreated host cells, whereas pretreatment of either type of host cell did not affect the interaction. The effect of interferon on the trypanosomes was reversible; the extent of the inhibitory effect was significantly reduced after 20 min, and was undetectable after 60 min when macrophages were used as host cells. For the myoblasts, 60 min elapsed before the inhibitory effect began to subside and 120 min elapsed before it became insignificant or undetectable. C.D.

**A84-45550\*** Massachusetts Univ., Worcester.

**INTERFERON INDUCES NATURAL KILLER CELL BLASTOGENESIS IN VIVO**

C. A. BIRON, G. SONNENFELD (Massachusetts, University, Worcester, MA), and R. M. WELSH (Louisville, University, Louisville, KY) *Journal of Leukocyte Biology* (ISSN 0741-5400), vol. 35, 1984, p. 31-37. Research supported by the American Cancer Society. refs

(Contract PHS-AI-17672; PHS-AI-00432; NCC2-213)

Interferon (IFN), types beta and gamma, and IFN inducers polyinosinic-polycytidylic acid and lymphocytic choriomeningitis virus, all stimulated the generation of blast-natural killer (NK) cells in mouse spleens. Blast-NK cells were characterized on the basis of size, 3H-thymidine uptake, and NK cell markers. These data indicate that in addition to augmenting NK cell-mediated lysis, IFN may regulate NK cell proliferation in vivo. Author

**A84-45573\*** Texas Univ., Austin.

**LACK OF CORRELATION BETWEEN MYCOPLASMA INDUCED IFN-GAMMA PRODUCTION IN VITRO AND NATURAL KILLER CELL ACTIVITY AGAINST FLD-3 CELLS**

V. KUMAR, J. LUST, A. GIFALDI, M. BENNETT (Texas, University, Dallas, TX), and G. SONNENFELD (Louisville, University, Louisville, KY) *Immunobiology*, vol. 165, 1983, p. 445-458. refs

(Contract NIH-CA-33058; NIH-CA-31792; NIH-AI-18811; NCC2-213)

The role of interferon (IFN) in the normal-killer-cell (NK) mediated lysis of tumor cells in vitro is investigated experimentally. Normal mouse spleen cells and spleen cells treated with anti-Thy-1.2 serum are cultured for 24 h with Friend erythroleukemia (FLD-3) cells in RPMI 1640 medium; supernatant fluid from cultures with FLD-3 lysis are assayed for IFN-gamma, and it is found that pretreatment with anti-Thy-1.2 suppresses IFN-gamma generation without affecting the ability of NK to mediate the lysis of FLD-3. Further tests indicate that the generation of IFN-gamma is stimulated by the presence of *Mycoplasma arginini* in the FLD-3 cells. T.K.

**A84-45913**

**STRUCTURAL-FUNCTIONAL ALTERATIONS IN THE SYNAPTIC MEMBRANES OF THE BRAIN AS A RESULT OF AGING [STUKTURNO-FUNKSIONAL'NYE ISMENENIIA SINAPTIKESKIKH MEMBRAN MOZGA PRI STARENII]**

A. A. MILIUTIN, E. I. BELIAEVA, K. IA. BULANOVA, A. P. KIRILIUK, T. I. LYSKOVA, I. M. OKUN, S. L. AKSENTSEV, S. V. KONEV, and V. K. KOLTOVER (Akademii Nauk Belorusskoi SSR, Sektor Gerontologii and Institut Fotobiologii, Minsk, Belorussian SSR; Akademii Nauk SSSR, Institut Khimicheskoi Fiziki, Chernogolovka, USSR) *Biofizika* (ISSN 0006-3029), vol. 29, July-Aug. 1984, p. 640-642. In Russian. refs

**A84-45995**

**PHYSIOLOGY OF THERMOREGULATION [FIZIOLOGIIA TERMOREGULIATSII]**

K. P. IVANOV, ED. Leningrad, Izdatel'stvo Nauka, 1984, 470 p. In Russian. No individual items are abstracted in this volume.

The principal problems of thermoregulation and heat transfer in the human organism and other mammals are investigated. Consideration is given to the relation between thermoregulation and bioenergetics and the heat sensitive structures of the body including thermoreceptors in the skin and internal organs and thermosensitive neurons in the central nervous system, and to the problem of the maintenance of heat balance in the human body. Some results from several recent clinical investigations of the roles of thermoregulation and brain activity, of the long-term adaptation to heat and cold, and of the evolution of thermoregulatory systems are also discussed. I.H.

**A84-46223**

**PASSIVE TRANSPORT OF SODIUM INTO EPITHELIAL CELLS - METHODS OF STUDY, PROPERTIES, REGULATION, AND ROLE [PASSIVNYI TRANSPORT NATRIIA V EPITELIAL'NYE KLETKI - METODY, IZUCHENIIA, SVOISTVA, REGULIATSII I ROL']**

S. T. METELSKII (Nauchno-Issledovatel'skii Institut po Biologicheskim Ispytaniiam Khimicheskikh Soedinenii, Kupavna, USSR) *Uspekhi Fiziologicheskikh Nauk* (ISSN 0301-1798), vol. 15, July-Sept. 1984, p. 23-41. In Russian. refs

**A84-46224**

**CURRENT IDEAS ON ION MECHANISMS FOR CARDIAC ARRHYTHMIAS AND POSSIBLE MECHANISMS FOR THE ACTION OF ANTIARRHYTHMIC DRUGS [SOVREMENNYE PREDSTAVLENIIA OB IONNYKH MEKHAZIMAKH ARITMII SERD TSA I VOZMOZHNYKH MEKHAZIMAKH DEISTV IIA SERDECHNYKH ANTIARITMIKOV]**

V. I. POROTIKOV, A. V. LAZAREV, and G. A. GLEZER (Nauchno-Issledovatel'skii Institut po Biologicheskim Ispytaniiam Khimicheskikh Soedinenii, Staraya Kupavna, USSR) *Uspekhi Fiziologicheskikh Nauk* (ISSN 0301-1798), vol. 15, July-Sept. 1984, p. 42-63. In Russian. refs

**A84-46225**

**NONSPECIFIC RESPONSIVITY OF THE BODY AND INDIVIDUAL RADIO SENSITIVITY [NESPETSIFICHESKAIA REAKTIVNOST' ORGANIZMA I INDIVIDUAL'NAIA RADIOCHUVSTVITEL'NOST']**

A. IU. GRIGOREV (Ministerstvo Zdravookhraneniia SSSR, Institut Biofiziki, USSR) *Uspekhi Fiziologicheskikh Nauk* (ISSN 0301-1798), vol. 15, July-Sept. 1984, p. 64-82. In Russian. refs

A relationship between total responsivity and radio sensitivity is established. Particular attention is given to the role of the initial state of the central nervous system in the evaluation of the development of radiation sickness under the effect of large radiation doses. It has been shown that individual radio sensitivity can be determined most effectively by a preliminary assessment of the individual adaptive capacities of the body, and of its total responsivity under functional loads. B.J.

## 51 LIFE SCIENCES (GENERAL)

**A84-46260**

### **LOW GRAVITY LOWERS IMMUNITY TO DISEASE**

A. TSCHOPP and A. COGOLI (Zuerich, Eidgenoessische Technische Hochschule, Zurich, Switzerland) *New Scientist* (ISSN 0028-6664), vol. 103, Aug. 23, 1984, p. 36.

As biological samples were carried into space during the first space flights, methods of culturing cells were developed and it became possible to perform investigations in conditions of weightlessness. On Spacelab 1, a 3.5 kg incubator, and glass-fiber reinforced Teflon flasks were used to study the activity of lymphocytes. On return to earth, results showed that the lymphocytes, which had been at a temperature of 37 C during the flight, did survive the space flight, and consumed nearly the same amount of glucose as the ground controls. Even though these results cannot be directly related to the fact that the immune system of astronauts is weaker after flight, studies performed in centrifuges on earth show that activation of lymphocytes at 10 times the earth's gravitational field is much higher than at 1-G. This lends some support to the hypothesis that high-G increases, and low-G decreases the proliferation of cells. More experiments are to be performed on future space flights. J.P.

### **N84-31903#** Joint Publications Research Service, Arlington, Va. **USSR REPORT: LIFE SCIENCES. EFFECTS OF NONIONIZING ELECTROMAGNETIC RADIATION**

6 Jan. 1984 117 p refs Transl. into ENGLISH from various Russian articles

(JPRS-UNE-84-001) Avail: NTIS HC A06

Publications, developments, and progress in international life science studies are presented. Topics discussed include: laser applications in medicine and its effects; age related responses to dehydration and hyperhydration, effects of cold exposure on erythrocytes; climate effects; heart rate changes in response to sensorimotor loads; correlation between individual and alpha rhythm parameters; stability of physiological and psychological function under extreme environmental conditions; and psychophysiological effects of monotonous activity.

### **N84-31912#** SRI International Corp., Menlo Park, Calif. **USAFSAM (USAF SCHOOL OF AEROSPACE MEDICINE) REVIEW AND ANALYSIS OF RADIOFREQUENCY RADIATION BIOEFFECTS LITERATURE Interim Report, 17 Jun. 1983 - 16 Mar. 1984**

L. N. HEYNICK and P. POLSON May 1984 287 p  
(Contract F33615-82-C-0610)

(AD-A142961; USAFSAM-TR-84-17; REPT-4) Avail: NTIS HC A13/MF A01 CSCL 06R

The objectives of this project are to acquire, review, and analyze on an ongoing basis, information on research pertaining to the biological effects of radiofrequency radiation (RFR) for the preparation of a computer data base of analyses at the USAF School of Aerospace Medicine (USAFSAM). The method in use is to: (1) select documents judged to be representative of prior and current research on various RFR-bioeffects topics, (2) analyze in detail the contents of each such document, and (3) assess the validity and significance of the results presented. In this fourth report, the major RFR-bioeffects topics are listed and the format used for analyzing each selected document is described. During the period covered by this report, 42 additional analyses were completed, for a total of 160 analyses. The texts of the additional analyses are presented in Appendix A. In addition to the text, each analysis includes information for computer retrieval by authors, key words, year of publication, and RFR parameters. Appendixes B and C are two cumulative indexes to reference citations for all of the analyses completed thus far. In Appendix B, each citation is listed under each pertinent major topic. Appendix C comprises a cumulative list of citations in alphabetical order by first author and without regard to topic. Author (GRA)

**N84-31913#** New York Univ. Medical Center. Inst. of Environmental Medicine.

### **EFFECTS OF MICROWAVES ON CELL MEMBRANE PERMEABILITY Final Report, Jul. 1981 - Jun. 1984**

R. P. LIBURDY 2 Jul. 1984 69 p

(Contract N00014-81-K-0669)

(AD-A142979; FR-3) Avail: NTIS HC A04/MF A01 CSCL 06R

The objective of this research project was to identify and characterize cell membrane responses to microwave radiation and, importantly, to determine specific conditions or modulators required for these responses. This study has revealed that membrane permeability changes in the erythrocyte and in liposome vesicles, as well as protein shedding in the erythrocyte, are induced by microwaves at the membrane phase transition, and that these responses are strongly dependent on plasma, oxygen tension, and antioxidant free radical scavengers. These findings provide new insight into both the physical and chemical nature of microwave radiation interaction with the cell membrane. GRA

### **N84-31914#** Missouri Univ., Rolla. Dept. of Life Sciences. **EFFECTS OF RADIOFREQUENCY RADIATION ON DIFFERENTIATION OF ERYTHROLEUKEMIC CELLS Final Report, 2 Sep. 1982 - 1 Feb. 1984**

R. F. BROWN and S. V. MARSHALL May 1984 39 p

(Contract F33615-82-K-0634)

(AD-A143038; USAFSAM-TR-84-12) Avail: NTIS HC A03/MF A01 CSCL 06R

A dose-response study was conducted to determine if chemically induced erythroid differentiation of murine erythroleukemic (MEL) cells is affected by continuous-wave radiofrequency (RF) radiation. RF exposures were at 1180 MHz in a specially constructed anechoic chamber equipped with a constant-temperature-air circulator designed to maintain the cell at 37.4 C. Experiments were performed at incident power densities of 5.5, 11, and 22 mW/sq cm, corresponding to SAR levels of 18.5, 37, and 74 W/kg, respectively. Four replicate experiments were conducted at each power level with two irradiated and two control cultures included in each replicate. Cultures were initiated by suspension of MEL cells in growth medium containing the inducer hexamethylene bisacetamide, 3 mM, in 10-cm cellulose nitrate tubes. One day after addition of the inducer, the cultures were placed in the exposure chamber and irradiated for 48 hr. Cells were then counted, resuspended in normal growth medium (no inducer), and incubation continued for 2 additional days. Number of cells undergoing erythroid differentiation was determined by staining with benzidine, a hemoglobin-specific reagent. Amount of hemoglobin present in lysates prepared from the differential cells was determined by a colorimetric procedure. GRA

### **N84-31915#** Rose-Hulman Inst. of Tech., Terre Haute, Ind. **CONFERENCE GRANT FOR 2ND WORLD CONGRESS ON BIOMATERIALS Final Report**

J. M. ANDERSON, ed. Jun. 1984 11 p Conf. held in Washington, D.C., 27 Apr. - 1 May 1984

(Contract N00014-84-G-0041; DAMD17-84-G-4005)

(AD-A143129) Avail: NTIS HC A02/MF A01 CSCL 06B

This document reports on the Second World Congress on Biomaterials held in Washington, D.C., on April 27 - May 1, 1984. GRA

### **N84-31916#** Joint Publications Research Service, Arlington, Va. **USSR REPORT: LIFE SCIENCES. BIOMEDICAL AND BEHAVIORAL SCIENCES**

6 Jun. 1984 94 p refs Transl. into ENGLISH from various Russian articles

(JPRS-UBB-84-012) Avail: NTIS HC A05/MF A01

Progress in the sciences, biomedical and behavioral sciences is reported. Topics discussed include: aerospace medicine, human factors engineering, laser effects, and clinical medicine.

**N84-31924#** Joint Publications Research Service, Arlington, Va.  
**USSR REPORT: LIFE SCIENCES. BIOMEDICAL AND BEHAVIORAL SCIENCES Abstracts Only**  
 7 Aug. 1984 113 p refs Transl. into ENGLISH from various Russian articles  
 (JPRS-UBB-84-017) Avail: NTIS HC A06/MF A01

The current status of soviet research in medicine, agrotechnology, microbiology, human factors engineering, environmental studies, radiation effects, radiation biology, physiology, public health, and veterinary medicine are presented. Topics include surgical techniques, plant protection, bacterial identification, operator performance, environmental protection, effects of nonionizing electromagnetic radiation, medical equipment and facilities design, modelling systems, and disease prevention in animals.

**N84-32989** California Univ., Davis.  
**MECHANISMS OF THERMOREGULATION OF RATS EXPOSED TO HYPERGRAVIC FIELDS Ph.D. Thesis**  
 C. B. MONSON 1983 105 p  
 Avail: Univ. Microfilms Order No. DA8407918

The thermoregulatory response to hypergravity achieved by centrifugation was presented. The role of heat loss, shivering and nonshivering thermogenic mechanisms in the thermoregulatory response to centrifugation, Tc, Tt and rates of oxygen consumption, VO<sub>2</sub>, were measured in rats exposed to hypergravic fields of 1.5 to 6G. The changes of Tc and Tt in serotonin depleted rats exposed to 3G fields suggested that serotonergic neurons modulate, rather than directly mediate the response of shivering and nonshivering thermogenic effectors during centrifugation. It is indicated that the controllers and effectors for shivering, nonshivering thermogenesis (NST) and heat loss are arranged in parallel and can be uncoupled during hypergravic exposure. Finally, it appears that shivering NST, and heat loss mechanisms function to regulate Tc during centrifugation but at a level lower than at 1G. The regulation of Tc at a lowered level appears to result from a decrease in the set point, the magnitude of this set point change is dependent on the acceleration field and the ambient temperature. It is indicated that in response to centrifugation, the activity of each of the distinct parallel neurocontrollers for shivering NST, and heat loss is modified and that serotonergic neurons modulate the activity of these neurocontrollers. Dissert. Abstr.

**N84-32990\*#** National Aeronautics and Space Administration, Washington, D. C.  
**PUBLICATIONS OF THE NASA SPACE BIOLOGY PROGRAM FOR 1980 - 1984**  
 L. G. PLEASANT, comp. and J. L. SOLBERG, comp. Sep. 1984 99 p Prepared by George Washington Univ., Washington, D.C. (Contract NASW-3165)  
 (NASA-TM-86857; NAS 1.15:86857) Avail: NTIS HC A05/MF A01 CSCL 06B

A listing of 562 publications supported by the NASA Space Biology Program for the years 1980 to 1984 is presented. References are arranged under the headings which are plant gravitational research, animal gravitational research, and general. Keyword title indexes and a principal investigator listing are also included. Author

**N84-32991#** Army Research Inst. of Environmental Medicine, Natick, Mass.  
**CORRELATION BETWEEN PLASMA FIBRONECTIN LEVEL AND MORTALITY FOLLOWING EXPERIMENTAL RATE HEAT STRESS**  
 D. A. DUBOSE, J. MCCREARY, and L. SOWDERS 7 Jul. 1984 20 p  
 (AD-A143383; USARIEM-M-29/84) Avail: NTIS HC A02/MF A01 CSCL 06S

Reticuloendothelial system (RES) clearance function correlates with the mortality rate associated with stresses which can induce shock. Likewise, mortality rate after experimental rat heat stress (ERHS) is altered by modulation of RES function. Since plasma fibronectin (PF) mediates in vivo phagocytosis by the RES, the

relationship between mean plasma fibronectin level (MPFL) and mortality after ERHS was examined. A comparison of MPFLs prior to ERHS revealed that rats which ultimately comprised the survival group had a MPFL (269.0 + 11.2 microgram/ml) which exceeded the value determined for the non-survivors (252.9 + or - 11.9 microgram/ml). Both groups had elevated MPFLs, up to 12 h following ERHS. However, after this time, MPFL began to decline. The decline was more severe for the non-survivors, with MPFLs at 15, 18, and 24 h, significantly ( $p < 0.01$ ) lower than the values for the survival group. GRA

**N84-32992#** Ottawa Univ. (Ontario). Dept. of Electrical Engineering.  
**STUDIES OF THE ELECTRIC FIELD DISTRIBUTION IN BIOLOGICAL BODIES: EXPERIMENTAL DOSIMETRY AT RADIO FREQUENCIES Annual Scientific Report, 1 Jun. 1983 - 31 May 1984**  
 S. S. STUCHLY and M. A. STUCHLY May 1984 110 p  
 (Contract N00014-82-G-0011)  
 (AD-A143507) Avail: NTIS HC A06/MF A01 CSCL 06R

This report summarizes research progress in the period from June 1, 1983 to May 31, 1984 in studies of the specific absorption rate (SAR) in a model of the human body exposed to radiofrequency radiation in the far and near field of antennas. The objective of the project was to develop and evaluate a computer-controlled system for measurements of the spatial distribution of the SAR in simulated and real biological bodies and to perform measurements on a model of the human body in the near field of typical antennas. In summary, our investigations of the SAR distribution in a full-scale mode of man showed that relevant dosimetric data in the far and the near field can be conveniently and accurately obtained by the measurements using implantable electric field probes and computer-controlled data acquisition system. Such information cannot be reliably obtained using presently available numerical methods. GRA

**N84-32993#** Los Alamos Scientific Lab., N. Mex.  
**RAPID MICROBIAL IDENTIFICATION BY CIRCULAR INTENSITY DIFFERENTIAL SCATTERING**  
 C. T. GREGG and G. C. SALZMAN Jun. 1984 28 p refs  
 Presented at the 4th Intern. Symp. on Rapid Methods and Automation in Microbiol., Berlin, West Germany, 7-10 Jun. 1984  
 (Contract W-7405-ENG-36)  
 (DE84-013894; LA-UR-84-1796; CONF-8406148-1) Avail: NTIS HC A02/MF A01

Circular Intensity Differential Scattering (CIDS) is a technique of microbial identification. The CIDS spectra can be measured as a function of wavelength, scattering angle, and/or matrix element, and a number of matrix elements can be measured virtually simultaneously. This panoply of measurements potentially gives the method resolving power for microbial identification. Some representative data taken over the past couple of years on CIDS spectra of several antiviral vaccines is presented. DOE

**N84-32994#** Harvard Univ., Cambridge, Mass.  
**UNRAVELING PHOTOSYSTEMS Progress Report**  
 1984 3 p  
 (Contract DE-AC02-82ER-12085)  
 (DE84-013812; DOE/ER-12085/1) Avail: NTIS HC A02/MF A01

Each of the three cyanobacteria examined contains two or more genes for the B protein of photosystem II of photosynthesis. One of these genes from the cyanobacterium *fremyella diplosiphon* was sequenced. Synthetic oligopeptides were used to raise antibodies to two ten amino acid-long sequences of the 32 kilodalton B protein. To examine whether it is possible for chloroplast promoter sequences (and hence possibly chloroplast genes) to function in cyanobacteria. A series of plasmids containing the chloramphenicol acetyl transferase (CAT) gene minus its bacterial promoter was used. It appears that chloroplast promoters are recognized in cyanobacteria and act efficiently. DOE

## 51 LIFE SCIENCES (GENERAL)

**N84-32995#** California Univ., Berkeley. Lawrence Berkeley Lab.

### **ROLES OF IONIZING RADIATION IN CELL TRANSFORMATION**

C. A. TOBIAS, N. W. ALBRIGHT, and T. C. YANG Jul. 1983  
33 p refs Presented at Neyman-Kiefer Conf., Berkeley, Calif.,  
1 Jul. 1983

(Contract DE-AC03-76SF-00098)

(DE84-013397; LBL-17448; CONF-8307122-2) Avail: NTIS HC  
A03/MF A01

The hypothesis that both lethal radiation action and cell transformation are results of similar processes the production of lesions in DNA followed by time dependent repair is presented. Lethal effects of radiation damage and radiation-induced cell transformation both appear to be the results of misrepair. A quantitative biological model intended to describe the lethal effects on mammalian cells of heavily ionizing tracks is introduced.

R.S.F.

**N84-32996#** Joint Publications Research Service, Arlington, Va.  
**USSR REPORT: LIFE SCIENCES. BIOMEDICAL AND BEHAVIORAL SCIENCES**

8 Aug. 1984 117 p refs Transl. into ENGLISH from various Russian articles

(JPRS-UBB-84-018) Avail: NTIS HC A06/MF A01

Research and progress in the USSR in the disciplines of life sciences, biomedical and behavioral science is reported. Topics discussed include: aerospace medicine, biotechnology, food technology, medicine, microbiology, and radiation biology.

**N84-32998#** Joint Publications Research Service, Arlington, Va.  
**EFFECT OF CYCLIC CHANGES IN CULTIVATION CONDITIONS OF GROWTH KINETICS AND PHYSIOLOGICAL PROPERTIES OF YEASTS Abstract Only**

D. P. SOKOLOV, S. A. LIROVA, and Y. A. SOKOLOVA *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-018) p 9 8 Aug. 1984 Transl. into ENGLISH from Mikrobiologiya (Moscow), v. 52, no. 6, Nov.-Dec. 1983 p 909-916

Avail: NTIS HC A06/MF A01

The effects of nonstationary conditions created by rapid changes in pH and pO<sub>2</sub> during periodic cultivation of yeasts on their growth rate, economical coefficient and morphophysiological characteristics were evaluated. The nonstationary conditions represented pH changes ranging from 2.6 to 7.5, 4.5 to 7.5 and 4.5 to 2.5 and the reverse of each pair, within a short time interval; pO<sub>2</sub> was altered from the normally required level to a practically anaerobic condition. It is shown that cyclic changes in pH and pO<sub>2</sub> during the experimental growth period increase specific growth rate from 0.33 to 0.5-0.6 hrs<sup>-1</sup> without lowering the economic coefficient. The formation of intermediate products during the oxidation of yeasts and their use during aerobic stage of the cyclic regimens was discussed. A mathematical model is described for yeast growth in nonsteady conditions which accounts for the formation of and utilization of possible intermediate biosynthetic products. E.A.K.

**N84-32999#** Joint Publications Research Service, Arlington, Va.  
**MICROBIOLOGY AND FOOD PROGRAM**

*In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-018) p 13-17 8 Aug. 1984 Transl. into ENGLISH of Ekonomicheskaya Gazeta (Moscow), no. 51, Dec. 1983 p 1-2  
Avail: NTIS HC A06/MF A01

The importance of the microbiological industry in food supply is outlined. Acceleration of the development of production by microbiological synthesis is discussed. The significance of the output of necessary items in animal husbandry of commercial fodder microbiological protein and lysine and of other production is emphasized. The progress in implementing the scientific and technical programs for the development of progressive technologies and equipment for microbiological industry is discussed. E.A.K.

**N84-33001#** Joint Publications Research Service, Arlington, Va.  
**RESISTANCE OF MICROORGANISMS FROM MESOSPHERE TO PERIODIC FREEZING-THAWING Abstract Only**

A. A. IMSHENETSKIY, S. V. LYSENKO, T. M. KOZLOVA, and A. T. NOVICHKOVA *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-018) p 49-50 8 Aug. 1984 Transl. into ENGLISH from Mikrobiologiya (Moscow), v. 52, no. 6, Nov.-Dec. 1983 p 902-908

Avail: NTIS HC A06/MF A01

Earth atmosphere represents a gaseous membrane which is subdivided by its composition, temperature and electric characteristics into four subdivisions: troposphere, stratosphere, mesosphere and thermosphere. Microflora exists in earth atmosphere, both in the positive and negative temperature zones. These microorganisms originate in the earth crust and the effect of freezing and thawing on these microorganisms were studied. It is shown that after 10 freeze/thaw cycles the outer backbone layer of these special envelopes broke down and the plasmalemma membrane became stratified. It is found that with sun radiation, the exposure to periodic freeze/thaw cycles lowers the number of microorganisms in earth atmosphere. E.A.K.

**N84-33002#** Joint Publications Research Service, Arlington, Va.  
**EFFECTS OF INSULIN AND HYDROCORTISONE ON ENERGY METABOLISM IN RATS IRRADIATED WITH FAST, 60 MEV NEUTRONS Abstract Only**

D. A. SUTKOVOY, V. A. BARABOY, and P. M. KHALYAVKO *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-018) p 100-101 8 Aug. 1984 Transl. into ENGLISH from Radiobiologiya (Moscow), v. 23, no. 6, Nov.-Dec. 1983 p 805-807

Avail: NTIS HC A06/MF A01

Parameters of energy metabolism were studied in rats irradiated with fast neutrons to define the endocrine mechanism responsible for changes in high energy compound metabolism. Irradiation of the animals with 60 MeV neutrons with a single 1 Gy dose or two 0.5 Gy doses at 7 day intervals resulted in similar biochemical changes in hepatic and muscle tissues, consisting a reduction in the concentration of ATP, total nucleotides, and elevation of the ATP/ADP ratio. The administration of exogenous hydrocortisone potentiated the effects of irradiation, while administration of insulin or of insulin-hydrocortisone combinations to the irradiated animals reversed or attenuated the effects of irradiation. It is indicated that sublethal irradiation induces an increase in glucocorticoid secretion via induction of lipid peroxidation. It is suggested that the elevated glucocorticoids are responsible for depression of ATP synthesis, while the injection of the physiological antagonist of glucocorticoids - insulin is successfully used to counteract the effects of glucocorticoids. E.A.K.

## 52

### **AEROSPACE MEDICINE**

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

**A84-43352#**

### **A STUDY OF PHYSIOLOGICAL EQUIVALENT EFFECT TEMPERATURE**

C. PANG and W. JIANG Chinese Society of Astronautics, Journal, no. 2, 1984, p. 10-15. In Chinese, with abstract in English.

Experiments were conducted with various combinations of microclimatic factors in order to assess tolerance to high temperature, and a nomogram was obtained by mathematical processing of the experimental data. The shape of the physiological equivalent effect temperature curves was established by applying a mathematical equation. The results may be of use in designing environmental control systems for vehicles and for medical evaluations. C.D.

A84-43518

**INFORMATIVE VALUE OF THE CATEGORY 4-4 OF THE MINNESOTA CODE AS AN EARLY SIGN OF ISCHEMIC HEART DISEASE [INFORMATIVNOST' MINNESOTSKOGO KODA KATEGORII 4-4 KAK RANNEGO PRIZNAKA ISHEMICHESKOI BOLEZNI SERD TSA]**

O. M. BREGADZE, N. N. BURKADZE, and S. M. SHAGINOVA (Nauchno-Issledovatel'skii Institut Klinicheskoi i Eksperimental'noi Kardiologii, Georgian SSR) Akademiia Nauk Gruzinskoi SSR, Soobshcheniia (ISSN 0132-1447), vol. 113, Feb. 1984, p. 417-420. In Russian. refs

A diagnostic method for the early identification of coronary insufficiency is proposed which is based on the observation of the sickle-shaped form of the EKG ST-segment. An epidemiological study was performed which involved 150 EKGs with a sickle-shaped form of the ST-segment; the age of the subjects ranged from 35 to 59. Results of dynamic observations clearly showed that the sickle-shaped ST-segment developed into EKGs with depressive T-teeth (category 4-4 of the Minnesota code). It is suggested that the above-mentioned category 4-4 be considered an ischemic code. B.J.

A84-43728

**A CHOLINOMIMETIC MODEL OF MOTION SICKNESS AND SPACE ADAPTATION SYNDROME**

D. S. JANOWSKY, S. C. RISCH, M. ZIEGLER, B. KENNEDY, and L. HUEY (California, University; U.S. Veterans Administration, Medical Center, San Diego, CA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 55, Aug. 1984, p. 692-696. Sponsorship: U.S. Veterans Administration. refs (Contract USVA-MRIS-4576; NIH-MH-30914)

The space adaptation syndrome is one of the more vexing problems confronted by our nation's astronauts during their journeys. This syndrome may be a variant of motion sickness, although this possibility has been questioned. Physostigmine, a centrally active cholinesterase inhibitor which increases brain acetylcholine, was found to cause a motion sickness-like syndrome - in psychiatric patients and normals - including nausea, emesis, malaise, dysphoria, increases in serum ACTH, beta-endorphin, cortisol, and prolactin. Neostigmine, a non-centrally acting cholinesterase inhibitor, and saline placebo caused no such effects. The above effects closely parallel those of motion sickness. Thus, the effects of physostigmine may be a convenient model for screening for treatments for motion sickness or space adaptation syndrome, or for predicting who will develop these syndromes. Author

A84-43729

**RELATIONSHIP BETWEEN THE VALUE OF THE WENCKEBACH POINT AND +GZ TOLERANCE**

L. KOPKA, R. DABROWA, and S. BOJENKO (Wojskowy Instytut Medycyny Lotniczej, Warsaw, Poland) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 55, Aug. 1984, p. 697-701. refs

The +Gz acceleration tolerance in a homogeneous group of 21 male clinically healthy pilots or candidates to airtask was evaluated. The +Gz acceleration tolerance was compared with the Wenckebach point, i.e., the lowest rate of atrial stimulation needed to produce constant Wenckebach or Mobitz II atrio-ventricular (AV) block. The Wenckebach point was used as an autonomic nervous system activity index. It was demonstrated that the degree of +Gz acceleration tolerance depends greatly upon autonomic nervous system activity; and is lower in people with enhanced parasympathetic tone. The possibility of pharmacological correction of +Gz acceleration tolerance was discussed. Author

A84-43730\* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

**CARDIOVASCULAR RESPONSES DURING ORTHOSTASIS - EFFECT OF AN INCREASE IN MAXIMAL O<sub>2</sub> UPTAKE**

V. A. CONVERTINO, L. D. MONTGOMERY, and J. E. GREENLEAF (NASA, Ames Research Center, Moffett Field, CA; Arizona, University, Tucson, AZ) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 55, Aug. 1984, p. 702-708. refs (Contract NCA2-OR-180-703)

A study is described which tests the hypothesis that changes in aerobic activity (increases in maximum oxygen uptake) will reduce the effectiveness of cardiovascular reflexes to regulate blood pressure during orthostasis. The hypothesis was tested by measuring heart rate, blood pressure and blood volume responses in eight healthy male subjects before and after an eight-day endurance regimen. The results of the study suggest that the physiologic responses to orthostasis are dependent upon the rate of plasma volume loss and pooling, and are associated with training-induced hypervolemia. It is indicated that endurance type exercise training enhances cardiovascular adjustments during tilt. The implications of these results for the use of exercise training as a countermeasure and/or therapeutic method for the prevention of cardiovascular instability during orthostatic stress are discussed. I.H.

A84-43732

**EFFECTS OF ENDURANCE FITNESS ON RESPONSES TO COLD WATER IMMERSION**

I. JACOBS, T. ROMET, J. FRIM, and A. HYNES (Defence and Civil Institute of Environmental Medicine, Toronto, Canada) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 55, Aug. 1984, p. 715-720. refs

The purpose of this study was to determine if the changes in selected blood hormones and substrates, metabolic rate, and rectal temperature in nine males after immersion in 10 C water, while clad in standard flight suits, were related to the level of aerobic fitness. Fitness was evaluated by the blood lactate response to submaximal exercise. Immersion time (IT) was defined as the time required for a 1 C decrease in rectal temperature and averaged 38.5 (range: 21-62) min. Metabolic rate increased 3.4 times the resting rate. Lactate, free fatty acids, triiodothyronine and thyroxine increased by 81, 38, 11, and 8 percent, respectively, in contrast to insulin which decreased by 32 percent, with all changes being statistically significant. Glucagon increased slightly but not significantly (0.11) while glucose levels did not change. The IT was correlated directly with a measure of aerobic fitness, with relative body fat, and with the T3 levels postimmersion (p less than 0.05). The results suggest that the aerobic fitness level can significantly influence the cooling rate during water immersion. Author

A84-43734

**NEGATIVE AIR ION EFFECTS ON HUMAN PERFORMANCE AND PHYSIOLOGICAL CONDITION**

L. W. BUCKALEW and A. P. RIZZUTO (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, OH) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 55, Aug. 1984, p. 731-734. refs (Contract F49620-79-C-0038) (AFAMRL-TR-82-99)

Beneficial effects of exposure to negative air ions have been suggested, to include improved performance, mood, attention, and physiological condition. Existing support is clouded by methodological problems of control and standardization in treatment and equipment. This study investigated effects of negative ions produced by a commercially marketed air purification device on grip magnitude, coding, motor dexterity, reaction time, tracking, pulse, blood pressure, and temperature. Two groups of 12 males were exposed to 6 continuous h of either negative or 'normal' ion environments under a double blind condition. Repeated measures (0, 3, 6 h) on each variable were obtained. MANOVA applied to change scores revealed no differences between groups, and 0 vs 3 and 0 vs 6-h group differences showed no significant

alteration in any measure. Negative ions generated by an air purification device were concluded to produce no general or specific alteration of cognitive or psychomotor performance or physiological condition. Author

**A84-43736****CARDIOVASCULAR RESPONSES TO ISOMETRIC NECK MUSCLE CONTRACTIONS - RESULTS AFTER DYNAMIC EXERCISE WITH VARIOUS HEADGEAR LOADING CONFIGURATIONS**

C. A. PHILLIPS and J. S. PETROFSKY (Wright State University, Dayton, OH) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 55, Aug. 1984, p. 740-745. refs (Contract DAMD17-80-C-0089)

Experiments have been conducted in order to quantify the cardiovascular responses of blood pressure and heart rate to isometric contractions of the neck muscles after exercises with various types of headgear. In the experiments, five healthy males with various neck sizes were used. The neck muscles were loaded by the head itself (the control group), a standard U.S. Army SPH-4 helmet and a combination of the SPH-4 helmet and Night Vision Goggles (NGV). During two exercise periods, the subjects would rotate the head from side to side of the control, helmet and NVG configurations. An isometric head dynamometer was used to measure sustained right lateral neck muscle contraction. It is found that systolic and diastolic blood pressure increase in response to the contractions, and that these increases are approximately 40 and 50 percent, respectively. Heart rate increased an average of 45 percent from a position of rest to the end of a fatiguing period. The responses are found to be independent of the duration of the exercise period, loading during exercise and specific muscle mass. I.H.

**A84-43738****SPHERE AND CYLINDER DISTRIBUTION AMONG THE USAF RATED POPULATION REQUIRING SPECTACLES**

W. F. PROVINCES, W. M. WOESSNER, T. J. TREDICI, and A. J. RAHE (USAF, School of Aerospace Medicine, Brooks AFB, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 55, Aug. 1984, p. 751-753.

The refractive error distribution of active duty U.S. Air Force pilots and navigators currently required to wear corrective lenses while flying is determined. Data are collected from an Air Force-wide random sampling survey. The sphere and cylinder forms of the refractive error distribution are given. The results of the survey are expected to be helpful in the development of corrective headgear design requirements, projecting prescription ranges for contact lenses, and in estimating experimental controls for future research. I.H.

**A84-43797****PHYSIOLOGICAL VESTIBULAR NYSTAGMUS [FIZIOLOGICHESKII VESTIBILIARNYI NISTAGM]**

V. I. GRINCHUK (Il Moskovskii Gosudarstvennyi Meditsinskii Institut, Moscow, USSR) Vestnik Otorinolaringologii (ISSN 0042-4668), July-Aug. 1984, p. 18-23. In Russian. refs

Electronystagmographs are used to record the physiological, positional, and vestibular nystagmus of 103 healthy subjects. The recordings for the weak, physiological, vestibular nystagmus consisted of 18.33 to 23.9 beats per minute. Some possible mechanisms for creating physiological vestibular nystagmus are identified, including: the functional assymetry of the vestibular analyzer on the level of its central and peripheral links; the distinctive features of collateral blood circulation in the neck; and a combination of these factors. Electronystagmographs of the representative types of nystagmus are provided. I.H.

**A84-43798****THE GENESIS OF POSITIONAL PAROXYSMAL NYSTAGMUS [O GENEZE POZITSIONNOGO PAROKSIZMAL'NOGO NISTAGMA]**

G. M. GRIGOREV (Sverdlovskii Meditsinskii Institut, Sverdlovsk, USSR) Vestnik Otorinolaringologii (ISSN 0042-4668), July-Aug. 1984, p. 23-26. In Russian. refs

On the basis of an analysis of clinical (electronystagmographic) tests performed on 82 patients with positional paroxysmal nystagmus, some possible causes for cupulolithiasis were discovered, including diseases of the middle ear, brain injury, ear surgery, arteriosclerosis, or infection. In patients who showed signs of dystonia in the vertebral-basilar vessels, dizziness and paroxysmal positional nystagmus often developed during episodes of elevated arterial activity. It is believed that cupulolithiasis is not the only possible cause of positional paroxysmal nystagmus, which may develop in connection with vascular dystonia particularly in the labyrinthine artery. I.H.

**A84-43799****VASCULAR PERMEABILITY IN PATIENTS WITH NASAL BLEEDING ON THE BACKGROUND OF ATHEROSCLEROSIS AND HYPERTENSION DISEASE, AND ITS RELATIONSHIP TO SOLAR AND GEOMAGNETIC DISTURBANCES [SOSUDISTAIA PRONITSAEMOST' U BOL'NYKH S NOSOVYM KROVOTECHENIEM NA FONE ATEROSKLEROZA I GIPERTONICHESKOI BOLEZNI I EE ZAVISIMOST' OT GELIOGEOMAGNITNYKH VOZMUSHCHENII]**

N. S. ZAGAINOVA (Sverdlovskii Meditsinskii Institut; Gorodskaiia Klinicheskaia Bol'nitsa Skoroi Meditsinskoi Pomoshchi, Sverdlovsk, USSR) Vestnik Otorinolaringologii (ISSN 0042-4668), July-Aug. 1984, p. 48-51. In Russian. refs

**A84-43819****GLUCOSE TURNOVER AND HORMONAL CHANGES DURING INSULIN-INDUCED HYPOGLYCEMIA IN TRAINED HUMANS**

M. KJAER, K. J. MIKINES, N. J. CHRISTENSEN, B. TRONIER, J. VINTEN, B. SONNE, E. A. RICHTER, and H. GALBO (Copenhagen, University; NOVO Research Institute, Copenhagen; University Hospital, Herlev, Denmark) Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology (ISSN 0161-7567), vol. 57, July 1984, p. 21-27. Sponsorship: Statens Laegevidenskabelige Forskningsrad. refs (Contract SLF-160-2,5; SLF-12-3817; SLF-12-1611)

In clinical medicine hypoglycemia is induced by administration of insulin to evaluate the function of the endocrine glands secreting counterregulatory hormones. The present investigation is concerned with the influence of training on glucose turnover and hormonal changes during insulin-induced hypoglycemia. It is found that insulin clearance as well as glucose kinetics during insulin-induced hypoglycemia are identical in trained and untrained subjects when the former are studied three days after the last exercise bout. However, the response of epinephrine, growth hormone (GH), and pancreatic polypeptide (PP) to hypoglycemia is exaggerated, and that of glucagon diminished in the trained subjects. These results imply that the patient's state of training should be taken into account before his hormonal response to a hypoglycemia test is interpreted as pathological or not. G.R.

**A84-43820****BLOOD O<sub>2</sub> AFFINITY AND MAXIMAL O<sub>2</sub> CONSUMPTION IN ELITE BICYCLE RACERS**

A. VEICSTEINAS, M. SAMAJA, M. GUSSONI, and P. CERRETELLI (Milano, Universita, Milan, Italy; Geneve, Universite, Geneva, Switzerland) Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology (ISSN 0161-7567), vol. 57, July 1984, p. 52-58. Research supported by the Consiglio Nazionale delle Ricerche and Universita di Brescia. refs

**A84-43822\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

**IMMERSION DIURESIS WITHOUT EXPECTED SUPPRESSION OF VASOPRESSIN**

L. C. KEIL, J. E. SILVER, N. WONG, W. A. SPAUL, J. E. GREENLEAF (NASA, Ames Research Center, Laboratory for Human Environmental Physiology, Moffett Field, CA), and S. E. KRAVIK *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology* (ISSN 0161-7567), vol. 57, July 1984, p. 123-128. refs

There is a shift of blood from the lower parts of the body to the thoracic circulation during bed rest, water immersion, and presumably during weightlessness. On earth, this central fluid shift is associated with a profound diuresis. However, the mechanism involved is not yet well understood. The present investigation is concerned with measurements regarding the plasma vasopressin, fluid, electrolyte, and plasma renin activity (PRA) responses in subjects with normal preimmersion plasma vasopressin (PVP) concentration. In the conducted experiments, PRA was suppressed significantly at 30 min of immersion and had declined by 74 percent by the end of the experiment. On the basis of previously obtained results, it appears that sodium excretion during immersion may be independent of aldosterone action. Experimental results indicate that PVP is not suppressed by water immersion in normally hydrated subjects and that other factors may be responsible for the diuresis. G.R.

**A84-43823**

**BLOOD LACTATE AND AMMONIUM ION ACCUMULATION DURING GRADED EXERCISE IN HUMANS**

M. J. BUONO, T. R. CLANCY, and J. R. COOK (San Diego State University, San Diego, CA) *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology* (ISSN 0161-7567), vol. 57, July 1984, p. 135-139. Research supported by the San Diego State University. refs

**A84-43824**

**CARDIAC HYPERTROPHY AND FUNCTION IN MASTER ENDURANCE RUNNERS AND SPRINTERS**

J. S. CHILD, R. J. BARNARD, and R. L. TAW (California, University, Los Angeles, CA) *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology* (ISSN 0161-7567), vol. 57, July 1984, p. 176-181. refs

It is pointed out that cardiac enlargement with an increase in left ventricular mass is an adaptive response to prolonged intensive physical conditioning. The long-term effects of athletic cardiac hypertrophy on ventricular pump performance are uncertain. The present investigation involves a study of nine Master endurance runners and 13 Master sprinters by M-mode echocardiography and systolic time intervals at rest and by treadmill stress testing to evaluate cardiac anatomy and function in older (equal to or greater than 40 yr of age) men who have continued intense dynamic exercise training. It was found that maximal oxygen consumption and left ventricular mass index are greater in distance runners than in sprinters, and in each greater than in control subjects. Resting left ventricular function is normal as judged by fractional shortening and systolic time intervals, while aerobic capacity does not directly correlate with left ventricular mass index. G.R.

**A84-43825**

**EFFECT OF HIGH LOCAL TEMPERATURE ON REFLEX CUTANEOUS VASODILATION**

W. F. TAYLOR, J. M. JOHNSON, D. OLEARY, and M. K. PARK (Texas, University, San Antonio, TX) *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology* (ISSN 0161-7567), vol. 57, July 1984, p. 191-196. refs (Contract NIH-HL-20663)

Circulation to skin is modulated by local factors and by reflexes, and elevated local temperature increases skin blood flow (SKBF). The present investigation is concerned with the effect of high local forearm skin temperature on reflex cutaneous vasodilator responses to elevated whole-body skin and internal temperatures. A study was conducted with six healthy male subjects. On the

basis of the obtained results, it is concluded that local warming of the skin to 42 C renders the forearm cutaneous vasculature unresponsive to the reflex drive for vasodilation attendant to increasing whole-body skin and internal temperature. It is proposed that this phenomenon is achieved by a reduction or abolition of cutaneous vascular smooth muscle tone. G.R.

**A84-43923**

**THE PHENOMENON OF 'INFINITE SOUND' AS AN INDICATOR OF THE PHYSICAL FITNESS OF MILITARY PERSONNEL [FENOMEN 'BESKONECHNOGO TONA' KAK POKAZATEL' FIZICHESKOI TRENIROVANNOSTI VOENNOSLUZHASHCHIKH]**

E. A. PORUCHIKOV *Voenno-Meditsinskii Zhurnal* (ISSN 0026-9050), June 1984, p. 41-43. In Russian.

Tests were conducted to evaluate the effectiveness of the infinite-sound phenomenon (IFS), involving the reduction to zero of minimum auscultatory pressure, as an indicator of physical fitness. The studies (including bicycle, treadmill, and running-in-place tests) were performed on athletes, nonathletes, flight personnel (18 to 40 years of age), and military personnel (45 to 65 years of age). It is shown that the IFS arising during physical exercise is a reliable indicator of cardiac activity and reflects three important aspects of physical fitness: responsiveness, work capacity, and recovery of initial cardiohemodynamics. B.J.

**A84-43924**

**ANOMALIES OF JOINT TROPISM AND SPINAL OSTEOCHONDROSIS IN FLIGHT PERSONNEL [ANOMALII SUSTAVNOGO TROPIZMA I OSTEOKHONDROZ POZVONOCHNIKA U LITS LETNOGO SOSTAVA]**

R. V. POLETAEV *Voenno-Meditsinskii Zhurnal* (ISSN 0026-9050), June 1984, p. 44-46. In Russian.

**A84-43925**

**RELATIONSHIP BETWEEN CERTAIN IMMUNOLOGICAL INDICATORS AND THE SUBJECTIVE STATE OF SEAMEN DURING VOYAGES [VZAIMOSVIAZ' NEKOTORYKH IMMUNOLOGICHESKIKH POKAZATELEI S SUB'EKTIVNYM SOSTOIANIEM MORIAKOV V PLOVANII]**

I. A. SAPOV and A. A. POVAZHENKO *Voenno-Meditsinskii Zhurnal* (ISSN 0026-9050), June 1984, p. 46-48. In Russian. refs

**A84-44083**

**CENTRAL HEMODYNAMICS DURING PROGRESSIVE UPPER- AND LOWER-BODY EXERCISE AND RECOVERY**

D. S. MILES, M. N. SAWKA, D. E. HANPETER, J. E. FOSTER, JR., B. M. DOERR, and M. A. B. FREY (Wright State University, Dayton, OH) *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology* (ISSN 0161-7567), vol. 57, Aug. 1984, p. 366-370. Research supported by the American Heart Association. refs

Stroke volume (SV) and myocardial contractility responses during and immediately after exercise are compared. Nine men (mean 28 yr, 78 kg) completed progressive-intensity discontinuous tests on both arm crank and cycle ergometer. Exercise for each power output (PO) was 7 min, with 20-min rest periods interspersed. Impedance cardiography was used to measure cardiac output (Q), SV, and contractility on a beat-by-beat basis during exercise and a 15-s recovery period. Q increased linearly, and total peripheral resistance decreased exponentially with increasing PO levels. During recovery from exercise, the Q and heart rate (HR) values decreased immediately at all PO levels. When the exercise VO<sub>2</sub> exceeded 1.0 l/min, SV fell significantly during recovery for both exercise modes. In general, the recovery myocardial-contraction indices remained similar to exercise values. It was concluded that immediately after low intensities of exercise, Q decreases because of a fall in HR. After moderate and high-intensity exercise, Q decreases because of a fall in both HR and SV. Author

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**A84-44085**

### **HUMAN WHOLE-BLOOD OXYGEN AFFINITY - EFFECT OF TEMPERATURE**

A. ZWART, G. KWANT, B. OESEBURG, and W. G. ZIJLSTRA (Groningen, Rijksuniversiteit, Groningen, Netherlands) *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology* (ISSN 0161-7567), vol. 57, Aug. 1984, p. 429-434. Research supported by the Nederlandse Organisatie voor Zuiver Wetenschappelijk Onderzoek. refs

O<sub>2</sub> dissociation curves and total proton Haldane factors are measured at 22, 27, 32, 37, and 42 C and controlled pH (7.40) and PCO<sub>2</sub> (40 torr) in blood from three male and three female subjects. The results are presented in graphs and tables and discussed. O<sub>2</sub> dissociation is determined by the method of Zwart et al. (1982) over the entire range of O<sub>2</sub>-saturation levels and found to be unaffected by temperature. The Haldane factor is shown to be temperature dependent, the liberation of protons depending on the O<sub>2</sub> saturation. The apparent heat of oxygenation is calculated as 42.7 kJ/mol of monomeric hemoglobin. T.K.

**A84-44086**

### **EXERCISE-THERMOREGULATORY STRESS AND INCREASED PLASMA BETA-ENDORPHIN/BETA-LIPOTROPIN IN HUMANS**

T. B. KELSO, W. G. HERBERT, F. C. GWAZDAUSKAS, F. L. GOSS, and J. L. HESS (Virginia Polytechnic Institute and State University, Blacksburg, VA) *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology* (ISSN 0161-7567), vol. 57, Aug. 1984, p. 444-449. Research supported by the Virginia Polytechnic Institute and State University. refs

**A84-44087**

### **COMBINED EFFECTS OF OZONE EXPOSURE AND AMBIENT HEAT ON EXERCISING FEMALES**

S. I. GIBBONS and W. C. ADAMS (California, University, Davis, CA) *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology* (ISSN 0161-7567), vol. 57, Aug. 1984, p. 450-456. Research supported by the State of California Air Resources Board. refs

**A84-44089**

### **EFFECT OF VARIED LACTATE LEVELS ON BICYCLE ERGOMETER PERFORMANCE**

M. C. HOGAN and H. G. WELCH (Tennessee, University, Knoxville, TN) *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology* (ISSN 0161-7567), vol. 57, Aug. 1984, p. 507-513. Research supported by the American Heart Association. refs

(Contract NIH-AM-29888)

The role of blood lactates in muscle fatigue during exercise is investigated experimentally in six healthy male subjects performing bicycle ergometer tests. The test protocol comprises 5-min work at 95 percent of maximum O<sub>2</sub> uptake breathing a mixture of 16, 21, or 60 percent O<sub>2</sub> in N<sub>2</sub>, a 4-min rest period breathing 21-percent O<sub>2</sub>, and work to exhaustion at 90 percent of maximum O<sub>2</sub> uptake breathing 21-percent O<sub>2</sub>. The hypoxic treatment is found to produce a significantly higher concentration of blood lactates at the time the exhaustive work is begun and significantly shorter performance time to exhaustion (9.1 min) than the hyperoxic treatment (14.8 min). Blood lactate and H(+) concentrations equalize by the end of the final work period. T.K.

**A84-44090**

### **HEMOGLOBIN CONCENTRATION AND AEROBIC WORK CAPACITY IN WOMEN FOLLOWING INDUCED ERYTHROCYTHEMIA**

R. J. ROBERTSON, R. GILCHER, K. F. METZ, C. J. CASPERSEN, T. G. ALLISON, R. A. ABBOTT, G. S. SKRINAR, J. R. KRAUSE, and P. A. NIXON (Pittsburgh, University, Pittsburgh, PA) *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology* (ISSN 0161-7567), vol. 57, Aug. 1984, p. 568-575. refs

Hemoglobin concentration (Hb), cardiovascular parameters, and performance on bicycle-ergometer tests are determined in the nine

healthy female subjects before and 2 d, 8 d, and 14 d after infusion of 334 ml of autologous red blood cells. The tests are begun 8 d after the beginning of menstruation in each subject: results are presented in graphs and tables and discussed. The injection is shown to produce increases in Hb (from 12.7 to 14.7 g/dl), hematocrit (from 38.1 to 44.9 percent), arteriovenous O<sub>2</sub> difference, maximal O<sub>2</sub> uptake, and work capacity, and decreases in submaximal cardiac output and heart rate, which persist through the test period. Submaximal O<sub>2</sub> uptake and stroke volume and maximal cardiac output, heart rate, and stroke volume are unaffected. The increased work capacity and cardiovascular response are attributed to improved O<sub>2</sub> transport due to increased Hb. T.K.

**A84-45548\*** Yale Univ., New Haven, Conn.

### **RAPID DIAGNOSTIC METHODS FOR INFLUENZA VIRUS IN CLINICAL SPECIMENS - A COMPARATIVE STUDY**

A. S. EVANS and B. OLSON (Yale University, New Haven, CT) *Yale Journal of Biology and Medicine* (ISSN 0044-0086), vol. 55, 1982, p. 391-403. refs  
(Contract NSG-2185)

A comparison of five rapid viral diagnostic techniques for identifying influenza virus in nasopharyngeal aspirates has been made on patients with influenza-like illnesses. Initial results with immune electron microscopy were positive in only one of 11 specimens from which virus was isolated and further work abandoned. Four other rapid tests were carried out on 39 specimens from which influenza virus had been isolated in tissue culture in 28. Of these 28 specimens yielding virus, 24 (85.7 percent) were positive by an indirect fluorescent antibody test (IFAT) on nasopharyngeal cells, 18 (64.3 percent) by enzyme-linked immunosorbent assay (ELISA), 19 (67.8 percent) by enzyme-linked fluorescent assay (ELFA), and 26 (92.8 percent) by a rapid tissue culture amplification method (TCA) in a continuous Rhesus monkey kidney line (LLC-MK2) with identification of virus by fluorescent antibody. In terms of sensitivity, simplicity, and rapidity, a combination of the IFAT and TCA methods seems to be very useful. Author

**A84-45665\*** Rockefeller Univ., New York.

### **VESTIBULAR-INDUCED VOMITING AFTER VESTIBULOCEREBELLAR LESIONS**

A. D. MILLER and V. J. WILSON (Rockefeller University, New York, NY) *Brain, Behavior and Evolution* (ISSN 0006-8977), vol. 23, 1983, p. 26-31. Previously announced in STAR as N83-24158. refs

(Contract NAG-2164; NSG-2380; NIH-NS-02619)

Vestibular stimulation, by sinusoidal electrical polarization of the labyrinths of decerebrate cats which can produce vomiting and related activity which resembles motion sickness was examined. The symptoms include panting, salivation, swallowing, and retching as well as vomiting. These symptoms can be produced in cats with lesions of the posterior cerebellar vermis. It is suggested that a transcerebellar pathway from the vestibular apparatus through the nodulus and uvula to the vomiting center is not essential for vestibular induced vomiting and the occurrence of many symptoms of motion. E.A.K.

**A84-45925**

### **EFFECT OF STIMULATION PARAMETERS ON THE VISUAL DETECTION OF OSCILLATORY MOTION [VLIIANIE PARAMETROV STIMULIATSII NA ZRITEL'NOE OBNARUZHENIE KOLEBATEL'NOGO DVIZHENIIA]**

A. N. SOKOLOV (Moskovskii Universitet, Vestnik, Seria 14 - Psikhologiya, Jan.-Mar. 1984, p. 64-66. In Russian. refs

**A84-46256**

### **WHY DO ASTRONAUTS SUFFER SPACE SICKNESS?**

C. OMAN (MIT, Cambridge, MA) *New Scientist* (ISSN 0028-6664), vol. 103, Aug. 23, 1984, p. 10-13.

Since 1961, space sickness has been experienced by astronauts and cosmonauts, and roughly half of the Shuttle crews have suffered from it. For the past 20 years, research has been

conducted into the possible causes of the illness, and recently scientists have tested Shuttle payload specialists through different experiments which were later performed aboard Spacelab 1. In orbit, the symptoms of the illness were found to be related to head movements, particularly those involving rolling and pitching. Even though space sickness had diminished by the third day, physical signs of fluid shift persisted throughout the mission. Generally, space sickness symptoms in orbit were similar to those documented before the flight, and medication taken to control symptoms was found to have no bad side effects. Data indicate that space sickness is a normal response to an abnormal gravito-inertial environment, and that it can be controlled through both drugs, and visual and tactile cues. J.P.

**A84-46257****TILTED ASTRONAUTS REVEAL THE BRAIN'S BALANCING ACT**

L. YOUNG (MIT, Cambridge, MA) *New Scientist* (ISSN 0028-6664), vol. 103, Aug. 23, 1984, p. 14, 15.

Through the monitoring of orientation on Spacelab 1, a study has been made on how the brain mixes signals from the difference sense organs, and how astronauts become more dependent on vision to orient themselves. Tests in an earth-bound laboratory have shown that subjects, who are standing still and are looking in a rotating visual field, have experienced a delay before they feelvection. This may be the result of the absence of visual sensation caused by a lack of signals sent to the brain by the semicircular canals of the vestibular system. It is also shown that signals from the otolith organs oppose any visually induced tilt, that the ear-stone organs prevent substantial continuous roll and do not confirm heat tilt or inversion. On the 'rotating dome' experiment aboard Spacelab, astronauts showed some increasedvection in weightlessness in the erect or supine positions, but strength of the phenomenon did not vary very much on the first, third or sixth day for the four crewmembers tested. Visual effects were also found to be stronger. The firm anchoring of the head to a 'bite board' probably prevented total domination by visual input in the absence of cues or G-forces. J.P.

**A84-46259****HOT AIR CHANGES OUR VIEW OF THE EAR**

A. BENSON (RAF, Institute of Aviation Medicine, Farnborough, Hants., England) *New Scientist* (ISSN 0028-6664), vol. 103, Aug. 23, 1984, p. 34, 35.

Experiments were performed on Spacelab 1 astronauts to test a theory of how temperature changes in the ear canal stimulate the sensory receptors of the semicircular canals of the inner ear. Thermal convection, which is believed to cause nystagmus, has been tested in the microgravity of orbital flight by blowing hot air into the ears of a subject at temperatures ranging from 44 to 20 C while he was moved backward and forward. An involuntary oscillation of the eyeballs beating in the same direction was observed. These responses did not differ greatly from those of ground tests before and after the flight. The experiment has raised doubts on the established theory of how thermal stimulation induced eye movement. Further tests are to be conducted on the Spacelab D-1 mission in 1985. J.P.

**A84-46435****STABILITY OF PHASE RECOGNITION IN COMPLEX SPATIAL WAVEFORMS**

M. A. GEORGESON and R. S. E. TURNER (Bristol, University, Bristol, England) *Vision Research* (ISSN 0042-6989), vol. 24, no. 8, 1984, p. 851-858. Sponsorship: Science and Engineering Research Council. refs  
(Contract SERC-GR/B/14401)

Observers viewed 200 msec presentations of gratings containing first (0.5 c/deg) and third (1.5 c/deg) harmonic components. The phase of the third harmonic and the absolute position of the grating on the screen varied randomly from trial to trial. Classification of the phase relation (0, 90, 180 or 270 deg) was 99 percent perfect. When a 2-sec period of inspection of the grating or its fundamental preceded the test presentation, strong

shifts in perceived waveform were observed that depended on the test grating's position relative to the inspection grating, and resembled the effects seen during continuous viewing. No phase-specific effects were obtained. The pattern of results was exactly that predicted by negative afterimages. Phase recognition at low contrast, and at a high spatial frequency, was also good. Triangular-wave gratings were misperceived (the 'square-wave illusion') only when real or simulated afterimages were present. It is concluded that recognition of phase relations in a complex waveform is stable when the predictable variation due to afterimages is eliminated. Author

**A84-46436****THE EFFECTS OF EXPOSURE DURATION AND LUMINANCE ON THE 3-DOT HYPERACUITY TASK**

I. HADANI, M. GURI (Technion - Israel Institute of Technology, Haifa, Israel), and A. Z. MEIRI (Technion - Israel Institute of Technology; GALRAM, Ltd., Haifa, Israel) *Vision Research* (ISSN 0042-6989), vol. 24, no. 8, 1984, p. 871-874. Research supported by the Julius Silver Research Fund. refs

The 3-dot hyperacuity task was given to two subjects under three experimental paradigms: constant luminance, constant energy, and constant duration. Hyperacuity was obtained under conditions (3 dots, 2-msec exposure) which rule out any significant temporal or spatial averaging. There was a clear threshold decrease in the constant-luminance paradigm as exposure duration increased, no significant variations in threshold with the constant-energy paradigm as exposure duration varied, and a U-shaped function in the constant-exposure-duration paradigm as luminance varied. It is concluded that what limits performance, at least for short-exposure durations, is the total energy of the stimulus. The implications of the present results to the static and dynamic approaches to hyperacuity are discussed. Author

**A84-46475****HUMAN SUSCEPTIBILITY TO MOTION DISEASE UNDER CONDITIONS OF COMBINED VESTIBULAR AND OPTOKINETIC STIMULATION AND REDUCED FIELD OF VISION [PODVERZHENNOST' CHELOVEKA UKACHIVANIU V USLOVIAKH SOCHETANNOI VESTIBULIARNOI I OPTOKINETICHESKOI STIMULIATSII PRI UMEN'SHENII POLIA ZRENIIA]**

E. V. LAPAEV and O. A. VOROBEV *Akademiia Nauk SSSR, Izvestiia, Seria Biologicheskaiia* (ISSN 0002-3329), July-Aug. 1984, p. 496-500. In Russian. refs

Human susceptibility to motion disease was investigated under conditions of limited fields of vision during open-eye tests in an optokinetic cylinder with continuous Coriolis acceleration which rotated at a higher velocity than the patient's chair. It is shown that under conditions of contradictory vestibular and optokinetic influences the limitation of central and peripheral fields of vision results in a substantial increase in resistance to motion disease, accompanied by a pronounced decrease in sensor activity. I.H.

**N84-31229#** Joint Publications Research Service, Arlington, Va. **INNOVATIONS IN COSMONAUT MEDICAL MONITORING, PHYSICAL CONDITIONING Abstract Only**

V. PISHCHIK *In its USSR Rept.: Space* (JPRS-USP-84-004) p 25 22 Aug. 1984 *Transl. from Med. Gazeta (Moscow)*, 11 Apr. 1984 p 3

Avail: NTIS HC A07

Medical monitoring information from the manned orbiting station Salyut-7, the status of medical/biological research aimed at heightening the safety and fitness of cosmonauts on prolonged space missions, and results of the first two months of work on board Salyut-7 are discussed. Particular attention is paid to the cosmonauts' metabolism studies and to the physical conditioning regime they are using. Changes are also made in conditioning and examination routines in which effects of negative pressure are produced on the lower half of the body with the aid of a special suit. Blood samples are taken from veins as well as fingers in monitoring of the cosmonauts' hormones, water/salt metabolism and blood. Ultrasonic echocardiography is used for evaluating the

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activity of the cardiovascular system. Psychological training allows the study of certain psychological problems which occur in small groups on prolonged missions. M.A.C.

**N84-31230#** Joint Publications Research Service, Arlington, Va. **MEDICAL RESEARCH IN FIRST 100 DAYS OF SALYUT-7 FLIGHT Abstract Only**

V. PISHCHIK *In its* USSR Rept.: Space (JPRS-USP-84-004) p 42-43 22 Aug. 1984 Transl. into ENGLISH from Med. Gazeta (Moscow), 18 May 1984 p 4  
Avail: NTIS HC A07

The medical research portion of the first 100 days of the mission of the orbiting station Salyut-7 is examined. During the 100 days, 17 medical experiments are performed for the purpose of further studying effects of space flight conditions on the human organism, including studies of the cardiovascular system, the space form of motion, sickness and metabolic processes. Physical conditioning regimens using the exercycle and the running track are used for the purpose of preventing adverse effects of weightlessness. Functional tests in which negative pressure is applied to the lower half of the body is examined. These tests and cardiographic studies are done for the purpose of more fully evaluating reserve potentials of the cardiovascular system at various stages of a mission. The condition of the cosmonauts' hormonal systems, water/salt metabolism and blood systems are monitored. A glucose load functional test is performed to evaluate features of carbohydrate metabolism. A series of psychological and sanitary-and-hygienic studies are performed, as well as a number of otorhinolaryngologic examinations and studies of the fungus of the eye, which yield objective data on dynamics of the blood supply of the rhinopharynx, the tympanic membrane and the eye during various periods of adaptation to weightlessness. M.A.C.

**N84-31234#** Joint Publications Research Service, Arlington, Va. **HYPOKINESIA EXPERIMENT STUDIES EFFECTS OF WEIGHTLESSNESS Abstract Only**

G. LOMANOV *In its* USSR Rept.: Space (JPRS-USP-84-004) p 80-81 22 Aug. 1984 Transl. into ENGLISH from Sots. Industr. (Moscow), 24 Mar. 1984 p 4  
Avail: NTIS HC A07

The methods and objectives of a hypokinesia experiment are described. The metabolic changes which can occur in the human organism during prolonged space missions, as a result of weightlessness are investigated. In the course of the experiment, mineral metabolism and the condition of the osteomuscular system are studied by neutron activation analysis and ultrasonic probing. The circumstances under which imbalances of metabolism occur in conditions of weightlessness and hypokinesia are examined. The potential effectiveness of preventive measures which have been proposed for minimizing losses of mineral substances in these conditions are investigated. M.A.C.

**N84-31904#** Joint Publications Research Service, Arlington, Va. **MEDICAL APPLICATIONS OF LASERS**

V. A. MILYUSHENKO *In its* USSR Rept.: Life Sci. Effects of Nonionizing Electromagnetic Radiation (JPRS-UNE-84-001) p 25-28 6 Jan. 1984 Transl. into ENGLISH from Sov. Export (Moscow), v. 4, no. 145, 1983 p 54-56  
Avail: NTIS HC A06

A new trend in laser surgery was developed. Medical applications of lasers rely on the effect of biological tissue vaporization under high intensity radiation. Depending on the nature of intervention and the characteristic features of the organs which are operated on either continuous wave lasers or pulsed lasers with a pulse duration as short as a few nanoseconds are applied. Several laser units for medical applications were developed and are produced in quantity. E.A.K.

**N84-31905#** Joint Publications Research Service, Arlington, Va. **AGE-RELATED RESPONSES TO DE- AND HYPERHYDRATION Abstract Only**

R. I. AYZMAN *In its* USSR Rept.: Life Sci. Effects of Nonionizing Electromagnetic Radiation (JPRS-UNE-84-001) p 37 6 Jan. 1984 Transl. into ENGLISH from Fiz. Cheloveka (Moscow), v. 9, no. 3, May - Jun. 1983 p 454-460  
Avail: NTIS HC A06

Age related responses to water deprivation (38-42h) and water loading (2.2% of body weight) were studied in children (4-11 years old) and young adults (18-22 years) on the basis of blood chemistries and urinalysis. It is indicated that in the older age groups, osmoregulation was the dominant factor during the first 16-18 h of water deprivation, while in the younger age group (4-6 years) volume regulation was the predominant physiologic response. Volume regulation became the dominant controlling factor in the other age groups in the late stages of deprivation (38th to 42nd h). Following water loading the osmo and volume regulating mechanisms interact in an age related fashion: the former predominates in the younger (4-6 years) group throughout the entire 210 min period of observation, while in the other groups the early response (120 min) consisted of volume regulation followed by osmoregulatory adjustments in the later stage. Plasma aldosterone increased in all groups in response to water deprivation and loading in direct proportion to age. However, in the youngest group (4-6 years) aldosterone levels decreased toward the end of deprivation, indicating functional exhaustion of the endocrine system. E.A.K.

**N84-31906#** Joint Publications Research Service, Arlington, Va. **EFFECTS OF WHOLE-BODY COLD EXPOSURE ON ERYTHROCYTE MORPHOLOGY Abstract Only**

A. G. MARACHEV and A. V. KORNEV *In its* USSR Rept.: Life Sci. Effects of Nonionizing Electromagnetic Radiation (JPRS-UNE-84-001) p 37-38 6 Jan. 1984 Transl. into ENGLISH from Arkhiv Patol. (Moscow), no. 9, Sep. 1983 p 11-18  
Avail: NTIS HC A06

The erythrocyte morphology of 3000 residents of the Soviet Far North, ranging in age from 17 to 52 years was studied. The group included natives and nonnatives with variable periods of residence; populations in Moscow and its environs studied for control. Blood chemistries and scanning electron micrographs showed that the hemoglobin concentration and erythrocyte counts remain within the normal range as long as hypothermia does not develop; however, both parameters show reduction whenever cold is exacerbated. The latter conditions involve the appearance of many young and immature forms of erythrocytes and accelerated destruction of the mature forms, and the appearance of abnormal forms. These changes reflect the hypochromic anemia aspects of cold sickness. E.A.K.

**N84-31907#** Joint Publications Research Service, Arlington, Va. **EFFECTS OF CLIMATE ON KININOGEN LEVELS IN HEALTHY HUMAN SUBJECTS Abstract Only**

S. C. BERKELIYEVA *In its* USSR Rept.: Life Sci. Effect of Nonionizing Electromagnetic Radiation (JPRS-UNE-84-001) p 38 6 Jan. 1984 Transl. into ENGLISH from Zdravookhr. Turkm. (Ashkhabad), no. 7, Jul. 1983 p 16-20  
Avail: NTIS HC A06

Effects of geophysical factors on kininogen levels in healthy human subjects were investigated in an arid region and in a temperate climate, and correlated with published findings on the effects of latitude and geomagnetic field on the same parameter. It is found that kininogen concentration increases from arid to temperate zones and also shows a positive correlation with increased amplitudes of short periodic variations in the horizontal components of the geomagnetic field from low to polar latitudes. The vasoactive role of the kinins shows the involvement in the adaptation of the cardiovascular system to ambient geophysical conditions. E.A.K.

**N84-31908#** Joint Publications Research Service, Arlington, Va.  
**HEART RHYTHM CHANGES IN RESPONSE TO SENSORIMOTOR LOAD OF VARYING COMPLEXITY Abstract Only**

Y. I. SHULMAN, M. Y. GELTSEL, and M. B. SHPARK *In its USSR Rept.; Life Sci. Effects of Nonionizing Electromagnetic Radiation (JPRS-UNE-84-001) p 39 6 Jan. 1984 Transl. into ENGLISH from Fiz. Cheloveka (Moscow), v. 9, no. 5, Sep. - Oct. 1983 p 757-761*  
 Avail: NTIS HC A06

Heart rhythm changes in response to sensorimotor load of varying complexity while carrying out a push button motor response were studied. In a semireclining position the subjects were exposed to one or two auditory stimuli and, depending on the quantity, quality, and time interval were required to carry out the appropriate response as instructed. Prior to sensorimotor stimuli the heart rate response to the auditory signal(s) consisted of a slight elongation of the first poststimulation R-R interval on the ECG, and recovery of normal R-R intervals at the expense of a shortened third R-R interval. In situations in which decision making was required, a statistically significant prolongation was seen in that R-R interval during which a decision to institute a motor response was made. The second and third R-R intervals were subject to prolongation and indicates that the start up of the response does not coincide with the decision making process itself, but with the final acceptance of the decision. E.A.K.

**N84-31909#** Joint Publications Research Service, Arlington, Va.  
**CORRELATION BETWEEN INDIVIDUAL ALPHA-RHYTHM PARAMETERS AND OPERATOR'S PERFORMANCE WHILE SUBJECTED TO MAXIMUM INFORMATION INPUT Abstract Only**

S. Y. POPOV, A. V. MIROLYUBOV, and I. L. SOLOMIN *In its USSR Rept.: Life Sci. Effects of Nonionizing Electromagnetic Radiation (JPRS-UNE-84-001) p 42 6 Jan. 1984 Transl. into ENGLISH from Fiz. Cheloveka (Moscow), v. 9, no. 5, Sep. - Oct. 1983 p 865-866*  
 Avail: NTIS HC A06

A mathematical analysis was conducted on the correlation between alpha rhythms obtained by unipolar recordings from the right and left occipital areas and the performance of 12 male subjects, in a psychological adding test complicated by maximum information input to the subjects. A positive correlation prevailed between the mean period of the alpha waves in the right hemisphere and between the duration of the ascending positive phase with an increase in the frequency of errors, and with a decrease in the time required for onset of mental block. The two alpha rhythm parameters appeared to determine or reflect performance accuracy and immunity to acute mental fatigue. The duration of the descending negative phase and the mean period of the alpha waves in both hemispheres shows negative correlation with fluctuations in the error frequency, and reflects the degree of performance instability. E.A.K.

**N84-31910#** Joint Publications Research Service, Arlington, Va.  
**STABILITY OF PHYSIOLOGICAL AND PSYCHOLOGICAL HUMAN FUNCTIONS UNDER EXTREME ENVIRONMENTAL CONDITIONS Abstract Only**

A. SLONIM *In its USSR Rept.; Life Sci. Effects of Nonionizing Electromagnetic Radiation (JPRS-UNE-84-001) p 43 6 Jan. 1984 Transl. into ENGLISH from Fiz. Cheloveka (Moscow), v. 9, no. 5, Sep. - Oct. 1983 p 873-875*  
 Avail: NTIS HC A06

Individual elements of physiological adaptation to extreme environments were described. Topics include: increased resistance to environmental changes ranging from the molecular to the population wide level, an analysis of specific and nonspecific elements of adaptation, and an evaluation of adaptational limitations. Ecological and evolutionary comparisons are used. The regulating and the regulated systems are considered. A hierarchic consideration of adaptational mechanisms is less successful since it is hard to classify energetic components, sensory components, information analysis, decision making, and motivational

mechanisms on that basis. Behavioral adaptation is outlined and the interaction of adaptation and pathology is reported. A theoretical unifying concept for human adaptation is described. E.A.K.

**N84-31923#** Joint Publications Research Service, Arlington, Va.  
**IMMEDIATE EFFECTS OF HYPERBARIC OXYGENATION ON BODY OXYGEN SUPPLY Abstract Only**

V. I. BURAVTSOV, A. N. TULUPOV, I. P. NIKOLAYEVA, S. A. TATULYAN, and A. L. KOSTYUCHENKO *In its USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-012) p 45 6 Jun. 1984 Transl. into ENGLISH from Anesteziol. i Reanim. (Moscow), no. 1, Jan-Feb. 1984 p 20-21*  
 Avail: NTIS HC A05/MF A01

The effectiveness of hyperbaric oxygenation in patients with destructive pulmonary abscesses in improving body oxygen balance was studied. The therapeutic protocol called for 4-6 sessions in a pressure chamber with a pO<sub>2</sub> of 152-183 kPa each session lasting for 30-45 min. Hemodynamic and biochemical studies demonstrated that therapy had no effect on pulmonary gas exchange, but the minute volume was decreased by 32% in patients with an elevated minute volume. Despite diminished oxygen transport, blood flow and arteriovenous difference in oxygen tension, tissue oxygen balance improved as indicated by decreased serum lactate dehydrogenase activity and increased stability of erythrocyte suspensions and electrophoretic mobility of erythrocytes. It is indicated that, following hyperbaric oxygenation, energy expenditures for respiration and circulation are less stringent. E.A.K.

**N84-31925#** Joint Publications Research Service, Arlington, Va.  
**LINK BETWEEN INDEXES FOR MENTAL WORK CAPACITY AND PARAMETERS IN CIRCULATORY SYSTEM BEFORE AND AFTER PHYSICAL STRESS Abstract Only**

N. I. SAPOVA and T. A. PAVLOVA *In its USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-017) p 43 7 Aug. 1984 Transl. into ENGLISH from Fiz. Cheloveka (Moscow), v. 9, no. 6, Nov.-Dec. 1983 p 897-901*  
 Avail: NTIS HC A06/MF A01

The dynamics of mental work capacity following low level physical stress are investigated. Interval cardiograms and rheoencephalograms and integrated total body rheograms are made during the entire period of examinations (20-35 minutes). Respiratory volume is determined by spirometry. The arterial pressure and other circulatory parameters are also measured. Subjects perform tests involving the operational memory at rest and following ergometer stress. Complex physiological and psychophysiological indexes are assessed using the methods of Student and Wilcoxon with the aid of regression analysis. The findings indicate small but definite changes in cerebral circulation and cardiac rhythm in mental work one without substantial nervous/emotional tension and moderate election of mental work capacity following relatively mild physical work. It is concluded that in some cases light physical work of short duration is capable of enhancing mental work capacity. M.A.C.

**N84-31929#** Joint Publications Research Service, Arlington, Va.  
**LINK BETWEEN BLOOD CATECHOLAMINE LEVELS AND INDIVIDUAL FEATURES IN DYNAMICS OF OPERATOR ERROR Abstract Only**

S. Y. POPOV and A. V. MIROLYUBOV *In its USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-017) p 45-46 7 Aug. 1984 Transl. into ENGLISH from Fiz. Cheloveka (Moscow), v. 9, no. 6, Nov.-Dec. 1983 p 1023-1024*  
 Avail: NTIS HC A06/MF A01

At the biochemical level, activating mechanisms are supported by the adrenergic system, whose activeness can be used to determine the dynamics in operator work quality indexes. A comparative study is made of the catecholamine level in the peripheral blood and the periodicity of operator error. Findings indicate a regular association between the catecholamine level, the frequency of operator error and the activity of the central nervous system. Subjects with higher catecholamine levels and displaying greater activeness are able to cope with a greater

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information load. The catecholamine level and activeness seems to be associated only with the dynamic work indexes but not with the overall level of operator error. M.A.C.

**N84-31930#** Joint Publications Research Service, Arlington, Va. **CHANGES IN ARTERIAL PRESSURE IN STATIC WORK AS FUNCTION OF TIME OF DAY AND DEGREE OF DISTURBANCE IN EARTH'S MAGNETIC FIELD Abstract Only**

V. A. KUZMENKO and A. B. BULUYEV *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-017) p 69 7 Aug. 1984 Transl. into ENGLISH from Fiz. Cheloveka (Moscow), v. 9, no. 6, Nov.-Dec. 1983 p 892-896  
Avail: NTIS HC A06/MF A01

Changes in the arterial pressure in healthy subjects under various static muscular loads at different times of the day and different values for the geomagnetic field are compared. Measurements are made to determine systolic pressure and heart rate. Geomagnetic disturbance during measurements are assessed from data on the K-index. Circadian patterns in systolic pressure under static muscular load are established. A correlation is found between disturbances in the geomagnetic field and pressor response during segments of the circadian cycle when arterial pressure is normally lower. Changes in arterial pressure did not appear to be associated directly with physical load as correlated with geomagnetic disturbance or with any cardiac response. The range of possible changes in the arterial pressor response as a function of geomagnetic disturbance is commensurable with circadian changes in the excitation of circulatory regulation.

M.A.C.

**N84-31931#** Joint Publications Research Service, Arlington, Va. **DYNAMICS OF FUNCTIONAL STATUS AND SUBJECTIVE SENSATIONS IN PROCESS OF HEAT ADAPTATION Abstract Only**

A. T. MARYANOVICH, V. D. BAKHAREV, L. A. GRIDIN, and P. M. YARTSEV *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-017) p 74 7 Aug. 1984 Transl. into ENGLISH from Fiz. Cheloveka (Moscow), v. 9, no. 6, Nov.-Dec. 1983 p 956-962

Avail: NTIS HC A06/MF A01

Objective functional status and subjective sensations in heat acclimation are compared and correlated. Rectal temperature, heart rate, oxygen demand and carbon dioxide exhalation at rest and during physical exercise are recorded. Subject sensations are reported according to a 7 point scale. Objective and subjective findings are correlated using the Student methods for paired and unpaired samples. During the initial period of heat acclimation, improvement in the thermal status can be achieved through stressing the homeostatic mechanisms, without involving the cardiovascular system but involving increase in the sensation of discomfort. Two individual tactical approaches are possible during the period of heat acclimation in humans: (1) either stressing of the homeostatic mechanisms to reduce impairment of the thermal balance to a minimum, or (2) reducing stress and improving subjective sensations at the cost of elevated body temperature. The subsequent status in which both impairment of the thermal balance and the degree of discomfort experienced subjectively are reduced to a certain minimum level should be regarded as a sign of complete adaptation to the environment. M.A.C.

**N84-31932#** Joint Publications Research Service, Arlington, Va. **STUDY OF SPATIAL ASYMMETRY IN HUMAN EXTERNAL ELECTRICAL FIELD Abstract Only**

Y. V. TORNUYEV and S. A. KUDELKIN *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-017) p 75 7 Aug. 1984 Transl. into ENGLISH from Fiz. Cheloveka (Moscow), v. 9, no. 6, Nov.-Dec. 1983 p 969-973 Original language document previously announced in IAA as A84-15741

Avail: NTIS HC A06/MF A01

The ability to assess the turn angle of the forearm in the horizontal plane was investigated in two series of observations on 150 subjects. In the first series, the subject himself, without visual monitoring, moved his arm to a certain intermediate value specified

by the researcher (active moment A); while in the second series the arm was moved by the researcher (passive movement P). It is shown that the Stevens function power distribution was normal in A movement but asymmetric in P movement. It is suggested that this heterogeneity is caused by an indeterminacy factor in the case of P movement. (IAA)

**N84-31934** California Univ., Santa Barbara. **SENSITIVITY TO HYPOXIA IN HUMANS Ph.D. Thesis**

F. H. CARLIN 1983 254 p  
Avail: Univ. Microfilms Order No. DA8401736

Evaluation of the work performed by others revealed shortcomings in the metrics used to assess human hypoxic drive. The concept of the strong hypoxic drive was developed as an improved assessment and was applied to the data collected from several subjects. The strong hypoxic response appears to be an acceptable measure of relative hypoxic drive, however, it is quite inappropriate for use in a model of ventilatory drive in the control systems sense. Therefore, a method was developed to compute the six coefficients for an arbitrary hyperbola fitting the experimental data. In order to efficiently determine these coefficients it was necessary to specify the asymptotes. The strong hypoxic response estimated one of the asymptotes and a similar technique was used to determine the other asymptote. The second asymptote is termed the weak hypoxic response because it most closely matches the ventilation in the euoxic region. Additional work is indicated to either substantiate the usefulness of the new measures, or determine if some other measure is in fact of higher merit.

Dissert. Abstr.

**N84-31935\*#** National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

**PULMONARY ARTERY LOCATION DURING MICROGRAVITY ACTIVITY: POTENTIAL IMPACT FOR CHEST-MOUNTED DOPPLER DURING SPACE TRAVEL**

A. T. HADLEY, III, J. CONKIN (Technology, Inc., Houston, Tex.), J. M. WALIGORA, and D. J. HARRIGAN, JR. Aug. 1984 8 p refs

(Contract NAS9-17200)

(NASA-TM-58262; S-538; NAS 1.15:58262) Avail: NTIS HC A02/MF A01 CSCL 06E

Doppler, or ultrasonic, monitoring for pain manifestations of decompression sickness (the bends) is accomplished by placing a sensor on the chest over the pulmonary artery and listening for bubbles. Difficulties have arisen because the technician notes that the pulmonary artery seems to move with subject movement in a one-g field and because the sensor output is influenced by only slight degrees of sensor movement. This study used two subjects and mapped the position of the pulmonary artery in one-g, microgravity, and two-g environments using ultrasound. The results showed that the pulmonary artery is fixed in location in microgravity and not affected by subject position change. The optimal position corresponded to where the Doppler signal is best heard with the subject in a supine position in a one-g environment. The impact of this result is that a proposed multiple sensor array on the chest proposed for microgravity use may not be necessary to monitor an astronaut during extravehicular activities. Instead, a single sensor of approximately 1 inch diameter and mounted in the position described above may suffice. Author

**N84-31936\*#** Stanford Univ., Calif. Cardiology Div. **PHARMACOLOGIC COUNTER MEASURES MINIMIZING POST-SPACE FLIGHT ORTHOSTATIC INTOLERANCE Interim Report**

D. C. HARRISON and R. KATES Mar. 1982 14 p

(Contract NCC2-232)

(NASA-CR-173861; NAS 1.26:173861) Avail: NTIS HC A02/MF A01 CSCL 06E

The effect of bed rest on drug disposition and physiological function was investigated as part of a project to determine the cardiovascular effects of space flight. One group of subjects was given doses of lidocaine, penicillin-G, and ICG during a control period and following seven days of bed rest. Cardiac function

was evaluated by echo-cardiography. Renal function was evaluated in a second group before and after several days of bed rest. Inulin, para-aminohippurate, and dextran clearances were studied. In the first group, the post-bed rest parameters were not statistically different from the pre-bed rest values. In the second study, renal function did not change significantly after seven days of bed rest. Plans for future research are reviewed. R.S.F.

**N84-31937#** Norwegian Defence Research Establishment, Kjeller.

**MODULATION OF THE CHOLINERGIC MECHANISMS IN THE BRONCHIAL SMOOTH MUSCLE Ph.D Thesis**

P. AAS Jun. 1984 110 p refs  
(NDRE/PUBL-84-1001; ISSN-0800-4412) Avail: NTIS HC A06/MF A01

It is shown that cholinergic nerves to the bronchial smooth muscle were modulated by several independent mechanisms. The release of acetylcholine (Ach) was regulated by presynaptic muscarinic receptors and by adenosine. The presynaptic regulation of release is shown to operate in addition to the postsynaptic stimulation of the bronchial smooth muscle. The function of the cholinergic nervous system in bronchi and the lungs is dependent upon the activities of acetylcholinesterase and cholinesterases, which exhibited rather high activities in the tissues. Serotonin, which is stored in and released from pleural mast cells, potentiated the release of Ach and thereby the contraction of the bronchial smooth muscle. In addition to the presynaptic effect, there was a postsynaptic stimulatory response to serotonin. Special attention was paid to the peptide neurotensin, which potentiated both the release of Ach and stimulated the muscle to contract by postsynaptic receptors. The release of serotonin and histamine from rat pleural mast cells was specifically induced. Author

**N84-31938#** Brown Univ., Providence, R. I. Dept. of Physics.  
**CORRELATION OF AFFERENT ACTIVITY AND BINOCULAR RECEPTIVE FIELD PROPERTIES**

M. A. PARADISO and L. N. COOPER 13 Jul. 1984 34 p  
(Contract N00014-81-K-0136; NR PROJ. 201484)  
(AD-A143087; TR-15) Avail: NTIS HC A03/MF A01 CSDL 06P

A theoretical model of synaptic plasticity is used to examine the importance of the correlation of left eye and right eye afferent activities for the development of binocular receptive field properties in visual cortex. Generally, cortical cells that receive less binocularly correlated activity become less binocular. We argue that larger disparity decreases correlation and larger receptive field size increases correlation. Therefore, the consequences of normal uncorrelated activity are: first, disparity selective neurons that are optimally stimulated at the horopter tend to be more binocular than cells selective for nonzero disparities. Second, cortical cells with large receptive fields tend to be more binocular and can maintain larger disparities than small-field cells. Third, low levels of uncorrelated activity allow changes in ocular dominance that accentuate any ocular dominance organization present prior to visual experience. The model also readily accounts for the loss of binocularity caused by monocular deprivation, alternating occlusion, and strabismus. GRA

**N84-31939#** Civil Aeromedical Inst., Oklahoma City, Okla.  
**ANTHROPOMETRIC AND MASS DISTRIBUTION CHARACTERISTICS OF THE ADULT FEMALE, REVISED**

J. W. YOUNG, R. F. CHANDLER, C. C. SNOW, K. M. ROBINETTE (AF Aerospace Medical Research Lab., Wright-Patterson AFB, Ohio), G. F. ZEHNER (Anthropology Research Project, Inc., Yellow Springs, Ohio), and M. S. LOFBERG (USAF Hospital George, Calif.) Sep. 1983 109 p Supersedes N84-18898  
(AD-A143096; FAA-AM-83-16-REV) Avail: NTIS HC A06/MF A01 CSDL 06N

This study of 46 living adult females is part of a long-range research program designed to establish valid analytical relationships between readily measured body dimensions and mass distribution characteristics of living populations. Presented in this report are data describing the mass distribution characteristics of

primary and composite body segments. The report also contains sets of regression equations which can be used to predict segmental volumes and moments of inertia from anthropometric data. The data base is derived from both classical anthropometric measurements and from stereophotogrammetric techniques. Subjects were representative of a general United States population as defined by the 1971-74 Public Health Service, Health and Nutrition Examination Survey (HANES). The data obtained describe segment and segment composite volumes, centers of volume, intersegment cut centroids, principal inertial axes, and surface anatomical landmarks with respect to anatomical axes developed for each segment. Experiments designed to test the validity of research techniques and controls, and to measure the differences between stereophoto-metrically derived values and values obtained by direct measurement techniques are also described here.

GRA

**N84-31940#** Militair Hospitaal Dr. A. Mathijssen, Utrecht (Netherlands). Afdeling: Oogheilkunde.

**OPHTHALMOLOGICAL INVESTIGATION AMONG CONTACT LENS WEARERS IN MILITARY SERVICE [OOGHEELKUNDIG ONDERZOEK BIJ CONTACTLENSDRAGERS IN DE MILITAIRE DIENST]**

A. J. P. ROUWEN Dec. 1983 62 p refs In DUTCH; ENGLISH summary  
(Contract A82/K/100)  
(REPT-AR/MHAM-1983-1; TDCK-78936) Avail: NTIS HC A04/MF A01

Data concerning visual acuity, refraction and biomicroscopy of 644 recruits with contact lenses are correlated with the type of lenses worn (conventional hard, gas permeable hard, and soft). The gas permeable hard contact lenses provide good vision with minimal corneal distortion and less complications compared to soft contact lenses. Before and after a three weeks field exercise the same parameters were compared. Seventy-nine percent of all soldiers wore their lenses during the exercise. In this group only a slight increase in contact lenses associated ocular pathology is observed. Author (ESA)

**N84-32037#** Tokyo Denki Univ. (Japan). Dept. of Electronic Engineering.

**NONLINEAR DYNAMICS IN EXCITABLE NERVE MEMBRANES**  
K. AIHARA, M. KOTANI, H. NOGUCHI, and T. NUMAZIRI *In its* Res. Repts. of the Fac. of Eng., No. 31 p 29-34 Dec. 1983 refs

Avail: NTIS HC A07/MF A01

Nonlinear oscillations in excitable nerve membranes are theoretically analyzed by the Hodgkin-Huxley ordinary and partial differential equations. The formation of self-sustained oscillation in nerve membranes is described by a subcritical inverted Hopf bifurcation in the nonlinear neutral dynamics. It is also reported that the nonlinear dynamics produces chaotic oscillations and different bifurcating routes into chaos. Author

**N84-32997#** Joint Publications Research Service, Arlington, Va.  
**PILOT JET LAG EXPERIMENTS DESCRIBED**

V. GOLOVANOV *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-018) p 1-3 8 Aug. 1984 Transl. into ENGLISH from Sovetskaya Rossiya (Moscow), 22 Apr. 1984 p 6

Avail: NTIS HC A06/MF A01

Working conditions for flight crews during long distance flights were investigated. Jet lag, physiological and biological effects during crossing of time and climate zones were measured. Temperature and humidity effects on the pilots were examined. Human short term adjustment to extreme changes in time and climate are discussed. E.A.K.

**N84-33000#** Joint Publications Research Service, Arlington, Va.  
**MODELING OF LETHAL ELECTRIC SHOCK**

V. A. VOSTRIKOV, V. Y. TABAK, and M. S. BOGUSHEVICH *In its USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-018) p 40-43 8 Aug. 1984 refs Transl. into ENGLISH from Anesteziologiya i Reanomatologiya (Moscow), no. 2, Mar.-Apr. 1984 p 52-53*  
Avail: NTIS HC A06/MF A01

The problem of electric shock is examined. Ventricular fibrillation (sudden death) was found to be the most frequent cause of those fatalities; this is a characteristic arrhythmia when a low voltage (127-380 V) A.C. current (50-400 Hz) passes through the cardiac region, which results from functional disturbances in excitation and conduction processes in cardiac muscle. The introduction of electropulse therapy (cardiac defibrillation) into clinical and experimental practice allows the control of this very dangerous rhythmic disturbance. The problem of lethal electric shock, however, is not limited to ventricular fibrillation only. Data on frequent fatalities following high voltage (1000 V) contact both with and without ventricular fibrillation are presented. Substantial injuries both to cardiac muscle and other vitally important organs and systems are indicated. E.A.K.

**N84-33003\*** National Aeronautics and Space Administration, Washington, D. C.**AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES**

Sep. 1984 61 p  
(NASA-SP-7011(262); NAS 1.21:7011(262) Avail: NTIS HC \$7.00 CSCL 06E

This bibliography lists 169 reports, articles and other documents introduced into the NASA scientific and technical information system in August 1984. Author

**N84-33004#** Royal Aircraft Establishment, Farnborough (England).**OXYGEN AFFINITY OF HEMOGLOBIN, 3 HOURS AFTER PASSIVE INCREASE IN ALTITUDE FROM 400 TO 1800 METRES**

E. HUMPELER, K. INAMA, and H. JUNGSMANN Nov. 1983 13 p refs Transl. into ENGLISH from Wiener Klinische Wochenschrift (West Germany), v. 92, no. 9, 1980 p 326-329  
(RAE-TRANS-2118; BR92722) Avail: NTIS HC A02/MF A01

An investigation in two parts was undertaken in nine male subjects of the effect of short exposure to moderate altitude on the oxygen affinity of hemoglobin and other parameters. Initial measurements were performed at 425 m and repeated 3 hours after ascent by cable car to an altitude of 1800 m (Untersberg, Salzburg), no muscular activity being allowed. The same protocol was repeated 3 days subsequently but the individuals were exercised on an ergometer bicycle. The intraerythrocytic 2,3-DPG concentration showed a significant increase (1.2 micro MOL/GHB) after 3 hours of altitude exposure with and without muscular exercise. Inorganic plasma phosphates decrease is in both experiments. These findings show that 3 hours after cable-car ascent to a medium altitude a DPG increase occurs which is able to counteract the Bohr effect. B.W.

**N84-33005#** Minnesota Univ., Duluth. Dept. of Biochemistry.  
**CEREBRAL METABOLISM AND BLOOD BRAIN TRANSPORT: TOXICITY OF ORGANOPHOSPHOROUS COMPOUNDS Annual Summary Report, 15 Apr. 1982 - 15 Apr. 1983**

L. R. DREWES and A. K. SINGH Jun. 1983 37 p  
(Contract DAMD17-82-C-2136; DA PROJ. 3M1-61102-BS-10) (AD-A142705; ASR-1) Avail: NTIS HC A03/MF A01 CSCL 06T

The overall objective of this research project is to characterize the toxic effects of sarin and soman on the brain using the isolated perfused canine brain model. During the first contract year our efforts were directed toward the following: (1) establishing the viability of isolated perfused canine brain in the presence of sarin by measuring EEG and cerebral oxygen and glucose consumption; (2) determining the effect of an acute exposure to sarin on

acetylcholinesterase (AChE) activity in the isolated perfused canine brain; (3) measurement of water content and electrolyte levels in various brain regions after exposure to sarin; (4) determining the effects of sarin on free amino acids and neurotransmitters in various brain regions; (5) determining the effects of sarin on unidirectional blood-brain transport of glucose, choline, tyrosine, and glutamic acid by the indicator dilution method; and (6) development of a technique for the analysis of sarin in perfusate blood. In these studies a total of 19 perfusion experiments was conducted. In addition, brain tissue from 4 dogs was collected for non-perfused control experiments. Sarin (400 microgram) produced immediate seizure-like EEG activity in the isolated perfused canine brain. This was accompanied by significant inhibition of brain AChE.

GRA

**N84-33006#** Science Applications, Inc., Dayton, Ohio.  
**DEVELOPMENT OF COLOR CRITERIA FOR ADVANCED DISPLAYS Technical Report, Sep. 1982 - Sep. 1983**

F. WARD, D. WILSON, and D. L. WALLQUIST Wright-Patterson AFB, Ohio Aerospace Medical Research Lab. May 1984 96 p

(Contract F33615-82-C-0500)  
(AD-A143246; SAI-84-02-157; AFAMRL-TR-84-023) Avail: NTIS HC A05/MF A01 CSCL 05E

The research described herein involves color calibration of a CRT, a color discrimination study, and a color-coding system using Synthetic Aperture Radar (SAR) imagery. The results of the color calibration effort showed that, with appropriate regression coefficients, color output, both on a CRT and on film could be predicted. The color discrimination study showed that color discrimination is poorest for red colors. These data agree with our previous studies on color matching and discrimination, and we recommend caution when using the UCS representation as the index of color difference. The radar imagery color-coding study found, as have other investigators, that black and white coding is superior to color coding. If imagery is to be color-coded, hue coding is better than hue-brightness coding. GRA

**N84-33007#** School of Aerospace Medicine, Brooks AFB, Tex.  
**MEASUREMENT OF SPECIFIC ABSORPTION RATE IN HUMAN PHANTOMS EXPOSED TO SIMULATED AIR FORCE RADAR EMISSIONS Final Report, Oct. 1980 - Sep. 1981**

W. D. HURT Jun. 1984 11 p  
(Contract AF PROJ. 775-7)  
(AD-A143570; USAFSAM-TR-84-16) Avail: NTIS HC A02/MF A01 CSCL 06R

It has been suggested that pulsed radiofrequency radiation (RFR) fields may produce different specific absorption rate (SAR) distributions than continuous wave (CW) exposures. SAR distributions were measured in a muscle-equivalent slab for various RFR frequencies and duty-cycle combinations. No significant differences in SAR distribution between pulsed and CW were measured. GRA

**N84-33008#** Health Effects Research Lab., Research Triangle Park, N. C.**IMMUNOLOGIC EFFECTS OF ELECTROMAGNETIC FIELDS (1981 - 1983)**

R. J. SMIALOWICZ May 1984 10 p refs  
(PB84-190602; EPA-600/D-84-124) Avail: NTIS HC A02/MF A01 CSCL 06E

In vitro studies provide evidence that support and EM field induced thermal mechanism for immune effects. When proper control of culture temperatures has been achieved during in vitro exposure to EM fields, no alterations have been observed for a variety of immune cell functions. There is conflicting evidence for effects on lymphocytes exposed in vitro to amplitude modulated EM fields at 60Hz. More work is needed to determine if there exists a possible interaction between low frequency modulated EM fields and the immune system. At present, however, there is no convincing evidence from in vivo and in vitro animal studies that EM fields adversely alter the immune system at levels found in the ambient environment. GRA

**N84-33009#** Northrop Services, Inc., Research Triangle Park, N. C.

**DOSIMETRY OF OZONE AND NITROGEN DIOXIDE IN MAN AND ANIMALS**

J. H. OVERTON, JR. and F. J. MILLER (Health Effects Research Lab.) May 1984 15 p refs  
(PB84-195304; EPA-600/D-84-126) Avail: NTIS HC A02/MF A01 CSCL 06T

Agreement between experimental data on maximum morphological damage and maximal predicated tissue does offer promise that mathematical dosimetry models can contribute to a better understanding of effective doses in animal studies and their correspondence to human exposure levels. Modeling must be a dynamic process to take advantage of new information and evolving conceptualizations of physical, chemical, and biological processes. Qualitative extrapolations from animals to man have been indirectly in setting National Ambient Air Quality Standards. Continued development of dosimetry models, along with information on species differences in sensitivity to pollutants, have the potential to make extrapolations between animals and man more quantitative in the future. GRA

**N84-33010#** Health Effects Research Lab., Research Triangle Park, N. C.

**INTEGRATION OF SPECIES SENSITIVITY AND DOSIMETRY DATA IN THE EXTRAPOLATION OF OZONE AND NITROGEN DIOXIDE HEALTH DATA FROM ANIMALS TO MAN**

J. A. GRAHAM and G. E. HATCH May 1984 14 p refs  
(PB84-195312; EPA-600/E-84-125) Avail: NTIS HC A02/MF A01 CSCL 06T

Estimations of regional pulmonary doses of O<sub>3</sub> and NO<sub>2</sub> need to be combined with an understanding of the sensitivity of several animal species and man to equivalent tissue doses before animal to man quantitative extrapolations can be performed. Because of potential species differences in anti-oxidant defenses and repair mechanisms it is unlikely that regional lung dose-response effects will be identical across species. The concepts and their current state of experimental or theoretical validation to be addressed include the application of: (1) scaling principles between species following in vitro and in vivo exposure, (2) the parallelogram concept which directly relates acute animal to acute human effects and acute animal to chronic animal effects, thereby permitting the indirect estimation of chronic human effects, and (3) species comparisons of the health effects of O<sub>3</sub>. GRA

**N84-33011#** Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).

**OCCUPATIONAL MEDICINE RELEVANT TO AVIATION MEDICINE**

Loughton, England May 1984 74 p refs In ENGLISH and FRENCH Symp. held in London, 4 Oct. 1983  
(AGARD-CP-341; ISBN-92-835-0354-6) Avail: NTIS HC A05/MF A01

Laser effects, toxicology, and vision problems are addressed. Among the specific topics considered are: occupational medicine; the biological and pathological effects of hydrazine; the toxicity of combustion products; the relationship among ethyl alcohol consumption, nystagmus, and the balance mechanism of the inner ear; cathode ray tubes and visual perception; laser safety; and laser damage to the eye.

**N84-33012#** Philips Medical Service, Eindhoven (Netherlands).  
**REVIEW OF OCCUPATIONAL MEDICINE RELEVANT TO AVIATION MEDICINE**

H. ZUIDEMA *In* AGARD Occupational Med. Relevant to Aviation Med. 6 p May 1984  
Avail: NTIS HC A05/MF A01

The aim and scope of occupational medicine are reviewed. The conditions required to practice occupational medicine are also considered. The following specific topics are addressed: occupational health care of the individual worker, occupational hygiene, and ergonomics. The preventive character of occupational

medicine is emphasized. Aviation medicine is a subcategory of occupational medicine. R.S.F.

**N84-33013#** Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

**HYDRAZINE TOXICOLOGY: IMPACT ON SAFETY AND HEALTH IN MILITARY AVIATION**

G. C. MOHR *In* AGARD Occupational Med. Relevant to Aviation Med. 4 p May 1984 refs  
Avail: NTIS HC A05/MF A01

Hydrazine is a chemical of considerable military interest widely used as a rocket fuel and as a propellant for gas turbine generators. Extensive studies of the acute and chronic toxicity of hydrazine were conducted previously. The protocol used for toxicological evaluation of potentially hazardous chemicals is described briefly; pertinent data on acute effects are summarized; and the results of a large scale oncogenic evaluation are reviewed. Currently accepted guidelines for occupational medical management in the workplace are presented. Author

**N84-33014#** Danish Defence Command, Copenhagen. Medical Services.

**HANDLING OF HYDRAZINE IN THE ROYAL DANISH AIR FORCE**

K. JESSEN and S. TRAUTNER *In* AGARD Occupational Med. Relevant to Aviation Med. 4 p May 1984  
Avail: NTIS HC A05/MF A01

The introduction of the F-16 fighter aircraft into the Royal Danish Air Force included the introduction of hydrazine as a propellant for the emergency power unit (EPU). The EPU and hydrazine are discussed briefly. The pathological effects of hydrazine exposure are reviewed along with environmental safety regulations extant in the Danish Air Force. A health examination program designed to collect baseline medical data is outlined. Three case histories of hydrazine accidents are presented. R.S.F.

**N84-33015#** Laboratoire Central de Biologie Aerospatiale, Paris (France). Div. de Chimie-Toxicologie.

**A COMPARATIVE STUDY IN THE ANIMAL OF THE TOXICITY OF THE COMBUSTION PRODUCTS OF DIVERSE MATERIALS [ETUDE COMPARATIVE CHEZ L'ANIMAL DE LA TOXICITE DES PRODUITS DE THERMOLYSE DE DIVERS MATERIAUX]**

J. P. DELCROIX and M. GUERBET *In* AGARD Occupational Med. Relevant to Aviation Med. 14 p May 1984 refs In FRENCH

Avail: NTIS HC A05/MF A01

Materials with minimal toxicity must be chosen in case of fire in an enclosed space and, more particularly, onboard aircraft. An analytical study of atmospheric products is not sufficient for evaluating the risks encountered. There must be experimentation with animals. A methodology was created which associates an original model fire and a protocol for exposing animals to toxic gas products in order to study the response to aggression of the entire organism with its susceptibilities and reactions. Objective toxicological criteria are proposed with a view towards establishing a classification of materials according to chosen danger criteria.

Transl. by A.R.H.

**N84-33016#** Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).

**AN UNUSUAL TOXICOLOGICAL PROPERTY OF ALCOHOL: THE DENSITY EFFECT ON THE ORGAN OF BALANCE**

K. E. MONEY and J. P. LANDOLT *In* AGARD Occupational Med. Relevant to Aviation Med. 8 p May 1984 refs  
Avail: NTIS HC A05/MF A01

The relationship among ethyl alcohol consumption, nystagmus, and the balance mechanism of the inner ear was investigated with particular concern for pilot performance during positional alcohol nystagmus (PAN). The following questions were addressed experimentally: (1) does simultaneous ingestion of heavy water with alcohol prevent the occurrence of the first phase of PAN; (2) does the second phase of PAN appear if the first phase is prevented; (3) is the second phase prolonged if the blood alcohol

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level is held high for a long time; and (4) does glycerol, which is denser than water, cause positional nystagmus. Nystagmus was recorded using electronystagmography. Results show that it is possible for the second phase of PAN to persist beyond 11 hours after the cessation of drinking. The cause of the second phase of PAN appears to be the presence of alcohol in the semicircular canals of the inner ear. R.S.F.

**N84-33017#** Centre d'Etudes et de Recherches de Medecine Aerospatiale, Paris (France).

### VISUAL PERCEPTION IN SYSTEMS MANAGEMENT IN AERONAUTICS [LA PERCEPTION VISUELLE DANS LES CONDUITES DE SYSTEME EN AERONAUTIQUE]

J. P. MENU, G. SANTUCCI, and R. AMALBERTI *In* AGARD Occupational Med. Relevant to Aviation Med. 7 p May 1984 refs *In* FRENCH

Avail: NTIS HC A05/MF A01

Informatics is present in all domains of activity and especially in aeronautics where the cathode ray tube is the preferred mechanism for presenting information. Visual perception thus attracted is analyzed under its diverse aspects. How the physical characteristics of the access stimuli are measured is described and mechanisms for information processing are then examined. A method is presented for evaluating the operator's capabilities for integrating preceding information. Transl. by A.R.H.

**N84-33018#** Bundesministerium der Verteidigung, Bonn (West Germany).

### EVALUATION AND CONTROL OF LASER HAZARDS

G. HOLTRUP *In* AGARD Occupational Med. Relevant to Aviation Med. 4 p May 1984

Avail: NTIS HC A05/MF A01

International agreements on laser safety are summarized and the laser safety regulations valid for the West German military forces are presented. Laser materials and their associated output wavelengths are enumerated. Problems which arise from airborne laser operations are discussed along with the development of eye-safe lasers. R.S.F.

**N84-33019#** Centre de Recherches du Service de Sante des Armees, Clamart (France).

### VISUAL FUNCTION AND THE DEFINITION OF THRESHOLDS FOR EXPOSURE TO LASER RADIATION [LA FONCTION VISUELLE ET LA DEFINITION DES SEUILS D'EXPOSITION AU RAYONNEMENT LASER]

L. COURT, D. COURANT, G. SANTUCCI (GERMA), J. P. CHEVALEAUD, and G. PERDRIEL (Service de Sante des Armees) *In* AGARD Occupational Med. Relevant to Aviation Med. 17 p May 1984 refs *In* FRENCH

Avail: NTIS HC A05/MF A01

Dangers presented by the use of lasers and more particularly those related to laser radiation are essentially due to eye impairment. If determination of the maximum value of exposure requires precise knowledge of the physical parameters and associated biological effects, the influence of laser beams on visual function should be evaluated in the dynamic perspective of sensory physiology. The threshold must express the limit value of a relation existing between the energy and/or the power dissipated in the exposed biological structure and the appearance of the smallest functional impairment or a detectable lesion capable of involving damage. This definition introduces two concepts, the choice of criteria, reversible or irreversible impairment, and the measurement, of the associated energy exchange. It thus appears that biological and physical parameters constitute a whole of which the elements react on each other in a complex dynamic. Their descriptions, the definition and criteria, and experimental results illustrate the difficulties encountered in analyzing functional impairment and in determining the exposure limits as well as call to mind the uncertainty of actual norms. Transl. By A.R.H.

**N84-33272\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

### LANGLEY EXPERIENCE WITH ADABAS/NATURAL

A. SWANSON *In* NASA, Washington NASA Admin. Data Base Management Systems, 1984 p 55-56 Sep. 1984

Avail: NTIS HC A07/MF A01 CSCL 05B

The use of the data base management system ADABAS and the companion software NATURAL and COM-LETE at the Langley Research Center is evaluated. A brief overview of data base management system technology is provided as well as system upgrading, user requirements, and use of the system for administrative support. M.A.C.

**N84-33362#** Massachusetts Inst. of Tech., Cambridge.

### COMMUNICATIONS BIOPHYSICS

N. Y. S. KIANG, W. T. PEAKE, W. M. SIEBERT, T. F. WEISS, M. C. BROWN, R. A. EATOCK, D. K. EDDINGTON, J. J. GUINAN, E. M. KEITHLEY, J. B. KOBLER et al. *In its* RLE Progr. Rept. No. 126 p 181-198 Jan. 1984 refs

Avail: NTIS HC A12/MF A01

Topics on the biophysics of the auditory system are discussed. Research emphasis is placed on the anatomical structures and physiological mechanisms of vertebrate hearing and the associated clinical problems. Sound intensity perception, binaural hearing, hearing aid research, auditory discrimination, and the use of tactile sense as a hearing substitute are also examined. M.A.C.

**N84-33363#** Massachusetts Inst. of Tech., Cambridge.

### PHYSIOLOGY

J. Y. LETTVIN, J. GARDNER, S. JHAVERI, L. A. KAMENSKY, D. PERLMAN, G. M. PLOTKIN, S. A. RAYMOND, S. WIESNER, G. GEIGER, L. R. CARLEY et al. *In its* RLE Progr. Rept. No. 126 p 199-224 Jan. 1984 refs

Avail: NTIS HC A12/MF A01

The physiology of sight and image processing is discussed. Investigations of nervous signals, texture sensing, photoreceptor models, image enhancement under textural masking, treatment of Caisson Disease, quantum cryptography, and the development of an improved eye chart are examined. M.A.C.

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## BEHAVIORAL SCIENCES

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

**A84-43768**

### AUDITORY INDUCTION OF DISCRETE TONES IN SIGNAL DETECTION TASKS

K. B. BENNETT, R. PARASURAMAN, J. H. HOWARD, JR., and A. J. OTOOLE (Catholic University of America, Washington, DC) Perception and Psychophysics (ISSN 0031-5117), vol. 35, no. 6, June 1984, p. 570-578. Navy-supported research. refs

Previously, auditory induction was examined only in the context of rapid and continuously alternating sounds. The present investigation was concerned with auditory induction in a more generalized task situation (nonalternating, or discrete, sounds) which allows the use of a signal detection paradigm to measure induction effects on perceptual performance. The investigation includes the conduction of three experiments, taking into account the employment of pure tone signals embedded in band-limited noise. Three types of signals were used (constant, rising, or falling in frequency). The obtained results indicate that auditory induction is a general phenomenon which can influence the perception of nonspeech sounds that are either constant or changing in frequency. Effects on the false-alarm rate are considered. G.R.

A84-44093

**SYNTHESIZED WARNING MESSAGES - EFFECTS OF AN ALERTING CUE IN SINGLE- AND MULTIPLE-FUNCTION VOICE SYNTHESIS SYSTEMS**

M. T. HAKKINEN and B. H. WILLIGES (Virginia Polytechnic Institute and State University, Blacksburg, VA) *Human Factors* (ISSN 0018-7208), vol. 26, April 1984, p. 185-195. refs  
(Contract N00014-81-K-0143; NR PROJECT SRO-101)

The present study examined the effectiveness of preceding synthesized voice warning messages with an alerting cue as a function of the amount of information presented by the voice synthesizer and the workload level in the primary task. Subjects performed a simplified air traffic control task in which they were required to monitor two visual displays and to enter commands via a standard keyboard. Emergency messages were always presented by phenome-based synthesized speech. However, the presence of an alerting cue (light and tone) prior to emergency messages and the presentation mode of noncritical messages (visual or auditory) were varied experimentally. When synthesized speech was used only for emergency messages, the presence of an alerting cue lengthened the response time to the message. However, when computer-generated speech was used for multiple functions; more emergency messages were detected when an alerting cue was used. Author

A84-44094

**OPERATIONAL EFFICIENCY AND TIME OF DAY**

A. CRAIG and R. CONDON (Sussex, University, Brighton, England) *Human Factors* (ISSN 0018-7208), vol. 26, April 1984, p. 197-205. refs

Forty-eight subjects performed a battery of six predominantly perceptual tasks that were relevant to bridge operations on a ship at sea. Sessions were run at six times over an extended waking day, between 0800 and midnight. For some of the tasks performance was noticeably deficient at certain times of day, the diurnal pattern corresponding approximately with that in activation and alertness. However, closer examination of the data reveals that although a genuine efficiency deficit may exist at particular times, a major part of the variation in performance can reasonably be attributed to a shift in the trade-off between speed and accuracy. Because the direction of the shift is towards faster but less careful performance as the day progresses, the shift may be due to accumulating fatigue rather than to time of day per se. Regardless of the primary cause, vulnerability may be increased at certain times due to a slump in operational efficiency. Author

A84-44096\* Miami Univ., Coral Gables, Fla.

**VIGILANCE AND TASK LOAD - IN SEARCH OF THE INVERTED U**

E. L. WIENER (Miami, University, Coral Gables, FL), R. E. CURRY (NASA, Ames Research Center, Moffett Field, CA), and M. L. FAUSTINA (San Jose State University, San Jose, CA) *Human Factors* (ISSN 0018-7208), vol. 26, April 1984, p. 215-222. refs

The 'Inverted-U Hypothesis' states that for a given task, there is an optimal level of workload or demand that yields the highest level of performance. A departure in either direction will result in a monotonically lower performance level, hence an inverted-U-shaped relationship between task demand and quality of performance. Most studies to date have failed to demonstrate the left-hand branch of the curve, that is, the regime in which performance presumably rises as load increases. The purpose of this study was to explore whether low-level additional demand on the monitor would result in improved performance. Four groups of subjects performed a visual monitoring task for 48 min, then two of the four groups were given additional tasks, and a third had potentially distracting information on its display. Results indicated that the two groups with additional demand detected more signals than did the control group or the control-plus-distraction group. There were no significant differences in false alarms. Author

A84-44749

**THE MEASUREMENT OF COCKPIT WORKLOAD**

P. KOHN (Sanders Associates, Inc., Nashua, NH) and E. STEIN (FAA, Technical Center, Atlantic City, NJ) IN: *Air Traffic Control Association, Annual Fall Conference, 27th, Atlantic City, NJ, October 18-21, 1982, Proceedings*. Arlington, VA, Air Traffic Control Association, 1982, p. 286, 287.

An experiment measuring dynamically perceived cockpit workload is described, as part of a series of experiments conducted by the FAA to determine the correlation between cockpit workload and meteorological conditions and the complexity of interaction with a ground based ATC system. In the experiment, 12 volunteer pilots with previous flying experience in multiengine aircraft were studied. The performance measures of the study were subjective, self-reported estimates of workload, over three simulated flights of approximately 25 minutes duration. Analysis of the data derived from in-flight and postflight questionnaires revealed the following results: (1) pilots were able and willing to enter a workload rating every minute; and (2) no interference with normal pilotage functions was detected, even during simulated emergencies. Since the in-flight and postflight estimates of workload represent two different aspects of the same experience, they are found to be complementary. I.H.

A84-45659

**DISTURBANCE OF SLEEP BY NOISE - INDIVIDUAL DIFFERENCES**

R. T. WILKINSON (Medical Research Council, Applied Psychology Unit, Cambridge, England) *Journal of Sound and Vibration* (ISSN 0022-460X), vol. 95, July 8, 1984, p. 55-63. refs

The literature on the effects of noise on sleep is searched for evidence on individual differences along the dimensions of age, sex, occupation, personality, neuroticism, and mental health. With the exception of age, little firm evidence is found. Thus, there remains a need to establish at better than the anecdotal level whether or not real individual differences exist. Author

A84-45924

**THE CORRELATION OF CLOSED EYE MOVEMENTS WITH THE PROCESS OF TASK PERFORMANCE [SVIAZ' DVIZHENII ZAKRYTYKH GLAZ S PROTSESSOM RESHENIIA ZADACHI]**

T. M. BUIAKAS and T. M. FEDOROVA *Moskovskii Universitet, Vestnik, Seria 14 - Psikhologiya*, Jan.-Mar. 1984, p. 45-55. IN Russian. refs

The distribution of types of macrodrifts and backward movements of closed eyes in the performance of tactile, mnemonic, graphic and translational tasks is described. It is assumed that the macrodrifts correspond to the stage of activity which demands exertion of a certain amount of inner effort, while the backward movements correspond to the removal of the effort. The analysis of closed eye macrodrifts during the performance of a task reveals the psychological structure and organizational features of the macrodrifts. I.H.

N84-31911# Joint Publications Research Service, Arlington, Va. **PSYCHOPHYSIOLOGICAL ASPECTS OF MONOTONOUS HUMAN ACTIVITY Abstract Only**

A. A. KOLODYNSKIY and V. V. KOLODYNSKA *In its USSR Rept.: Life Sci. Effects of Nonionizing Electromagnetic Radiation (JPRS-UNE-84-001)* p 61 6 Jan. 1984 Transl. into ENGLISH from *Izv. Akad. Nauk Latv. SSR (Riga)*, no. 7, Jul. 1983 p 102-111

Avail: NTIS HC A06

The psychophysiological correlates of monotonous mental and physical activity as it affects human performance are reviewed. The basic mechanisms underlying the negative consequences of such sensory monotony involve activation of the right cerebral hemisphere with simultaneous deactivation of the left hemisphere and motor asymmetry. The activation of the right hemisphere, particularly the posterior temporal area, and the concomitant inverse change in the left one may be key factors leading to perturbation of interhemispheric neurodynamics and suboptimal selfregulation in the brain, finding somatic manifestations as less

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efficient task performance. It is concluded that improvement of performance under such conditions may rest on the selective stimulation of the right and left hemispheres to ensure a near physiological functional balance. E.A.K.

**N84-31927#** Joint Publications Research Service, Arlington, Va. **LINK BETWEEN CHARACTERISTICS OF EEG RHYTHMS IN BIOFEEDBACK CONTROL AND INDEXES FOR OPERATOR ACTIVITY Abstract Only**

V. G. MARKMAN, S. KURGUZOV, and M. Z. KHANDOV *In its USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-017) p 44 7 Aug. 1984 Transl. into ENGLISH from Fiz. Cheloveka (Moscow), v. 9, no. 6, Nov.-Dec. 1983 p 994-998*

Avail: NTIS HC A06/MF A01

The feasibility of predicting operator abilities on the basis of individual characteristics in conscious control of EEG rhythms is examined. After establishing baseline values for comparing the biofeedback control of EEG parameters and the ability to track a radar target on a laboratory simulator, tests are conducted in 160 subjects. Subjects are divided into two groups; one trained to increase the alpha rhythm, the other to reduce theta rhythm. Determinations are then made of the working characteristics of subjects as they solve problems on a radar tracking simulator. Results are shown for visual motor compensation tracking, conscious control of alpha rhythm and work on the radar simulator, and conscious control of alpha and theta rhythm control of EEG parameters is not associated with time based assessments of operator skill. The indexes for biofeedback control of alpha rhythm enable prediction of success in operator task solving in extreme conditions. M.A.C.

**N84-31928#** Joint Publications Research Service, Arlington, Va. **QUANTITATIVE ASSESSMENT OF ROLE OF SPATIAL FREQUENCIES OF IMAGES IN VISUAL RECOGNITION OF NUMBERS Abstracts Only**

Y. D. BORISOVA *In its USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-017) p 45 7 Aug. 1984 Transl. into ENGLISH from Fiz. Cheloveka (Moscow), v. 9, no. 6, Nov.-Dec. 1983 p 999-1004*

Avail: NTIS HC A06/MF A01

A quantitative evaluation is made of the role of the spatial frequency component of the Fourier spectrum for symbols (figures) during the process of visual recognition. Actual images are used whose spectral composition is altered in accordance with the tasks set. After band elimination spatial filtering in a digital computer, and the spatial frequency above a predetermined level is clipped. The remaining part of the image is not distorted. Psychophysiological characteristics in recognition of the filtered images are studied using a tachistoscopic method. When spatial frequencies higher than 1.22 cycles per degree are filtered out, images are virtually unrecognizable. Image recognition patterns are retained when contrast is reduced within specific limits, but reduction of contrast causes lower correct recognition values when exposure time is reduced. M.A.C.

**N84-31933#** Joint Publications Research Service, Arlington, Va. **PSYCHOPHYSICS OF PROPRIOCEPTIVE SENSIBILITY Abstract Only**

I. A. RYBIN, A. N. SERGEYEVA, and A. P. KASATOV *In its USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-017) p 75-76 7 Aug. 1984 Transl. into ENGLISH from Fiz. Cheloveka (Moscow), v. 9, no. 6, Nov.-Dec. 1983 p 974-978*

Avail: NTIS HC A06/MF A01

Results are presented from a study of subjective assessment of spatial shifts based on the sensory system of the musculoskeletal system. The ability of subjects to assess the angle of rotation of the forearm in the horizontal plane without visual control is investigated. Results are processed using the method of least squares. Results are presented in graphic and tabular form showing the distribution of subjects for the Stevens' function in active and passive movement compared with normal distribution, and the

distribution of individual indexes for subjects in subgroups. Differences in active and passive movements are discussed and it is concluded that care should be taken with regard to the effectiveness of simulation training for sportsmen since development of motor skills is less adequate than in active training where learning to eliminate error promotes acquisition of a high level of resistance to noise in sensory signals. M.A.C.

**N84-31941#** Rice Univ., Houston, Tex. Dept. of Psychology. **THE EFFECT OF INFORMATION DISPLAY FORMAT ON MULTIPLE-CUE JUDGMENT**

S. P. KERKAR and W. C. HOWELL Jun. 1984 53 p (Contract N00014-82-C-0001)

(AD-A142884; TR-84-2) Avail: NTIS HC A04/MF A01 CSCL 05J

Since empirical evidence on the effects of display features in cognitive tasks is sparse, three studies were conducted to explore various aspects of the relationship. In all three, subjects were required to combine multiple predictive items (teacher attributes, applicant test scores) into overall evaluations (teacher effectiveness; qualification for a defined position) under conditions of either graphic or numerical display. Using the policy capturing methodology, in which multiple regression is used to model behavior, a description of individual judgment strategies was obtained. Display format was found to have a direct influence on the importance attached to (the weighting of) the separate pieces of information (viz., intelligence, etc.) in forming an overall evaluation. Moreover, simultaneous presentation of graphic information tended to produce holistic processing in contrast with the serial processing of numerical information. These findings appear to have important implications for the design of computer-based information processing systems. GRA

**N84-31942#** Tennessee Univ., Knoxville. **VARIABILITY OF PRACTICE AND THE TRANSFER OF TRAINING OF MOTOR SKILLS**

C. A. WRISBERG and T. P. WINTER Nov. 1983 50 p (Contract MDA903-81-C-0216; DA PROJ. 2Q1-61101-B-74-F) (AD-A142896; ARI-TR-596) Avail: NTIS HC A03/MF A01 CSCL 05I

The Training and Simulation Technical Area of the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) maintains a program of research in support of the systems approach to training. A major focus of this program is the development of fundamental data and technology in the areas of skill acquisition, retention and transfer necessary for fielding training systems that improve individual job performance. Typically, soldiers are trained in service schools on only a portion of those tasks required for effective job performance. The remaining tasks are trained on the job once soldiers arrive in their operational units. Because unit training resources are limited, a primary goal of school training is to promote effective positive transfer of school-taught tasks to those additional tasks required on the job. Such transfer would reduce unit training demands and promote better on-the-job performance and associated combat readiness. This basic research report examines the effects of amount and variability of practice on the transfer of training of motor skills. The findings indicate that transfer improves with increased initial task training but that the effects of variety are task specific. GRA

**N84-32227#** Air Force Human Resources Lab., Williams AFB, Ariz. Operations Training Div. **PILOT ORIENTED PERFORMANCE MEASUREMENT**

J. DEMAIO, H. H. BELL, and J. BRUNDERMAN *In American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 p 27-31 16 Nov. 1983* (AD-P003450) Avail: NTIS HC A17/MF A01 CSCL 05I

Flight simulators provide a complete quantitative record of a pilot's flying performance. Evaluating this record is complicated by the volume of data and by its fine detail, dozens of flight parameters, sampled many times per second. Automated performance measurement systems (APMS) reduce the volume of

data to an amount which is manageable and understandable. The usual APMS is aircraft state oriented. The APMS keys on aircraft state (e.g., X-Y position, bank angle) to define intervals over which performance data are integrated. This PAMS is relatively insensitive to pilots' intentions and so may average performances which had differing objectives, based only on their having occurred at the same point during the task sequence. An alternative APMS has been developed which is piloted oriented. This APMS defines measurement intervals based on control inputs. Control inputs are identified by discrete changes in flight path. These intervals are psychologically relevant in that they begin with a goal-directed control input and end with a countervailing input. By relating performance in the pilot defined intervals to state defined intervals, it is possible to quantify performance on given flight segments (e.g., a level turn), and to specify factors which lead to a given level of performance. Author (GRA)

**N84-32228#** McDonnell-Douglas Electronics Co., St. Charles, Mo.

**NEW CONCEPTS IN AIRCREW TRAINING USING COMPUTER GENERATED IMAGERY: A STUDY REPORT**

D. HAUCK and M. VERSTEGEN *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 p 32-38 16 Nov. 1983 (AD-P003451) Avail: NTIS HC A17/MF A01 CSCL 05I

The results of a study of the use of computer generated imagery in non-traditional training techniques are reported. These techniques complement and extend the role of a simulator from that of aircraft replicator to that of a training device. The study had three primary objectives: (1) exploit the flexibility of CGI to generate new concepts in aircrew training methods; (2) develop and demonstrate examples of these concepts; and (3) perform exploratory testing of the examples to assess their effectiveness and pilot acceptance. For future study, the concept of using the simulator as a specific visual task trainer is discussed.

Author (GRA)

**N84-32235#** Air Force Human Resources Lab., Williams AFB, Ariz. Operations Training Div.

**VISUAL CUEING EFFECTIVENESS: COMPARISON OF PERCEPTION AND FLYING PERFORMANCE**

J. DEMAIO, E. J. RINALDUCCI (Georgia Inst. of Tech.), R. BROOKS, and J. BRUNDERMAN *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 p 92-96 16 Nov. 1983 (AD-P003458) Avail: NTIS HC A17/MF A01 CSCL 05I

Growing emphasis on simulation of low altitude and air-to-air tactical scenarios has greatly increased the requirement for simulator visual systems capable of providing the pilot high-fidelity out-of-the-cockpit cues. Evaluation of visual system performance through simulator flying studies has been the primary measure of system quality. Such studies can be costly and time consuming, and often they provide equivocal results. The present set of experiments was conducted to investigate the use of psychophysical measurement methodology to provide quick, low-cost evaluation of the altitude cueing effectiveness of simulator visual displays. Experiment 1 examined altitude perception in several visual environments. Experiment 2 was a validation effort, in which flying performance was evaluated in selected visual environments. In Experiment 1 pilots made altitude estimates based on static and dynamic presentations of visual displays containing texture and varying sizes of 3-dimensional objects. Best-fitting power functions were used to relate perceived altitude to actual altitude. In Experiment II Air force pilots flew the Advanced Simulator for Pilot Training F-16 through five selected visual environments at 600 ft and 150 ft AGL. Reliable difference were found as a function of display variables. GRA

**N84-32242#** Falcon Research and Development Co., Buffalo, N. Y.

**MARINE CORPS GROUND SIMULATOR TRAINING NEEDS IN THE 1985-1995 TIME FRAME**

P. PATTI and J. MARLIN (Marine Corps., Quantico, Va.) *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 p 127-139 16 Nov. 1983

(AD-P003465) Avail: NTIS HC A17/MF A01 CSCL 15E

This study was initiated to develop a document to be used for the planning and programming of simulation acquisition in support of Marine Corps training. Generic training task requirements in the ground combat (C), combat support (CS) and combat service support (CSS) fields which can be enhanced through the use of simulation were identified. Tradeoff analyses were performed to develop prioritized lists of the tasks for which simulators should be developed and of recommended generic-type simulation devices. The extent of the need for simulation was assessed by determining which of the training task requirements would be improved by the use of simulation, taking into account the technology state-of-the-art (SOA). Measures of quality of training used included: performance, time to train, training cost, personnel support, technological risk, integratability with other training, and special assets requirements. This paper describes the methodology applied and the results obtained. Special emphasis is put on the criteria utilized and the planned future use of the results.

Author (GRA)

**N84-32261#** Air Force Human Resources Lab., Williams AFB, Ariz. Operations Training Div.

**TRAINING THE MULTIPLE-AIRCRAFT COMBAT ENVIRONMENT**

P. A. COOK and C. L. HANSON *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 p 350-355 16 Nov. 1983 (AD-P003495) Avail: NTIS HC A17/MF A01 CSCL 05I

Aircrew training devices for the teaching of tactical combat maneuvering currently range from simple desk-top trainers to large weapon system trainers with limited visual systems. Still missing from the spectrum is the capability to practice full-mission multi-ship scenarios. At present such training can only be provided by major field exercises such as Red Flag, at great expense. A network of hostile-environment simulators could greatly increase the frequency of training, provide more realistic training, and keep pilots at a higher state of readiness than by using aircraft alone. The Air Force Human Resources Laboratory is exploring technology requirements for multiple aircraft simulation under Project 2743, the Combat Mission Trainer (CMT) program. The goal is to develop a full-mission combat simulator affordable at the wing level and capable of training all air-to-air and air-to-ground tasks.

Author (GRA)

## MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

### **A84-43440\*# Massachusetts Inst. of Tech., Cambridge. RESULTS OF THE M.I.T. BEAM ASSEMBLY TELEOPERATOR AND INTEGRATED CONTROL STATION**

J. R. SPOFFORD and D. L. AKIN (MIT, Cambridge, MA) IN: Guidance and Control Conference, Seattle, WA, August 20-22, 1984, Technical Papers . New York, American Institute of Aeronautics and Astronautics, 1984, p. 351-359. refs

(Contract NAGW-21)

(AIAA PAPER 84-1890)

To examine the issues of optimum human-machine mixtures for orbital assembly operations, a full six degree-of-freedom teleoperator system for assembly of large space structures has been developed by the Space Systems Laboratory. This consists of a free-flying neutrally buoyant Beam Assembly Teleoperator (BAT) with two manipulators, and a modular Integrated Control Station (ICS). The design and configuration of both the BAT and the ICS are described in some detail in this paper. In addition, qualitative results from early tests of the system are presented. These tests concentrated mostly on free-flying operations and grasping. Future tests will involve complete teleoperated assembly. Author

### **A84-43446\*# Purdue Univ., Lafayette, Ind. TIME SERIES MODELING OF HUMAN OPERATOR DYNAMICS IN MANUAL CONTROL TASKS**

D. J. BIEZAD and D. K. SCHMIDT (Purdue University, West Lafayette, IN) IN: Guidance and Control Conference, Seattle, WA, August 20-22, 1984, Technical Papers . New York, American Institute of Aeronautics and Astronautics, 1984, p. 399-414. refs

(Contract NAG4-1)

(AIAA PAPER 84-1899)

A time-series technique is presented for identifying the dynamic characteristics of the human operator in manual control tasks from relatively short records of experimental data. Control of system excitation signals used in the identification is not required. The approach is a multi-channel identification technique for modeling multi-input/multi-output situations. The method presented includes statistical tests for validity, is designed for digital computation, and yields estimates for the frequency responses of the human operator. A comprehensive relative power analysis may also be performed for validated models. This method is applied to several sets of experimental data; the results are discussed and shown to compare favorably with previous research findings. New results are also presented for a multi-input task that has not been previously modeled to demonstrate the strengths of the method. Author

### **A84-43735 AUDIO-OCULAR RESPONSE - SACCADIC PROGRAMMING**

S. TRACCIS, L. A. ABEL, and L. F. DELLOSSO (U.S. Veterans Administration, Medical Center, Case Western Reserve University, Cleveland, OH) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 55, Aug. 1984, p. 735-739. Research supported by the U.S. Veterans Administration. refs

The eye movements elicited by auditory stimuli - the audio-ocular response (AOR) - differ from those made in response to a visual target. The movements consist of both monosaccadic and multiple saccadic refixations (MSR). In visual refixation, monosaccadic refixations are always accurate; in AOR, they rarely are. In MSR, many strategies were used in the attempt to find the target but they were not always successful. However, final amplitudes of the total refixation were quite accurate in both MSR and monosaccadic refixations. Velocity profiles of the AOR showed such anomalies

as discrete decelerations and multiple, closely-spaced saccades. These data suggest that, without visual feedback, the location of acoustic targets is difficult. In the absence of visual afference, when vigilance may be decreased by the lack of arousal, the velocity profiles also became abnormal, even at small amplitudes. Thus, for cockpit warning devices, a combination of auditory and visual indicators should be used. Author

### **A84-43737**

#### **THE ENERGY EXPENDITURE OF HELICOPTER PILOTS**

R. THORNTON, G. A. BROWN, and C. HIGENBOTTAM (RAF, Institute of Aviation Medicine, Farnborough, Hants., England) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 55, Aug. 1984, p. 746-750. refs

The results of an experiment to measure the energy cost of Army Air Corps and Royal Air Force helicopter pilots during flight in Gazelle and Puma helicopters are reported. For comparison, the energy expenditure of the subjects was measured at rest and while walking to and from the aircraft. Heart rates were also recorded. The results of the experiment confirm the findings of other authors that the energy cost of flying helicopters is about 50 percent higher than that of sitting at rest. I.H.

### **A84-44091**

#### **CORRELATES OF OCULAR AND SOMATIC SYMPTOMS AMONG VIDEO DISPLAY TERMINAL USERS**

A. B. SMITH, S. TANAKA, W. HALPERIN (U.S. Public Health Service, National Institute for Occupational Safety and Health, Cincinnati, OH), and R. D. RICHARDS (Maryland, University, Baltimore, MD) Human Factors (ISSN 0018-7208), vol. 26, April 1984, p. 143-156. refs

A cross-sectional survey was conducted among employees of a large newspaper company (1) to define the type of ocular and somatic complaints reported by video display terminal (VDT) users and to identify their relationship to VDT use, (2) to determine the association between symptoms and the participants' adequacy of correction of refractive errors for their jobs, and (3) to assess the prevalence of eye abnormalities, especially cataracts, and their relationship to VDT use. Poor visual clarity of the VDT screen explained the plurality of work-associated symptoms. These associations were independent of the effects of potential confounding variables. The relationships with headaches associated with work and changes in visual function were replicated in a small, independent sample. One qualitative and two quantitative VDT-use variables that suggested lesser skill or experience were associated with headaches. No meaningful relationship was found between adequacy of the participants' refractions, including the wearing of glasses with bi- or multifocal lenses, and the reporting of work-associated symptoms. No significant association was found between VDT use and the prevalence of eye abnormalities, including cataracts. Author

### **A84-44095**

#### **DEXTERITY PERFORMANCE AND REDUCED AMBIENT TEMPERATURE**

M. W. RILEY and D. J. COCHRAN (Nebraska, University, Lincoln, NE) Human Factors (ISSN 0018-7208), vol. 26, April 1984, p. 207-214. refs

(Contract NIH-1-R01-OH-0129-02)

The results of an experimental evaluation of the dexterity performance of 70 male and female subjects at ambient temperatures of 1.7, 12.8, and 23.9 C are reported. The tests consisted of four manipulative, pencil-point tapping and assembly tasks, as well as the Purdue Pegboard test. The results showed little change in performance from the high ambient temperature to the middle temperature (23.9 to 12.8 C), but considerable change from the high and middle temperatures to the low ambient temperature (1.7 C). It is pointed out that there should exist some range at which significant decrements in performance begin to take place. Several differences were found in the relative performances of men and women, and some possible explanations for the differences are discussed. I.H.

A84-44751

**THE FLIGHT SERVICE AUTOMATION SYSTEM**

J. T. REHMANN (FAA, Technical Center, Atlantic City, NY) IN: Air Traffic Control Association, Annual Fall Conference, 27th, Atlantic City, NJ, October 18-21, 1982, Proceedings. Arlington, VA, Air Traffic Control Association, 1982, p. 307-312.

Results of an evaluation of selected functions of the Flight Service Automation System (FSAS), Model 2, are presented. The FSAS provides a means of rapid information retrieval as well as continuously updated graphics and radar products. Flight and weather data are processed and stored in computers for immediate call-up on CRT displays. The evaluation, which has been performed in the laboratory under conditions closely simulating actual operation conditions, has prompted changes to several messages to improve their effectiveness. The advantages of the evaluations of this kind are discussed, with particular attention given to data distribution and optimal human factor design. V.L.

A84-45160

**AN APPROACH TO CONTROL LAWS FOR ARM MOTION**

A. AILON (Rensselaer Polytechnic Institute, Troy, NY), G. LANGHOLZ (Tel Aviv University, Tel Aviv, Israel; Florida State University, Tallahassee, FL), and M. ARCAN (Tel Aviv University, Tel Aviv, Israel) IEEE Transactions on Biomedical Engineering (ISSN 0018-9294), vol. BME-31, Sept. 1984, p. 605-610. refs

This paper is concerned with the investigation of arm motion between fixed boundary conditions within a two-dimensional space. An approach to the mathematical modeling and formulation of the control laws which govern arm reaching motion is presented.

Author

A84-46258

**DEXTERITY IS JUST A FUMBLE IN SPACE**

H. ROSS (Stirling, University, Stirling, Scotland) New Scientist (ISSN 0028-6664), vol. 103, Aug. 23, 1984, p. 16, 17.

An experiment was performed aboard Spacelab 1 to determine whether or not mass discrimination and weight discrimination could return to normal values under prolonged weightlessness. The apparatus consisted of a box containing 24 balls ranging from 50 to 64 grams in mass. The balls were picked up in pairs, shaken in the hand, and returned to the box, determining then which felt heavier. The crew members were tested prior to the flight, which resulted in an error of approximately 25 percent, rising to 33 percent during the flight. The 10-day mission showed no sign of improvement, and postflight performance was poorer than that of preflight. The crew showed postural and other after-effects of weightlessness, and their ability to discriminate weight was impaired. The main result of the experiment seems to be that weight is a more important component of the sensation of heaviness than is inertial mass. J.P.

N84-31917# Joint Publications Research Service, Arlington, Va.

**FIRST MIXED CREW IN SPACE Abstract Only**

In its USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-012) p 1 6 Jun. 1984 Transl. into ENGLISH from Zdorovye (Moscow), no. 11, Nov. 1982 p 12-14

Avail: NTIS HC A05/MF A01

The Soyuz T-7 flight was the first to include a woman crew member. Medical and biological changes during the flight were investigated. No significant differences were found in the physiological reactor of the females or males to the extreme factors of space flight. It is shown that women adapt more rapidly and successfully to hypokinesia than men. It is found that women are well suited for future, longer space flights. E.A.K.

N84-31918# Joint Publications Research Service, Arlington, Va. **ERGONOMIC ANALYSIS OF HUMAN OPERATION OF VIDEO TERMINAL Abstract Only**

V. M. BONDAROVSKAYA In its USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-012) p 30 6 Jun. 1984 Transl. into ENGLISH from Prib. i Sistemy Uprav. (Moscow), no. 7, Jul. 1983 p 6-7

Avail: NTIS HC A05/MF A01

Ergonomics and video terminal systems were analyzed. The activity of the users of a number of editing systems was studied and fatigue was observed in 70% of cases after 2 hours of work. Recommendations were developed to improve the organization of labor of terminal users, which includes arrangement of information on the screen in a manner convenient for reading and for location of fragments of text rather than as a continuous sequence of characters, reduction in the quantity of information presented at one time, adjustment of computer response time to the user in accordance to the structure of the activity which is performed, and provisions of a reaction by the computer to virtually every action by the operator. Five to 10 minute breaks are recommended each 2 hours of work. E.A.K.

N84-31919# Joint Publications Research Service, Arlington, Va. **RESULTS OF PSYCHOPHYSIOLOGICAL STUDY OF VIDEOTON TERMINAL OPERATORS Abstract Only**

O. A. LIKHACHEVA, L. P. STEPANOVA, and V. K. KHUKHLAYEV In its USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-012) p 30-31 6 Jun. 1984 Transl. into ENGLISH from Prib. i Sistemy Uprav. (Moscow), no. 7, Jul. 1983 p 7-8

Avail: NTIS HC A05/MF A01

Studies were performed using a combination of methods including measurement of critical blinking frequency, reaction to sound, endurance and strength of the hands in order to determine the basic properties of the central nervous system during work with the Videoton computer terminal. Subjects were 18 to 33 years of age and had been working with the terminal for one month to 6 years. It was found that operator fatigue, headache and other symptoms are characteristic of CRT terminal workers and increase with an increase in the information load. The study did not answer whether the specific source of these sensations is the hardware itself, the blinking of the signal characters, the density of information on the screen or something else. E.A.K.

N84-31920# Joint Publications Research Service, Arlington, Va. **REALIZATION OF HUMAN WORK CAPACITY: INTERDISCIPLINARY PROBLEMS Abstract Only**

B. S. MARYENKO, K. R. KOPYSTYANSKAYA, and N. A. TITOVA In its USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-012) p 31 6 Jun. 1984 Transl. into ENGLISH from Visn. Akad. Nauk Ukr. RSR (Kiev), no. 1, Jan. 1984 p 25-33

Avail: NTIS HC A05/MF A01

Approaches to utilization of human work capacity are discussed from a psychophysiological and organizational point of view. In addition to relying on physiological and psychological testing of applicants for a position to determine their suitability, factors such as creating favorable work environments and rational work assignment and management are important. Optimum production and productivity can only be expected when all the factors pertinent to a given work situation are scientifically analyzed and evaluated. This also implies the need for periodic reassessment of both the health and attitudes of the workers, and of the changing job requirements. E.A.K.

N84-31921# Joint Publications Research Service, Arlington, Va. **STRESS IN WORK Abstract Only**

K. M. SMIRNOV In its USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-012) p 32 6 Jun. 1984 Transl. into ENGLISH from Usp. Fiz. Nauk (Moscow), v. 15, no. 1, Jan-Feb. 1984 p 76-99

Avail: NTIS HC A05/MF A01

Labor physiology concerns itself with the state and activity of the human body during performance of some work. Concepts,

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terminology and general ideas of labor physiology are defined to distinguish between stress and strain. Work strain is discussed for general physical labor, local physical effort and nonphysical exertion. The effect of the environment and the cumulative effect of multiple factors on human performance are addressed. Evaluation criteria and possible normalization of labor stress are addressed. Data on labor stress and strain are a component of the knowledge on human physiology and are considered in hygienic and ergonomic evaluations and productivity analyses. E.A.K.

**N84-31926#** Joint Publications Research Service, Arlington, Va.  
**EFFECT OF BODY TEMPERATURE ON HUMAN WORK CAPACITY Abstract Only**

A. S. PAVLOV *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-017) p 43-44 7 Aug. 1984  
Transl. into ENGLISH from Fiz. Cheloveka (Moscow), v. 9, no. 6, Nov.-Dec. 1983 p 963-968

Avail: NTIS HC A06/MF A01

Changes of a variety of indicators of physical and mental work capacity were investigated in trained and untrained persons at various levels of gradually developing muscular hyperthermia in the range of 1.5-2.0 deg. It is shown that in conditions of such hyperthermia the work-capacity indicator first increase by 108-112 percent and then decline. These results lead to the conclusion that an increase of body temperature under physical-load conditions is a positive phenomenon. (IAA)

**N84-31943** Ohio State Univ., Columbus.  
**MODELING, CONTROL AND SIMULATION OF THREE-DIMENSIONAL ROBOTIC SYSTEMS WITH APPLICATION TO BIPED LOCOMOTION Ph.D. Thesis**

Y. F. ZHENG 1984 197 p refs

Avail: Univ. Microfilms Order No. DA8410448

A three dimensional, five link biped system is established. Newton/Euler state space formulation is employed to derive the equations of the system. The constraint forces involved in the equations can be eliminated by projection onto a smaller state space system for deriving advanced control laws. A model referenced adaptive control scheme is developed to control the system. Impact effects of biped contact with the environment are modeled and studied. A mathematical model of the skeletal muscle is discussed. A physical threshold model is proposed for recruitment which encompasses the size principle, its manifestations and exceptions to the size principle. Dissert. Abstr.

**N84-31944\*#** Martin Marietta Corp., Denver, Colo.  
**TELEOPERATOR HUMAN FACTORS STUDY Progress Report, 8 May - 8 Jun. 1984**

Jun. 1984 3 p

(Contract NAS8-35184)

(NASA-CR-171120; NAS 1.26:171120; MCR-83-607) Avail:

NTIS HC A02/MF A01 CSCL 05H

The progress made on the Teleoperator Human Factors Study program is summarized. Technical and programmatic problems that were encountered were discussed along with planned activities. The report contains four sections: Work Performed, Future Work, Problems Encountered, and Cost Information R.S.F.

**N84-31945\*#** Ohio State Univ., Columbus. Dept. of Industrial and Systems Engineering.  
**RESEARCH ON COMPUTER AIDED TESTING OF PILOT RESPONSE TO CRITICAL IN-FLIGHT EVENTS Final Report, 1 Jan. 1983 - 31 Mar. 1984**

W. C. GIFFIN, T. H. ROCKWELL, and P. J. SMITH 1 Jun. 1984  
277 p refs

(Contract NAG2-112)

(NASA-CR-173871; NAS 1.26:173871) Avail: NTIS HC A13/MF A01 CSCL 05H

Experiments on pilot decision making are described. The development of models of pilot decision making in critical in flight events (CIFE) are emphasized. The following tests are reported on the development of: (1) a frame system representation describing how pilots use their knowledge in a fault diagnosis

task; (2) assessment of script norms, distance measures, and Markov models developed from computer aided testing (CAT) data; and (3) performance ranking of subject data. It is demonstrated that interactive computer aided testing either by touch CRT's or personal computers is a useful research and training device for measuring pilot information management in diagnosing system failures in simulated flight situations. Performance is dictated by knowledge of aircraft subsystems, initial pilot structuring of the failure symptoms and efficient testing of plausible causal hypotheses. E.A.K.

**N84-31946#** Inflation Systems International, Canyon Country, Calif.

**DEVELOPMENT, TEST AND DELIVERY OF SOLID PROPELLANT GENERATORS FOR INFLATION OF PFD'S Final Report, Oct. 1980 - Oct. 1981**

G. HOLCOMBE, B. HAMILTON, and T. BORLAND 22 Oct. 1981  
59 p refs

(Contract DTCG-23-80-C-20031)

(AD-A130047; USCG-D-31-82) Avail: NTIS HC A04/MF A01 CSCL 211

The objective of the program is to develop and test solid propellant gas generation system as a practical replacement for CO2 cartridges for inflatable life jackets and/or hybrid life jackets, with enhanced reliability and performance over a temperature range of -65 F to 185 F. To document comparative performance of the CO2 and solid propellant systems, test beds of 20 lb. and 35 lb. buoyancy inflatables are employed. Repetitive tests are made of each system, over the indicated environmental span, with specimens subjected to shock, vibration, cycling, and many other tests necessary to prove functional and life savings reliability and capability. The solid propellant inflator (SPI) test results reflect uniform performance across the temperature range at time/pressure levels considered ideal for the usage. The CO2 cartridge performance was poor at soak temperatures below 20 F and above 150 F. As the SPI is pressured only upon activation, leakage during storage is not possible. Operating pressure is under 500 psi and a small overpressure device negates the possibility of overpressure stress from a blocked orifice condition. It is concluded that the SPI represents a significant improvement in the inflation of life jackets and similar buoyant devices, having the need for prompt, reliable, fail/safe performance. Author

**N84-31947#** California Univ., Los Angeles.  
**MEASUREMENT AND MODIFICATION OF SENSORIMOTOR SYSTEM FUNCTION DURING VISUAL-MOTOR PERFORMANCE Annual Technical Report, 30 Sep. 1982 - 29 Sep. 1983**

M. B. STERMAN Apr. 1984 10 p

(Contract AF-AFOSR-0335-82)

(AD-A142919; AFOSR-84-0520TR) Avail: NTIS HC A02/MF A01 CSCL 05J

Studies conducted during the initial phase of this project had two major objectives. The first was the selection of a visual-motor performance task that met the needs of (1) long term operation, (2) physiological and functional appropriateness, (3) relevance to the Air Force mission, and (4) feasibility within the resources available to us. Towards this end four video games were tested on each of six adult subjects. Evaluation of these tasks as well as EEG correlates of performance led to the selection of one for subsequent studies. Our second objective was to determine if the quantitative analysis of somatosensory EEG characteristics could yield information predictive of performance. Preliminary findings indicate that specific frequency components do, indeed, change in relation to response accuracy and speed. These consistent observations provided support for our basic assumptions and will guide the focus of subsequent studies. GRA

**N84-31948#** Monroney (Mike) Aeronautical Center, Oklahoma City, Okla. Protection and Survival Lab.  
**UNIFORM MASS DISTRIBUTION PROPERTIES AND BODY SIZE APPROPRIATE FOR THE 50 PERCENTILE MALE AIRCREWMEMBER, 1980 - 1990**  
 R. F. CHANDLER and J. YOUNG 27 Mar. 1981 21 p  
 (AD-A142946; AAC-119-81-4) Avail: NTIS HC A02/MF A01 CSCL 05E

The design and analysis of aircraft seating, restraint and interior systems requires careful consideration of human factors relating to the mission to be performed and to the characteristics of the occupant. If comparisons are to be made among different system concepts, it is desirable to have a uniform basis for describing the characteristics of the human occupant and of any tools used as a human surrogate in the design, analysis or evaluation of the system. To this end, the U.S. Army Aeromedical Research Laboratory initiated an effort for the promotion of a tri-service Standard Man military specification in February 1980. The immediate goal of that effort was to develop a specification for body dimensions, joint locations, sitting heights, and mass distribution of military aircrewmembers. A meeting was held in March 1980 to discuss this effort and to establish a program to accomplish the work. GRA

**N84-33020\*#** Old Dominion Univ., Norfolk, Va. Center for Applied Psychological Studies.

**VISUAL INFORMATION TRANSFER. 1: ASSESSMENT OF SPECIFIC INFORMATION NEEDS. 2: THE EFFECTS OF DEGRADED MOTION FEEDBACK. 3: PARAMETERS OF APPROPRIATE INSTRUMENT SCANNING BEHAVIOR Progress Report, 15 Feb. - 15 Aug. 1984**

J. R. COMSTOCK, JR., R. H. KIRBY, and G. D. COATES Aug. 1984 4 p  
 (Contract NAG1-451)  
 (NASA-CR-173913; NAS 1.26:173913; PAL-84-32) Avail: NTIS HC A02/MF A01 CSCL 05H

Pilot and flight crew assessment of visually displayed information is examined as well as the effects of degraded and uncorrected motion feedback, and instrument scanning efficiency by the pilot. Computerized flight simulation and appropriate physiological measurements are used to collect data for standardization.

M.A.C.

**N84-33021\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

**SHOULDER AND HIP JOINT FOR HARD SPACE SUITS AND THE LIKE Patent Application**

H. C. VYKUKAL, inventor (to NASA) 20 Aug. 1984 22 p  
 (NASA-CASE-ARC-11534-1; NAS 1.71:ARC-11534-1;  
 US-PATENT-APPL-SN-642602) Avail: NTIS HC A02/MF A01 CSCL 06Q

A joint between the covering and the upper arm covering (i.e., shoulder) or between the torso covering and upper leg covering (i.e., hip) is disclosed. Each joint has an outer covering and an inner covering. The outer covering has plural truncated toroidal sections decreasing in size proceeding outwardly. To accommodate the decreased size of the next section, at the smaller end of each section is an end wall filling what would otherwise be a gap between the sections. Bellows like inner walls are also provided for each section fixed at one end to an inner cylindrical flange and, at the opposite end, to an end wall. Each outer section may rotate 360 deg relative to the next outer section, whereas the bellows sections do not rotate, but rather expand or contract locally as the rigid sections rotate relative to each other. NASA

**N84-33022\*#** Martin Marietta Corp., Denver, Colo.  
**TELEOPERATOR HUMAN FACTORS STUDY Progress Report, 8 Aug. - 8 Sep. 1984**  
 Sep. 1984 3 p  
 (Contract NAS8-35184)  
 (NASA-CR-173890; NAS 1.26:173890; MCR-83-607) Avail: NTIS HC A02/MF A01 CSCL 05H

The progress made on the Teleoperator Human Factors Study program is summarized. Technical and programmatic problems that were encountered are discussed along with planned activity. Work performed, future work, problems encountered, and cost information comprise the topics addressed herein. R.S.F.

**N84-33023\*#** Narco Scientific, Houston, Tex.  
**DEVELOPMENT OF ENGINEERING PROTOTYPE OF LIFE SUPPORT MODULE (LSM) Final Report**

Aug. 1984 104 p  
 (Contract NAS9-16723)  
 (NASA-CR-171806; NAS 1.26:171806) Avail: NTIS HC A06/MF A01 CSCL 06K

The development of an engineering prototype of a life support system is discussed. The module consists of an electrocardiogram, a defibrillator, a resuscitator, and an aspirator, as well as body temperature and blood pressure measuring instruments. A drug kit is included. R.J.F.

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### PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

**A84-43055\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

**PREBIOTIC ORGANIC SYNTHESIS AND THE ORIGIN OF LIFE**  
 S. CHANG, D. DESMARAIS, R. MACK (NASA, Ames Research Center, Extraterrestrial Research Div., Moffett Field, CA), S. L. MILLER (California, University, La Jolla, CA), and G. E. STRATHEARN (California, University, Los Angeles, CA) IN: Earth's earliest biosphere: Its origin and evolution. Princeton, NJ, Princeton University Press, 1983, p. 53-92.  
 (Contract NAGW-20)

The outline of a modern paradigm for the origins of life on earth was first formulated by Oparin (1924). According to the considered hypothesis, living organisms arose naturally on the primitive earth through a lengthy process of chemical evolution of organic matter which began in the atmosphere and culminated in the primordial seas. Details regarding the chemical evolution paradigm are discussed, and chemical evolutionary processes formulated by principal contributors are reviewed in a historical context. Attention is given to the Oparin model of the prebiotic earth, the Urey model, the Rubey model, a multistage model for early atmospheric evolution, and other variations on the theme of prebiotic atmospheres. Evidence in support of the chemical evolution paradigm is considered along with modern models regarding the accretion of earth and the formation of its core, and problems and prospects for future studies. G.R.

**A84-45119\*** Salk Institute for Biological Studies, San Diego, Calif.

**CHIRAL SELECTION IN POLY(C)-DIRECTED SYNTHESIS OF OLIGO(G)**

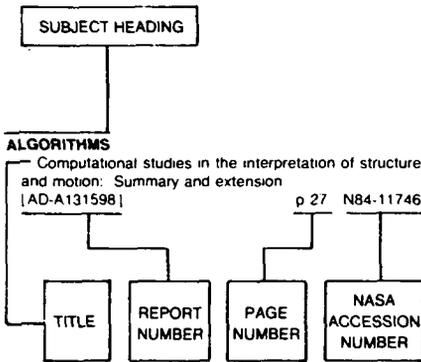
G. F. JOYCE, L. E. ORGEL (Salk Institute for Biological Studies, San Diego, CA), G. M. VISSER, J. H. VAN BOOM, J. VAN WESTRENNEN (Leiden, Rijksuniversiteit, Leiden, Netherlands), and C. A. A. VAN BOECKEL (Organon International, Oss, Netherlands) Nature (ISSN 0028-0836), vol. 310, Aug. 16, 1984, p. 602-604. NIH-NASA-supported research.- refs

An experimental study is reported which shows that poly(C)-directed oligomerization of activated guanosine

## 55 PLANETARY BIOLOGY

mononucleotides proceeds readily if the monomers are of the same optical handedness as the template, and is far less efficient if the monomers are of the opposite handedness. However, in template-directed reactions with a racemic mixture, monomers of the opposite handedness to the template are incorporated as chain terminators at the 2'(3') end of the products. This inhibition raises an important problem for many theories of the origin of life. C.D.

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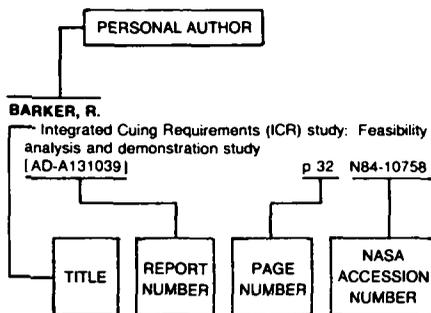
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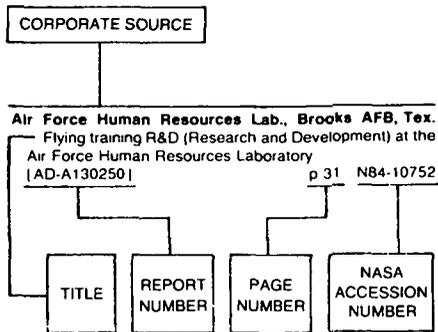
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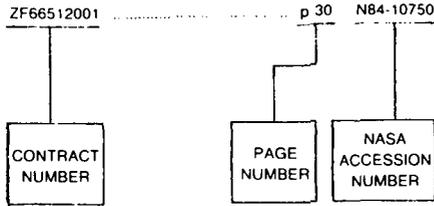
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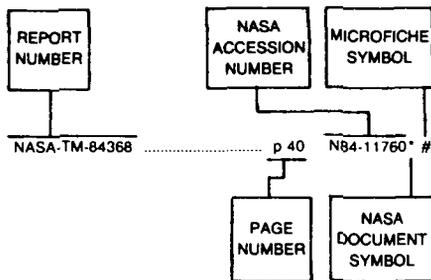
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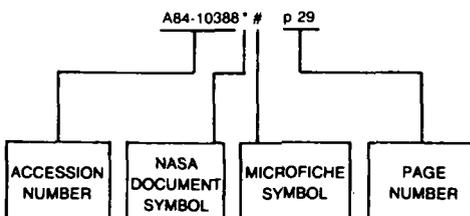


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Tucson, AZ 85721  
(602) 626-5233

### CALIFORNIA STATE LIBRARY

Govt. Publications Section  
P.O. Box 2037  
Sacramento, CA 95809  
(916) 322-4572

### UNIV. OF COLORADO LIB.

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Campus Box 184  
Boulder, CO 80309  
(303) 492-8834

### DENVER PUBLIC LIBRARY

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1357 Broadway  
Denver, CO 80203  
(303) 571-2131

### CONNECTICUT STATE LIBRARY

Government Documents Unit  
231 Capitol Avenue  
Hartford, CT 06106  
(203) 566-4971

### UNIV. OF FLORIDA LIBRARIES

Library West  
Documents Department  
Gainesville, FL 32611  
(904) 392-0367

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Athens, Ga 30602  
(404) 542-8951

### UNIV. OF HAWAII LIBRARY

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2550 The Mall  
Honolulu, HI 96822  
(808) 948-8230

### UNIV. OF IDAHO LIBRARY

Documents Section  
Moscow, ID 83843  
(208) 885-6344

### ILLINOIS STATE LIBRARY

Information Services Branch  
Centennial Building  
Springfield, IL 62706  
(217) 782-5185

### INDIANA STATE LIBRARY

Serials Documents Section  
140 North Senate Avenue  
Indianapolis, IN 46204  
(317) 232-3686

### UNIV. OF IOWA LIBRARIES

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Iowa City, IA 52242  
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### UNIVERSITY OF KANSAS

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Lawrence, KS 66045  
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(504) 388-2570

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(318) 257-4962

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Tri-State Regional Documents  
Depository  
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### UNIVERSITY OF MARYLAND

McKeldin Lib.—Doc. Div.  
College Park, MD 20742  
(301) 454-3034

### BOSTON PUBLIC LIBRARY

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Boston, MA 02117  
(617) 536-5400 ext. 226

### DETROIT PUBLIC LIBRARY

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5201 Woodward Avenue  
Detroit, MI 48202  
(313) 833-1409

### MICHIGAN STATE LIBRARY

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Lansing, MI 48909  
(517) 373-0640

### UNIVERSITY OF MINNESOTA

Government Pubs. Division  
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309 19th Avenue South  
Minneapolis, MN 55455  
(612) 373-7813

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Documents Department  
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Documents Division  
Missoula, MT 59812  
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Lincoln, NE 68508  
(402) 471-2045  
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Reno, NV 89557  
(702) 784-6579

### NEWARK PUBLIC LIBRARY

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Santa Fe, NM 87501  
(505) 827-2033, ext. 22

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Chapel Hill, NC 27515  
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### UNIVERSITY OF NORTH DAKOTA

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Documents Department  
Grand Forks, ND 58202  
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Dakota State Univ. Library)

### STATE LIBRARY OF OHIO

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Columbus, OH 43215  
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### OKLAHOMA DEPT. OF LIB.

Government Documents  
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Oklahoma City, OK 73105  
(405) 521-2502

### OKLAHOMA STATE UNIV. LIB.

Documents Department  
Stillwater, OK 74078  
(405) 624-6546

### PORTLAND STATE UNIV. LIB.

Documents Department  
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Portland, OR 97207  
(503) 229-3673

### STATE LIBRARY OF PENN.

Government Pub. Section  
P.O. Box 1601  
Harrisburg, PA 17105  
(717) 787-3752

### TEXAS STATE LIBRARY

Public Services Department  
P.O. Box 12927—Cap. Sta.  
Austin, TX 78753  
(512) 471-2996

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Lubbock, TX 79409  
(806) 742-2268

### UTAH STATE UNIVERSITY

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Logan, UT 84322  
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Charlottesville, VA 22901  
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(206) 753-4027

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