



Aerospace Medicine  
and Biology  
A Continuing  
Bibliography  
with Indexes

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## ACCESSION NUMBER RANGES

Accession numbers cited in this Supplement fall within the following ranges.

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# **AEROSPACE MEDICINE AND BIOLOGY**

**A CONTINUING BIBLIOGRAPHY  
WITH INDEXES**

**(Supplement 286)**

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 June 1986 in

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



Scientific and Technical Information Branch

1986

**National Aeronautics and Space Administration**

Washington, DC

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# INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* lists 213 reports, articles and other documents announced during June 1986 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*. The first issue of the bibliography was published in July 1964.

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

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

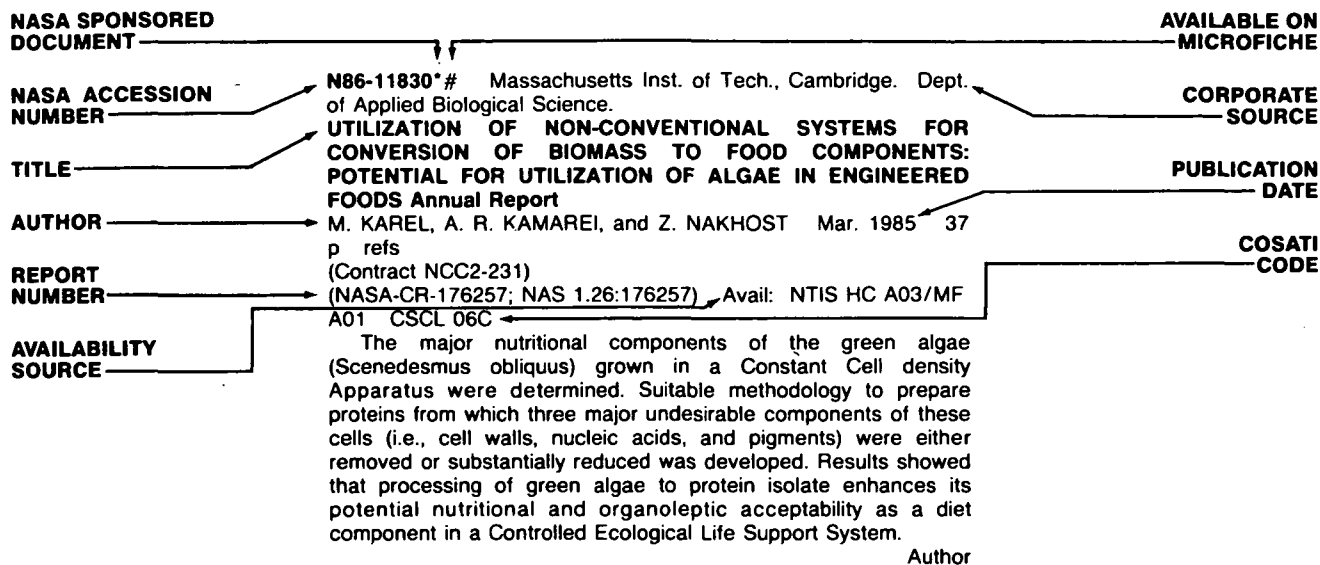
Seven indexes -- subject, personal author, corporate source, foreign technology, contract, report number, and accession number -- are included.

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1986 Supplements.

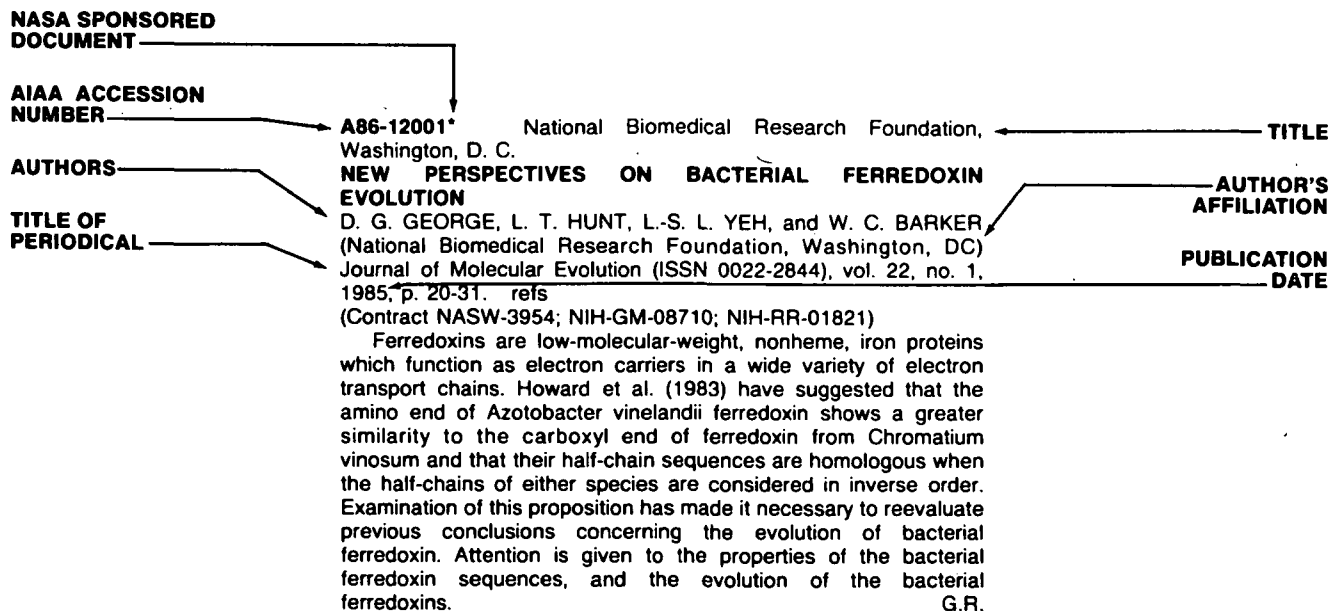
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## TYPICAL CITATION AND ABSTRACT FROM STAR



## TYPICAL CITATION AND ABSTRACT FROM IAA



# AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 286)

JULY 1986

51

## LIFE SCIENCES (GENERAL)

Includes genetics.

**A86-26490**

### STROMATOLITES FROM THE 3,300-3,500-MYR SWAZILAND SUPERGROUP, BARBERTON MOUNTAIN LAND, SOUTH AFRICA

G. R. BYERLY, D. R. LOWER, and M. M. WALSH (Louisiana State University, Baton Rouge) *Nature* (ISSN 0028-0836), vol. 319, Feb. 6, 1986, p. 489-491. Research supported by the ARCO Foundation, Anglo-American Corp. and University of Cape Town. refs

(Contract NSF EAR-79-19907; NSF EAR-79-19908; NSF EAR-82-06015)

A morphologically variable assemblage of stromatolites has been discovered in thin chert layers within the Fig Tree Group of the Swaziland Supergroup, South Africa. They are commonly low-relief, nearly stratiform, laterally linked domes. Rarer forms include pseudocolumns and crinkly stratiform stromatolites. The stromatolites grew on a substrate of altered komatiitic lava and sediments deposited on the lava surface, and in most places are covered by later komatiitic flows. Abundant fine-grained tourmaline included within the stromatolite laminae suggests that stromatolites formed in an environment dominated by boron-rich hot-spring emissions and evaporitic brines. Author

**A86-27051**

### POLYRIBONUCLEIC ACIDS AS ENZYMES

F. H. WESTHEIMER (California, University, La Jolla) *Nature* (ISSN 0028-0836), vol. 319, Feb. 13, 1986, p. 534, 535. refs

The implications of the discovery by Cech and Altman (1986) that polyribonucleic acids can function as enzymes are considered. Emphasis is given to a description of the enzymic properties of the cascade of spontaneous selfsplicing reactions in the RNA of *Tetrahymena thermophila*, in particular the catalytic properties of the intervening linear sequence (1-IVS). The possibility that ribozymes may have preceded protein enzymes in the prebiotic environment is briefly discussed. I.H.

**A86-27473**

### EFFECT OF COSMOHELIOGEOPHYSICAL FACTORS ON BACTERIAL AGGLUTINATION IN VITRO [VLIANIE KOSMOGELIOGEOFIZICHESKIKH FAKTOROV NA KHOD AGGLIUTINATSII BAKTERII IN VITRO]

A. M. OPALINSKAIA and L. P. AGULOVA (Tomskii Gosudarstvennyi Universitet, Tomsk, USSR) *Biofizika* (ISSN 0006-3029), vol. 31, Jan.-Feb. 1986, p. 94-98. In Russian. refs

The effect of solar cosmic ray characteristics on biological activity was studied, using antiserum-produced agglutination of *Salmonella typhosa* as an elementary model. The six year long study has encompassed periods of both minimal (1973-1974) and maximal (1977-1980) solar activity. Among the various indices of solar radiation examined, the index of neutron component intensity exhibited the most distinct and reliable correlation with the agglutination rate. Agglutination rate was also seen to vary with

season, solar rotation, polarity of the interplanetary magnetic field, and the course of geomagnetic storms. The onset of a geomagnetic storm coincided with a slowdown of the agglutination reaction, while the storm's end coincided with its speedup. Shielding of the reaction vessel with steel and Permalloy has almost abolished these effects, indicating the role of electromagnetism in bioactivity. I.S.

**A86-27475**

### EFFECT OF LOW-POWER MILLIMETER-RANGE MONOCHROMATIC ELECTROMAGNETIC RADIATION ON BIOLOGICAL PROCESSES [VLIANIE MONOKHROMATICHESKIKH ELEKTROMAGNITNYKH IZLUCHENII MILLIMETROVOGO DIAPAZONA MALOI MOSHCNOSTI NA BIOLOGICHESKIE PROTSESSY]

M. B. GOLANT *Biofizika* (ISSN 0006-3029), vol. 31, Jan.-Feb. 1986, p. 139-147. In Russian. refs

A systematic analysis is presented of Soviet and foreign studies dealing with the effects of low-power millimeter waves on living organisms. The basic characteristics of the biologically-active microwaves are discussed, including flux density, radiation frequency, duration of exposure, and the maximally sensitive body areas. Special consideration is given to biological and physical factors responsible for the microwave effects, and to biophysical aspects of these effects. The mechanism for the effects of nonionizing monochromatic microwaves is explained by the possibility that the microwave radiation imitates, to a certain extent, the signals of correlation and control used by physiological systems, and thus influences the dynamics of the body's functional changes. I.S.

**A86-27878#**

### MEDICAL TECHNOLOGY IN SPACE - FORESEEABLE ECONOMIC ISSUES

J. S. HIXSON (Medicasters, Inc., Bethesda, MD) IN: *Space, our next frontier*; Proceedings of the Conference, Dallas, TX, June 7, 8, 1984. Dallas, TX, National Center for Policy Analysis, 1985, p. 52-61. refs

An evaluation is made of economic factors affecting the development and operation of hospital facilities in space. Such facilities are currently envisioned as serving two distinct primary purposes: the first of these complements the life support systems which will accompany space personnel in exploratory or commercial ventures in space, while the second actively exploits the microgravity environment for the development of novel medical technologies that will be economically useful in either orbital or terrestrial settings. Attention is presently given to the two distinct value and financing systems that these purposes require. O.C.

**A86-28124**

### SKELETAL MUSCLE LACTATE RELEASE AND GLYCOLYTIC INTERMEDIATES DURING HYPERCAPNIA

T. E. GRAHAM, J. K. BARCLAY, and B. A. WILSON (Guelph, University, Canada) *Journal of Applied Physiology* (ISSN 0161-7567), vol. 60, Feb. 1986, p. 568-575. refs (Contract NSERC-A-6466)

The effect of respiratory acidosis on the rates of glycolysis and the lactate (La) release in the autoperfused gastrocnemius-plantaris muscle group was studied in anesthetized dogs ventilated either with air or with oxygen-nitrogen mixture

## 51 LIFE SCIENCES (GENERAL)

enriched with 4 percent of CO<sub>2</sub>. Blood flow, VO<sub>2</sub>, VCO<sub>2</sub>, and tension development were unaffected by respiratory acidosis. The glycogen catabolism was also not affected, but the release of La was lowered by muscle activity in CO<sub>2</sub>, and there was evidence that glycolysis was inhibited at the phosphofructokinase step, with increases recorded for the fructose-6-phosphate, the fructose-6-phosphate/fructose 1, 6-diphosphate, and the alpha-glycerophosphate/dihydroxyacetone phosphate ratios. Net La uptake occurred during the last 10 min of contractions. I.S.

**A86-28449**

### ELECTRICAL ENHANCEMENT OF HEALING

B. A. ROWLEY (Wright State University, Dayton, OH) IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2. New York, Institute of Electrical and Electronics Engineers, 1985, p. 994-999. refs

A review is presented of the use of electrical currents in effecting growth and regeneration of soft tissue, with a particular focus on low intensity direct currents. Data are presented on the use of tissue cultures as a model for investigating the phenomena. The use of low-intensity direct currents has been shown to enhance the repair of decubitus ulcers and to assist in the elimination of infecting bacteria. The exact mechanisms of this process are not known. Studies in vivo and in vitro do not always correlate. Low level 60-Hz currents have not been shown to have any measurable effect on bacteria or tissue growth. D.H.

**A86-28793**

### CRITICAL LIFE SCIENCE ISSUES FOR A MARS BASE

P. J. BOSTON (National Center for Atmospheric Research, Boulder, CO) IN: The case for Mars II. San Diego, CA, Univelt, Inc., 1985, p. 287-332. refs (AAS 84-167)

A number of the major issues of concern to the life scientist in regard to future Mars missions are examined. Issues covered include: contamination (forward and backward between Mars and earth), self-sufficiency of the base (whether the needs of the crew are to be totally resupplied, partially resupplied, or met through primary self-sufficiency), food self-sufficiency (including an adequate buffer or reserve for nutrition, and considering, as one possibility, microorganisms for food). Research recommendations, medical issues, and the question of whether life now exists or has ever existed on Mars are additional issues to be weighed. D.H.

**A86-28860\*** Miami Univ., Fla.

### CHARACTERIZATION AND OPTIMIZATION OF HYDROGEN PRODUCTION BY A SALT WATER BLUE-GREEN ALGA OSCILLATORIA SP. MIAMI BG 7. II USE OF IMMOBILIZATION FOR ENHANCEMENT OF HYDROGEN PRODUCTION

E. J. PHILIPS and A. MITSUI (Miami University, FL) International Journal of Hydrogen Energy (ISSN 0360-3199), vol. 11, no. 2, 1986, p. 83-89. refs (Contract NSF CPE-83-12092; NAS10-10531)

The technique of cellular immobilization was applied to the process of hydrogen photoproduction of nonheterocystous, filamentous marine blue-green alga, *Oscillatoria* sp. Miami BG 7. Immobilization with agar significantly improved the rate and longevity of hydrogen production, compared to free cell suspensions. Rates of H<sub>2</sub> production in excess of 13 microliters H<sub>2</sub> mg dry/wt h were observed and hydrogen production was sustained for three weeks. Immobilization also provided some stabilization to environmental variability and was adaptable to outdoor light conditions. In general, immobilization provides significant advantages for the production and maintenance of hydrogen photoproduction for this strain. Author

**A86-29089\*** National Aeronautics and Space Administration. National Space Technology Labs., Bay Saint Louis, Miss.

### FOLIAGE PLANTS FOR INDOOR REMOVAL OF THE PRIMARY COMBUSTION GASES CARBON MONOXIDE AND NITROGEN DIOXIDE

B. C. WOLVERTON, R. C. MCDONALD (NASA, National Space Technology Laboratories, Bay St. Louis, MS), and H. H. MESICK (Pan American World Services, Bay St. Louis, MS) Mississippi Academy of Sciences, Journal (ISSN 0076-9436), vol. 30, 1985, p. 1-8. refs

Foliage plants were evaluated for their ability to sorb carbon monoxide and nitrogen dioxide, the two primary gases produced during the combustion of fossil fuels and tobacco. The spider plant (*Chlorophytum elatum* var. *vittatum*) could sorb 2.86 micrograms CO/sq cm leaf surface in a 6 h photoperiod. The golden pothos (*Scindapsus aureus*) sorbed 0.98 micrograms CO/sq cm leaf surface in the same time period. In a system with the spider plant, greater than or equal to 99 percent of an initial concentration of 47 ppm NO<sub>2</sub> could be removed in 6 h from a void volume of approximately 0.35 cu m. One spider plant potted in a 3.8 liter container can sorb 3300 micrograms CO and effect the removal of 8500 micrograms NO<sub>2</sub>/hour, recognizing the fact that a significant fraction of NO<sub>2</sub> at high concentrations will be lost by surface sorption, dissolving in moisture, etc. Author

**A86-29096**

### STIMULATION OF BRAIN MUSCARINIC ACETYLCHOLINE RECEPTORS ACUTELY REVERSES RADIOGENIC HYPODIPSIA

G. A. MICKLEY (U.S. Armed Forces Radiobiology Research Institute, Bethesda, MD) and K. E. STEVENS (U.S. Air Force Academy, Colorado Springs, CO) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, March 1986, p. 250-255. DOD-USAF-supported research. refs

The role of hypothalamic muscarinic receptors in the production of radiation-induced hypodipsia was investigated in Co-60-irradiated rats, by measuring water consumption changes after intrahypothalamic injection of either carbachol (a muscarinic agonist) or atropine (an antagonist) into the irradiated rats. The lower dose of radiation (600 rads) produced a 5-d hypodipsia, whereas a more transient, albeit larger, effect was seen after 1000 rads. Carbachol produced acute reversal of radiogenic hypodipsia, while atropine potentiated the hypodipsia. These postirradiation drug-induced behaviors were similar to those observed after the same dose was given before irradiation. The persistence and the pharmacologic liability of the cholinergic functions suggest that other neuronal systems and/or neurochemicals may be more prominently involved in the radiogenic hypodipsia. I.S.

**A86-29097**

### CHANGES IN GLYCOLYTIC INTERMEDIATES IN RAT ERYTHROCYTES DURING EXPOSURE TO SIMULATED HIGH ALTITUDE

A. NAKAMURA, H. OSADA, T. SAKAGUCHI, I. SAKURAI, and S. YAGURA (Japan Air Self-Defense Force, Aeromedical Laboratory, Tokyo) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, March 1986, p. 256-262. refs

Regulatory mechanisms of erythrocyte glycolysis and 2,3-diphosphoglycerate (2,3DPG) metabolism under hypoxia were studied in rats exposed to a simulated altitude of 18,000 ft (5,486 m) for 5 d. Changes in erythrocyte glycolytic intermediates were determined by enzymatic analysis. Marked alterations of glycolytic intermediates were found during 1 d of exposure which were quite different from those observed during exposure for 2,3, and 5 d. Alterations of intermediates seem to be highly correlated with blood pH changes; however, pH alone cannot explain the overall changes in intermediates. Results suggested that overall intermediate changes are the results of the combined effect of alterations of cellular pH and hemoglobin desaturation. Increased 2,3DPG at initial stages of exposure (within 1 d) may be caused mainly by the increased cellular pH; sustained elevation of 2,3DPG at later

stages could be attributed to the relief of product inhibition of diphosphoglycerate mutase by deoxygenation. Author

**A86-29099**  
**CARDIOVASCULAR RECEPTORS AND FLUID VOLUME CONTROL (1985 ARMSTRONG LECTURE)**

J. P. MEEHAN (Southern California, University, Los Angeles, CA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, March 1986, p. 267-275. refs

Experiments with negative pressure breathing led Gauer and Henry to the discovery of left atrial receptors that affected the release of ADH and the concept of a cardiovascular basis for fluid volume control. Since then, neural mechanisms involving cardiac receptors controlling the release of renin have been described, thus giving strong support for the role of cardiac receptors in fluid volume control. The original experimental work in the dog has been confirmed. The available pool of patients that have undergone heart transplant operations provide the opportunity for more definitive studies on the role of cardiac receptors in the control of cardiovascular function. Author

**A86-29174**  
**EFFECT OF WEIGHTLESSNESS ON THE DEVELOPMENT OF NEUROSECRETORY STRUCTURES OF THE HYPOTHALAMO-HYPOPHYSEAL SYSTEM OF THE RAT BRAIN (ELECTRON-MICROSCOPE STUDY) [VLIANIE NEVESOMOSTI NA RAZVITIE NEIROSEKRETORNYKH STRUKTUR GIPOTALAMO-GIPOFIZARNOI SISTEMY MOZGA KRYS /ELEKTRONNO-MIKROSKOPICHESKOE ISSLEDOVANIE/]**

I. I. BABICHENKO (Universitet Druzhby Narodov, Moscow, USSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 286, no. 4, 1986, p. 976-978. In Russian. refs

The paper presents an analysis of the ultrastructure of the neurosecretory elements of the hypothalamo-hypophyseal system of developing rats whose mothers were flown on the Cosmos-1514 biosatellite during the 13-18th days of pregnancy. A delay in differentiation and changes in the basic components of the neuropil were observed in the neurosecretory-element ultrastructure in 18-day rat embryos 5-6 hours after a 5-day stay in weightlessness. These changes are evidently connected with the effect of a number of humoral factors (particularly an elevated concentration of calcium ions in the blood) on the developing brain. B.J.

**A86-29255**  
**ELECTRICAL ACTIVITY OF CEREBELLUM IN THE WAKEFULNESS-SLEEP CYCLE [ELEKTRICHESKAIA AKTIVNOST' MOZZHECHKA V TSIKLE BODRSTVOVANIE-SON]**

G. L. BEKAIA and G. G. BERADZE (AN GSSR, Institut Fiziologii, Tbilisi, Georgian SSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 71, Dec. 1985, p. 1480-1487. In Russian. refs

Dynamics of spontaneous electrical activity of cerebellar cortex and of fastigial nuclei were compared in unrestrained cats with implanted electrodes. The activity recorded during the periods of wakefulness and various phases of sleep revealed characteristic differences between these two structures, expressed most clearly during the paradoxical sleep phase. An analysis of activities in fastigial nuclei and dorsal hippocampus has shown a weak correlation between the two processes. Functional significance of the changes observed in electrical activity of the cerebellum during the wakefulness-sleep cycle and their possible mechanisms are discussed. I.S.

**A86-29256**  
**CALMODULIN, A SECOND MESSENGER - HISTORY OF INVESTIGATION AND PHYSIOLOGICAL IMPORTANCE [KAL'MODULIN-VTORICHNYI PERADTCHIK /SECOND MESSENGER/ ISTORIA IZUCHENIIA, FIZIOLOGICHESKOE ZNACHENIE]**

P. K. KLIMOV and B. V. MISSIUL (AN SSSR, Institut Fiziologii, Leningrad, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 71, Dec. 1985, p. 1500-1512. In Russian. refs

The primary structure of calmodulin, its physicochemical properties, and molecular conformation are presented, together with a discussion of calmodulin distribution in body tissues and in subcellular structures. Consideration is given to changes in cellular calmodulin contents due to physiological changes and pathological alterations. Special attention is given to the enzymatic targets of calmodulin and to the mechanism of its action. The role of calmodulin in the hormonal effects of catecholamines, dopamine, insulin, the renin-angiotensin system, and other hormones is discussed. I.S.

**A86-29257**  
**MECHANISMS OF CALCIUM PERMEABILITY CHANGES IN THE SARCOLEMMA OF VASCULAR SMOOTH-MUSCLE CELLS DURING HYPOXIA [MEKHANIZMY IZMENENIIA KAL'TSIEVOI PRONITSAEMOSTI SARKOLEMMY GLAKOMYSHECHNYKH KLETOK SOSUDOV PRI GIPOKSII]**

A. I. SOLOVEV and A. V. STEFANOV (AN USSR, Institut Fiziologii, Kiev, Ukrainian SSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 71, Dec. 1985, p. 1560-1567. In Russian. refs

**A86-29275**  
**THE INFLUENCE OF THE INITIAL VALUE OF A PARAMETER ON ITS CHANGE UNDER THE ACTION OF EXTERNAL FACTORS [VLIANIE ISKHODNOI VELICHINY PARAMETRA NA EGO IZMENENIIA PRI VNESHNIKH VOZDEISTVIAKH]**

V. I. KOPANEV and V. V. VLASOV (Voenno-Meditsinskaia Akademiia, Leningrad, USSR) Akademiia Nauk SSSR, Izvestia, Seriya Biologicheskaya (ISSN 0002-3329), Jan.-Feb. 1986, p. 96-114. In Russian. refs

The chief postulates and consequences of the law of initial values (LIV), concerning changes in organisms under the action of external factors, are discussed. The applicability of the LIV in the analysis of the responsivity and resistance of organisms is shown to be very broad. The LIV can explain many individual differences between organisms and the characteristics of the initial state of organisms at the moment external stimulation is applied. The relationship between the LIV and other ways of describing responses of the organism to external factors are examined. B.J.

**N86-20444#** Joint Publications Research Service, Arlington, Va.  
**SHKLOVSKIY DISCUSSES POSSIBILITY OF EXTRATERRESTRIAL INTELLIGENCE**

I. S. SHKLOVSKIY In its USSR Report: Space (JPRS-USP-86-002) p 39-44 10 Feb. 1986 Transl. into ENGLISH from Zemlya i Vselennaya (Moscow, USSR), no. 3, May - Jun. 1985 p 76-80  
Avail: NTIS HC A05

The silence of the universe can be completely and naturally attributed to the fact that extraterrestrial civilizations have either perished, not being able to contend with the problems that arose in the course of their own development, or there have never been such civilizations. In an examination of the history of terrestrial civilization it is seen that there are global problems in the present era and an inability to solve them can lead mankind to destruction. The proposed hypothesis makes possible a more profound discussion of the broad range of problems related to the future of mankind and the extent to which life occurs in the universe. Author

## 51 LIFE SCIENCES (GENERAL)

**N86-20445#** Joint Publications Research Service, Arlington, Va.  
**SALYUT-7 ELECTROPHORESIS EXPERIMENTS AID MEDICAL RESEARCH**

T. CHESANOVA *In its* USSR Report: Space (JPRS-USP-86-002) p 45 10 Feb. 1986 Transl. into ENGLISH from Leningradskaya Pravda (Leningrad, USSR), 13 Oct. 1985 p 2  
Avail: NTIS HC A05

Experiments performed by crews of Salyut orbiting stations have been aimed at obtaining extrapure hemagglutinin and other surface proteins of the influenza virus, using the method of electrophoresis. The series of space experiments called Tavriya demonstrated that such products can be obtained comparatively quickly and easily in conditions of zero gravity. A new generation electrophoretic unit called EFU-Robot is now in use on the Salyut-7 station. The EFU-Robot can be programmed by a cosmonaut to select samples of substances purified in the course of experiments and automatically transfer the samples from the unit's working chamber to ampoules, using syringes. Preparations obtained during the current manned orbital mission were delivered to Earth recently by cosmonauts. Author

**N86-20890#** Joint Publications Research Service, Arlington, Va.  
**METEOROLOGICAL ADAPTATION RESEARCH AT BIOLOGY INSTITUTE Abstract Only**

Y. KRUSHELNITSKIY *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) p 5-6 10 Jan. 1986 Transl. into ENGLISH from Trud (Moscow, USSR), 26 Sep. 1985 p 3  
Avail: NTIS HC A04

Natural mechanisms of anticipation of weather changes in animals and human beings, and effects of weather conditions on human behavior and working fitness were studied. Meteorological sounds on the noise of free atmosphere caused by turbulent motion of the air. It is perceived by living organisms as sounds, analyzed by them and their behavior is modified accordingly. The biological forecasting mechanism may lead to the development of improved weather-forecasting methods and equipment. An acoustic weather-forecasting method was used. Cloudiness and precipitation reportedly were forecast with accuracies of 98% and 85 percent using this method. A medical forecasting method using primary data, which is based on the meteorological-adaptation hypothesis was developed. Ecological factors are considered in the forecasting and prevention of illness. E.A.K.

**N86-21097\*#** National Aeronautics and Space Administration, Washington, D.C.

**THE HUMAN FACTOR: BIOMEDICINE IN THE MANNED SPACE PROGRAM TO 1980**

J. A. PITTS 1985 402 p refs *In its* History Series (Contract NASW-3213) (NASA-SP-4213; NAS 1.21:4213; LC-85-21526) Avail: SOD HC \$23.00 as 033-000-00977-1; NTIS MF A01 CSCL 05E

The purpose of this publication is to provide NASA personnel, NASA managers, and the biomedical and historical research communities a well-documented, historical summary of the content and organization of NASA's biomedical programs from Project Mercury up to the Shuttle program. The publication includes not only a major narrative portion, but appendixes and reference notes. Author

**N86-21098#** Michigan Univ., Ann Arbor. Dept. of Physiology.  
**CIRCADIAN VARIATION IN HOST DEFENSE Annual Report, Nov. 1984 - Oct. 1985**

M. J. KLUGER 18 Nov. 1985 10 p (Contract N00014-85-K-0027; RR0-4108) (AD-A161702) Avail: NTIS HC A02/MF A01 CSCL 06O

We have been monitoring the body temperature and relative activity of up to 24 rats at a time using a recently developed biotelemetry system (The Dataquest III; Mini-Mitter Company). Each cage is maintained in a constant temperature chamber at 27 C and is on a 12:12 hour light-dark cycle. In the process of testing the versatility of this system and obtaining pilot data we have generated data for two manuscripts: (1) Hyperthermia induced by open-field stress is blocked by salicylate, Physiology and Behavior,

and (2) Selection of cage size by Sprague-Dawley rats. Data directly relevant to the ultimate goal of the research include the following: a. We have established a dose of sodium salicylate which will block the circadian rise in body temperature, and b. We have established the normal circadian variation in activity for rats maintained on a 12:12 light-dark cycle. The administration of an antipyretic dose of sodium salicylate to rats in the late afternoon resulted in significant attenuation of the rise in body temperature normally observed at night; the drug had no effect on activity. Administration of this same dose of sodium salicylate to rats during the morning hours had no effect on body temperature or on activity. Since antipyretic drugs are thought to act by returning an elevated thermoregulatory set-point to normal, these data suggest to us that the rise in temperature observed at night in rats is a true fever, perhaps induced by interleukin-1 (IL-1). GRA

**N86-21099#** Georgia Univ., Athens.  
**ROLE OF CA(2+)/CALMODULIN IN PHOSPHORYLATION OF PROTEINS IN PLANTS Final Report, 1 Aug. 1983 - 31 Jul. 1985**

M. J. CORMIER 1985 11 p refs (Contract DE-AS09-83ER-13107) (DE86-001804; DOE/ER-13107/3) Avail: NTIS HC A02/MF A01

In order to elucidate the role of Ca(2+)-dependent protein phosphorylation in plant cell function, a Ca(2+)-dependent protein kinase from suspension-cultured soybean cells has been partially purified and characterized. It was previously shown that crude extracts of the soybean cells contain soluble protein kinase(s) that preferentially phosphorylates at least eight endogenous proteins in vitro in the presence of 0.5 mM CaCl<sub>2</sub>. An assay based on phosphorylation of the artificial substrate histone H1 has been devised. DOE

**N86-21100#** Los Alamos National Lab., N. Mex.  
**NEW ROLES FOR COMPUTATION IN THE LIFE SCIENCES**

G. I. BELL 1985 13 p refs Presented at the Computer Analysis for Life Science, Okayama, Japan, 9 Jul. 1985 (Contract W-7405-ENG-36)

(DE85-017542; LA-UR-85-2985; CONF-850784-2) Avail: NTIS HC A02/MF A01

Important new roles for computation in the life sciences are being found in the study of the linear polymers DNA, RNA, and proteins, and in the correlation of the sequence with the structure and function of each. Because of the ease with which DNA sequences can be determined and the definitive and often surprising information contained in the sequences, an explosion of biological information is taking place that will increasingly rely on computers for its analysis and understanding. DOE

**N86-21101#** Brookhaven National Lab., Upton, N. Y.  
**EXPERIMENTAL, STRUCTURAL AND THEORETICAL MODELS OF BACTERIOCHLOROPHYLLS A, D AND G**

J. FAJER, K. M. BARKIGIA, E. FUJITA, D. A. GOFF, L. K. HANSON, J. D. HEAD, T. HORNING, K. M. SMITH, and M. C. ZERNER 1985 17 p refs Prepared in cooperation with California Univ., Davis, and Florida Univ., Gainesville (Contract DE-AC02-76CH-00016)

(DE86-001727; BNL-36992) Avail: NTIS HC A02/MF A01

The model studies presented here probe possible effects that the protein environment may induce or impose on the conformation and electronic configuration of photosynthetic chromophores. Results are presented for the effect of axial ligation and hydrogen bonding on the electron spin resonance properties of bacteriopheophytin and bacteriochlorophyll a cation radicals. X-ray diffraction results on single crystals illustrate the significant conformational changes that different crystal habits enforce on the same skeleton of bacteriopheophytins d and the structural consequences of oxidation on a magnesium porphyrin. Theoretical calculations are also described that predict spectral and redox properties of bacteriochlorophyll g, the recently discovered chromophore of the anoxygenic bacterium, heliobacterium chlorum. DOE

**N86-21102#** Pacific Northwest Lab., Richland, Wash.  
**COMPARATIVE ANALYSIS OF BIOMASS PYROLYSIS CONDENSATES**

D. C. ELLIOTT Sep. 1985 38 p refs Presented at the Health and Environmental Research on Complex Organic Mixtures, Richland, Wash., 21 Oct. 1985 (Contract DE-AC06-76RL-01830) (DE86-001773; PNL-SA-13158; CONF-851027-2) Avail: NTIS HC A03/MF A01

The purpose of this research is to determine the chemical composition, physical properties, and biological activity of biomass gasification/pyrolysis tars and condensates. The analytical results show conclusively that all biomass derived tars and condensates are not the same. There is no typical tar composition that can be adequately used. It is dependent on the operating conditions, principally a time/temperature thermal severity-type function. Results show high biological activity (Ames assay) only in high-temperature processed tars. Mutagenic activity in gasification condensates is correlated with the concentration of polycyclic aromatic hydrocarbons in the same. Based on the above information, a potential processing dilemma has now been identified. Higher temperatures are generally perceived to improve the efficiency and rate of gasification. In addition, our data also suggests that less contamination will remain in the aqueous byproduct stream when the gasification is performed at higher temperature. On the other hand, the tar components that do remain following higher temperature processing contain more highly condensed PAH which result in a higher level of mutagenic activity. The transformation from phenolic to PAH is strongly a function of temperature in the range of 700(0) to 950(0)C. Therefore consideration of the processing requirements for the aqueous condensate stream versus the organic condensate stream may become critical with operating temperature being the major independent variable. DOE

**N86-21132#** Joint Publications Research Service, Arlington, Va.  
**GREENHOUSES WITH CURVILINEAR PLANTING SURFACE**

Y. A. BERKOVICH, V. A. KOR BUT, and V. I. PAVLOVSKIY *In its USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 115-119 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 77-80* Avail: NTIS HC A08/MF A01

The laws of light distribution in plants shown on the flat plane, spherical or cylindrical surfaces were investigated. In microgravity where the plants are arranged radially the level of illumination of lower leaf strata is higher on curvilinear than on flat surfaces. This is due to the following: as the plants grow they get separated; also, the concentration of the light flux increases with depth of plants on the curvilinear surfaces. In view of this, a space greenhouse is suggested, the design of which provides high productivity per unit volume and per unit energy of the incident flux of photosynthetically active radiation. Author

**N86-22082#** Gordon Research Conferences, Inc., Kingston, R.I.  
**PROCEEDINGS: PROTONS AND MEMBRANE REACTIONS HELD AT SANTA BARBARA, CALIFORNIA ON 28 JANUARY - 1 FEBRUARY 1985**

L. PACKER and D. DEAMER 9 Oct. 1985 28 p Conference held in Santa Barbara, Calif., 28 Jan. - 1 Feb. 1985 (Contract N00014-85-G-0055; DA PROJ. RR0-4108) (AD-A161331) Avail: NTIS HC A03/MF A01 CSCL 06A

The Proceedings of the Conference on Protons and Membrane Reactions which took place at Santa Barbara, California, on 28 January to 1 February, 1985, included the following topics: Intracellular Water Structure/Translocation; Concepts and Principles of Membrane Proton Conduction Pathways; Translocation of Protons/Water through Liposomes and Model Systems; Non Bulk Phase vs Bulk Proton Translocation; Translocation of Protons Through Membranes: Bacteriorhodopsin; Transmembrane Proton Translocation by the F sub 0 Moiety of H(+)-ATP (Adenosine Triphosphate) Synthase; Proton Translocation and the Catalytic

Process in the H<sup>+</sup>-ATP Synthase; The Flagellar Motor System; Proton Translocation Through Redox Complexes. GRA

**N86-22083#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**THEORETICAL PREREQUISITES FOR THE POSSIBLE USE OF BACTERIA WHICH SPLIT ORGANOPHOSPHATES IN ORDER TO INCREASE THE YIELD OF NUTRIENT YEAST AND ITS NITROGEN AND PHOSPHOROUS CONTENT**

D. L. SHAMIS 28 Oct. 1985 25 p Transl. into ENGLISH from Trudy Instituta Mikrobiologii i Virusologii, Adademiya Nauk Kazakhskoy SSSR (USSR), v. 11, 1968 p 3-17 (AD-A161811; FTD-ID(RS)T-1393-84) Avail: NTIS HC A02/MF A01 CSCL 06M

This article reflects the theme of one of the areas of investigation of the Laboratory of Microbial Protein Synthesis, where we are studying the factors which accelerate the conversion (mobility) of macroergic and other phosphorous compounds. The purpose of these studies is to increase the energy supply of the metabolic synthesis reactions connected with the yield and quality of food yeast. Professor Malkov, the author of the idea of the partial inhibition of respiration in order to save carbon, mentions a factor which may be the cause of intensification of the biosynthetic processes of the yeasts he investigated. We are speaking here about the doubled amount of labile phosphorous p7 obtained in yeast as a result of placing it in concentrated orthophosphate. In our investigations the increased labile phosphorous content is connected with the biosynthetic activity of the yeast. The article correlates many studies which show the very important role of ATP and polyphosphates as energy accumulators and transporters, and presents data from the literature and preliminary results of our own investigations which indicate the exceptional effectiveness of making practical use of the phenomena of microbial synergism and metabiosis. Bacteria which split orthophosphates were studied on the basis of these results. There is also significant interest in the phosphatase activity of food yeast using organophosphates as a phosphorous source. GRA

**N86-22084#** Minnesota Univ., Duluth. Dept. of Medical Microbiology and Immunology.

**SUPPRESSION OF ANTIBODY FORMING CELLS BY MURAMYL DI-PEPTIDES Final Report, Aug. 1982 - Nov. 1985**

M. WAKAI and A. G. JOHNSON 1 Dec. 1985 25 p (Contract N00014-82-K-0635; RR0-4108) (AD-A162400) Avail: NTIS HC A02/MF A01 CSCL 06E

Non-toxic synthetic adjuvants are under prime consideration for use in increasing the immune response of human beings. Three of microbial origin are the muramyl di-peptides (N-acetyl-muramyl-L-alanyl-D-isoglutamine and analogs, termed MDP), polyadenylic acid polyuridylic acid-polyuridylic acid complexes termed poly A-poly U) and the recently isolated monophosphoryl lipid A. While each of these has been demonstrated in animals to be active in increasing the immune response when given with the antigen, each also has been found to suppress this response when given one to several days before antigen. The enhancing actions of MDP and poly A-poly U have been well characterized. However, characterization of the suppressive phenomenon has been minimal, but it is important to gain a responsible understanding of how these adjuvants regulate the immune response non-specifically. Accordingly, the experiments proposed during the tenure of this contract were undertaken to further knowledge of how each of these adjuvants activate the suppressive arm of the immune response. GRA



## 51 LIFE SCIENCES (GENERAL)

**N86-22085#** Minnesota Univ., Duluth. Dept. of Medical Microbiology and Immunology.

**STUDIES ON THE MECHANISM OF SUPPRESSION OF THE IMMUNE RESPONSE BY SYNTHETIC, NON-TOXIC ADJUVANTS Final Report, Aug. 1982 - Nov. 1985**

A. G. JOHNSON, M. J. ODEAN, M. WAKAI, and M. TOMAI 1 Dec. 1985 26 p

(Contract N00014-82-K-0635; RR0-4108)

(AD-A162444) Avail: NTIS HC A03/MF A01 CSCL 06E

The immunomodulatory action of a non-toxic monophosphoryl lipid A (MPL) and a toxic diphosphoryl lipid A (DPL) fraction derived from endotoxins of the heptoseless mutants of bacteria were compared. Both derivatives retained the ability characteristic of lipopolysaccharides, to enhance antibody formation in young adult mice when injected along with antigen and suppress antibody production when given a day before antigen. In aging mice, a model of immunodeficiency, a marked restoration of antibody formation was observed when antigen was injected together with either MPL or DPL. Levels of antibody in these aging mice were comparable to those observed in young adult mice. Moreover, both MPL and DPL enhanced antibody production significantly in the endotoxin low-responder mouse strains, C3H/HeJ and C57Bl/10 ScN, whereas, phenol-water extracted endotoxin from an R-7 mutant was ineffective. MPL and DPL also acted as suppressive agents when administered prior to antigen in the C3H/HeJ strain. Thus, the results from these studies show that (a) the toxic properties of lipid A can be removed without eliminating immunomodulating activity, and (b) such lipidic compounds can overcome the immunologic lesions of immunodeficient and hyporesponsive animals. GRA

**N86-22086#** California Univ., Berkeley. Dept. of Microbiology and Immunology.

**MOLECULAR AND BIOLOGICAL PROPERTIES OF AN IMMUNOPOTENTIATING COMPLEX POLYSACCHARIDE ADJUVANT PRODUCED BY A GLIDING BACTERIUM Annual Report, 1 Jul. 1984 - 30 Jun. 1985**

R. I. MISHELL and W. R. USINGER 13 Dec. 1985 15 p

(Contract N00014-84-K-0626)

(AD-A162664) Avail: NTIS HC A02/MF A01 CSCL 06O

Gliding bacteria adjuvant (GBA) is composed of macromolecular substances secreted or shed into the growth media of a newly described *Cytophaga* species. We had established prior to the onset of this contract that GBA strongly augments the in vitro generation of humoral immunity by mouse spleen cells and that it is mitogenic for murine spleen cells. Since GBA is very water soluble, its absorbance at 280 nm is low, and its biological activities are stable to boiling, we hypothesized that GBA was a polysaccharide or a complex of polysaccharides. Our principal objectives during the first year of this contract were to develop methods for large scale production and purification of GBA, to initiate studies of its physical and chemical properties, to prepare a panel of monoclonal antibodies against GBA for future studies defining its biologically significant epitopes and to extend studies of its biological activities. Large scale production and purification have been essentially achieved using protocols described in this report. Knowledge of the biological activities of GBA for mammalian cells was extended this year. Titration curves with the most highly purified preparations of GBA were performed with assays measuring in vitro adjuvanticity, mitogenicity, B cell polyclonal activation and induction of the murine macrophage cell line, WEHI 265, to secrete IL-1. Studies on the mechanism of action of GBA were initiated. GRA

**N86-22087#** Northeastern Univ., Boston, Mass. Dept. of Biology.

**LYMPHOCYTE ACTIVATION - REGULATORY SUBSTANCES Final Report, Jun. 1982 - Sep. 1985**

P. R. STRAUSS 10 Dec. 1985 8 p

(Contract N00014-82-C-0283)

(AD-A162683) Avail: NTIS HC A02/MF A01 CSCL 06P

Initially, the objectives of this work were to characterize substances which regulated DNA synthesis in lymphocytes. In

particular we wished to determine the role of detergent soluble (DS)DNA in replication of activated splenocytes. We now feel that DS DNA is a hitherto overlooked class of replication intermediates not yet stabilized by nucleosome maturation. One possibility is that the detergent lability arises because of the presence of topoisomerase II in the replicating region which results in the release of these fragile fragments. These observations hold not only in activated lymphocytes but also in any actively dividing cell. GRA

**N86-22088#** Tel-Aviv Univ. (Israel). Dept. of Chemistry.

**BIMANE DERIVATIVES AS FLUORESCENT PROBES FOR BIOLOGICAL MACROMOLECULES Periodic Report, No. 4, Jul. - Dec. 1985**

E. M. KOSOWER Dec. 1985 16 p

(Contract DAJA45-83-C-0057)

(AD-A162725) Avail: NTIS HC A02/MF A01 CSCL 07C

Nine years ago, a convenient syntheses for a new class of heterocyclic molecules, the bimanans or 1,5-diazabicyclo(3.3.0) octadienediones was discovered and developed. In the course of preparing the bromo derivatives, fortuitously that proteins were fluorescently labeled by bromobimanans. It was established that bromobimanans reacted preferentially with thiols, and usefulness of such labeling for both small and large molecules in biological systems was demonstrated. Many applications of the agents have been reported. The primary aims of our research on the bimanans are divided into the following areas: (1) synthesis, (2) reactivity, (3) photophysics, and (4) application to macromolecules. Although we have a number of new results, it seems pertinent to base this report on a new summary of the application of bimanane labeling to thiols. GRA

**N86-22089#** Ohio State Univ., Columbus. Dept. of Microbiology.

**DEVELOPMENT AND USE OF ANUCLEATED BACTERIAL CELLS TO ASSAY THE IN VIVO ACTIVITY OF POLLUTANTS Final Report, Apr. 1981 - Jul. 1985**

J. N. REEVE and J. B. RICE 31 Jul. 1985 93 p

(Contract AF-AFOSR-0087-81)

(AD-A162727; AFOSR-85-1136TR) Avail: NTIS HC A05/MF A01 CSCL 06M

There were 2 objectives in this research project: development of an in vivo assay for mistranslation-inducing activity of pollutants and characterization of amino acid substitutions. The first objective proved to be the more difficult. The T7 0.3 gene product (0.3 protein) was purified by a modification of the published procedure, and used to raise rabbit antibody to this protein. A radioimmune precipitation assay was developed which could be used to estimate increased misincorporation of cysteine into 0.3 protein. A sample assay involving only counting of the radioimmune precipitate was not achieved because we were not able to obtain the 0.3 protein free of contaminating proteins in the RIP. The 2nd objective proved more fruitful. The cysteine substitution sites in the N-terminal 42 positions of 0.3 protein have been successfully identified. Cleavage of 0.3 protein with trypsin to identify cysteine for arginine substitutions showed that the major sites of cysteine misincorporation were at residues other than arginine. Sequencing of (35S) cysteine-labeled 0.3 protein showed that the most frequent substitution was at residue 15 (tyrosine) and other substitutions were at a positions 9 (asparagine), 12 (aspartate), 41 (alanine) and 42 (aspartate). GRA

**N86-22090#** Charles F. Kettering Research Lab., Yellow Springs, Ohio.

**PARTICULATE MODELS OF PHOTOSYNTHESIS Progress Report**

G. R. SEELY Oct. 1985 27 p refs

(Contract DE-FG02-84ER-13187)

(DE86-001625; DOE/ER-13187/2) Avail: NTIS HC A03/MF A01

Studies are reported on the photochemical and physical properties of chlorophyll while associated with various surfactants onto polyethylene particles. Results to date have shown that the

forms of chlorophyll association are specific to the surfactant; furthermore, when chlorophyll is ligated by the surfactant, even dense associations are fluorescent, but when the ligating surfactant contains a reducible group like quinone, the fluorescence is strongly suppressed. DOE

**N86-22091#** Oak Ridge National Lab., Tenn.  
**BIOMEDICAL AND ENVIRONMENTAL SCIENCES AT OAK RIDGE NATIONAL LABORATORY**

1985 47 p  
(Contract DE-AC05-84OR-21400)  
(DE86-001639; ORNL/M-88) Avail: NTIS HC A03/MF A01

The themes, activities, and facilities of the Biomedical and Environmental Sciences Program at Oak Ridge National Laboratory are described. Programs discussed include those in the Biology Division, Environmental Sciences Division, Health and Safety Research, and the Biotechnology Program. DOE

**N86-22092#** Science Applications International Corp., La Jolla, Calif.

**JAPANESE TECHNOLOGY EVALUATION PROGRAM (JTECH): BIOTECHNOLOGY PANEL Final Report**

D. OXENDER, C. COONEY, D. JACKSON, G. SATO, and R. WICKNER Jun. 1985 171 p Sponsored in part by Department of Commerce, Washington, D.C.

(Contract TA-83-SAC-02254; NSF PRA-85-13755)  
(PB86-109386; JTECH-TAR-8404; NSF/PRA-85016) Avail:  
NTIS HC A08/MF A01 CSCL 06E

Japanese research and development in several of the main areas of biotechnology, including biochemical process technology, biosensors, cell culture technology, protein engineering, and recombinant DNA technology are assessed. Japan's strategic planning in biotechnology is based on a 10 to 15 year time scale, whereas most similar planning and resource commitment in the United States is based on a 3 to 5 year time scale. This difference in time scale is thought to be partially responsible for Japan's apparently more technology-driven than market-driven resource commitment. It is noted that much of the commercialization of biotechnology in Japan is being carried out by large established companies and that Japan has a well-established coordination of the development of biotechnology by industry, universities, and government groups. GRA

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## AEROSPACE MEDICINE

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

**A86-27474**

**INTERACTION BETWEEN THE OTOLITHIC ORGAN AND THE SEMICIRCULAR CANALS OF THE VESTIBULAR APPARATUS IN THE SYSTEM OF SPATIAL ANGULAR STABILIZATION IN HUMANS [VZAIMODEISTVIE OTOLITOVOGO ORGANA I POLUKRUZHNYKH KANALOV VESTIBULIARNOGO APPARATA V SISTEME UGLOVOI STABILIZATSII CHELOVEKA V PROSTRANSTVE]**

V. M. GUSEV (AN SSSR, Institut Fiziologii, Leningrad, USSR) and V. A. KISLIAKOV *Biofizika* (ISSN 0006-3029), vol. 31, Jan.-Feb. 1986, p. 123-127. In Russian. refs

A mathematical model is developed for spatial angular stabilization in which the fixed and variable space coordinates are related to the coordinates of the semicircular canals and the otolithic organ during spatial displacement. The equations describing the interrelationship of both vestibular systems are solved for the case of abrupt displacement of angular vectors, and for the case of slow periodic variations of the same angles, approximating the pitching and rocking motions of a medium-size fishing trawler. The results indicate a need for integrated activity

of both the semicircular canals and the otolithic organ for an acceptable stabilization: the canals insure short-term stabilization and stabilization during the abrupt changes of spatial orientation, while the otolithic organ plays a dominant role during long-term slowly occurring changes. I.S.

**A86-28098#**

**THE EFFECTS OF CIRCUIT WEIGHT TRAINING AND G EXPERIENCE ON +GZ TOLERANCE**

C. MIZUMOTO and M. IWANE *Japan Air Self Defence Force, Aeromedical Laboratory, Reports* (ISSN 0023-2858), vol. 26, Sept. 1985, p. 105-120. In Japanese, with abstract in English. refs

Two experiments evaluating the G tolerance of ten men ranging in age from 21-32 years are described. Four men were subjected to G force and their tolerance was estimated, and the other six men performed circuit weight training (CWT). Graphs of G tolerance changes for the ten subjects are presented and analyzed. The data reveal that exposure to G force once a week for four weeks does not affect G tolerance. In the men subjected to CWT for eight weeks, four men increased their G tolerance by 0.5-0.8 G, one displayed no change in tolerance, and the sixth decreased G tolerance by 0.4G; a correlation between femoral muscle strength and G tolerance is observed. It is concluded that short periods of CWT will increase peak G tolerance. I.F.

**A86-28099#**

**CHANGES IN CATECHOLAMINE EXCRETION DURING PHYSICAL AND MENTAL WORKLOAD**

A. NAKAMURA, Y. KAKIMOTO, T. SAKAGUCHI, I. SAKURAI, F. TAJIMA et al. *Japan Air Self Defence Force, Aeromedical Laboratory, Reports* (ISSN 0023-2858), vol. 26, Sept. 1985, p. 121-129. In Japanese, with abstract in English. refs

The excretion of norepinephrine and epinephrine in four male subjects exposed to physical and mental work is evaluated. The physical exercise involved running and the bicycle ergometer, and the mental work included the addition of digits, span of attention and preposition cancellation tests, and instrument reading. The preparation of the urine samples and the catecholamine analysis are described. Graphs displaying the amount of norepinephrine and epinephrine excreted following work are presented. The data reveal that norepinephrine excretion is increased significantly with physical work and epinephrine is increased during mental work. I.F.

**A86-28100#**

**EFFECTS OF PHYSIOLOGICAL AND MENTAL STRESS ON CREW MEMBERS IN RELATIVELY LONG FLIGHT BY C-1 JET TRANSPORT AIRCRAFT**

Y. KAKIMOTO *Japan Air Self Defence Force, Aeromedical Laboratory, Reports* (ISSN 0023-2858), vol. 26, Sept. 1985, p. 131-155. In Japanese, with abstract in English. refs

The relationship between physical and mental work and crew response is examined. The age and flying experience of the crew members, and the thermal conditions and noise level in the cockpit are described. The heart rate, critical flicker frequency (CFF), salivary cortisol level, adrenalin excretion, and fatigue level of the pilots and copilots during operation and nonoperation are evaluated. The data reveal that the heart rate of both pilots and copilots increases during takeoff and landing. During cruise the pilots heart rate is constant; however, the copilots display an increase in heart rate revealing a correlation between heart rate and flying experience. The salivary cortisol response is parallel to the heart rate changes. It is detected that the adrenalin level in the copilots increases with operation and in the pilots it remains unchanged. The CFF in the pilots is unchanged and in the copilots a lower level is observed; the pilots are subjected to increased fatigue compared to the copilots. It is concluded that the pilots remain alert by maintaining constant levels during operation and nonoperation, and that copilots could adapt to long flight missions with increased flight experience. I.F.

**A86-28122****AFTERDROP OF BODY TEMPERATURE DURING REWARMING - AN ALTERNATIVE EXPLANATION**

P. WEBB (Webb Associates, Yellow Springs, OH) *Journal of Applied Physiology* (ISSN 0161-7567), vol. 60, Feb. 1986, p. 385-390. refs

(Contract N00014-72-C-0057; N00014-80-C-0193)

The effect of the rate of body cooling and rewarming on afterdrop (a continued fall of deep body temperatures during rewarming) was investigated in healthy men subjected to either a rapid cooling-immediate rewarming, a rapid cooling-delayed rewarming, or a slow, prolonged cooling-immediate rewarming regimen. Typical afterdrops in the rectal, esophageal, and auditory canal temperatures were observed in the case of rapid cooling-immediate rewarming regimen, but not in the two other regimens. Afterdrops were also observed in two inanimate models with no circulation. These results make the circulatory explanation of afterdrop improbable. Instead, afterdrop can be explained by the simple rules of heat flow through a mass of tissue. I.S.

**A86-28123****EFFECTS OF BODY MASS AND MORPHOLOGY ON THERMAL RESPONSES IN WATER**

M. M. TONER, M. N. SAWKA, M. E. FOLEY, and K. B. PANDOLF (U.S. Army, Research Institute of Environmental Medicine, Natick, MA) *Journal of Applied Physiology* (ISSN 0161-7567), vol. 60, Feb. 1986, p. 521-525. refs

Effects of body mass and surface area on thermal responses to 1-h long immersion into 26-C water were studied in two groups of men, similar in total body fat and skinfold thicknesses, but different in other body characteristics. The large-body mass (LM) group was 16.3 kg heavier and 0.22 sq cm/kg smaller in surface area-to-mass ratio,  $A(D)/wt$ , than the small-body mass (SM) group. Metabolic rate (M), and the rectal, skin, and esophageal temperatures, (Tre, Tsk, and Tes) were measured at the end of 1-h periods of rest and exercise in water. While the M, Tre, Tes, and the calculated, value of tissue insulation were similar in both groups after exercise, the value of tissue insulation was lower in the SM group, indicating that a greater body mass increases the overall tissue insulation during rest, when the perfusion of the muscle mass is relatively low. The effect of  $A(D)/wt$  in thermoregulation in water appeared to be minimal. I.S.

**A86-28125\* Medical Coll. of Virginia, Richmond. DEVICE FOR RAPID QUANTIFICATION OF HUMAN CAROTID BARORECEPTOR-CARDIAC REFLEX RESPONSES**

J. M. SPRENKLE, D. L. ECKBERG, R. L. GOBLE, J. J. SCHELHORN, and H. C. HALLIDAY (USVA, Medical Center; Virginia, Medical College, Richmond) *Journal of Applied Physiology* (ISSN 0161-7567), vol. 60, Feb. 1986, p. 727-732. USVA-supported research. refs

(Contract NAS9-16046; NCH-HL-22296)

A new device has been designed, constructed, and evaluated to characterize the human carotid baroreceptor-cardiac reflex response relation rapidly. This system was designed for study of reflex responses of astronauts before, during, and after space travel. The system comprises a new tightly sealing silicon rubber neck chamber, a stepping motor-driven electrodeposited nickel bellows pressure system, capable of delivering sequential R-wave-triggered neck chamber pressure changes between +40 and -65 mmHg, and a microprocessor-based electronics system for control of pressure steps and analysis and display of responses. This new system provokes classic sigmoid baroreceptor-cardiac reflex responses with threshold, linear, and saturation ranges in most human volunteers during one held expiration. Author

**A86-28448****ESTIMATING THE SMALL AIRWAYS RESISTANCE FROM MEASUREMENTS OF THE UPSTREAM RESISTANCE OF SEVERAL GAS MIXTURES**

D. B. REYNOLDS and B. BRUNS (Wright State University, Dayton, OH) IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2. New York, Institute of Electrical and Electronics Engineers, 1985, p. 992, 993. refs

Based on measurements of the maximal expiratory flow-volume (MEFV) for air and for He-O<sub>2</sub>, a theory and methods are developed to extrapolate the upstream resistance, i.e. the resistance of airways peripheral to the equal pressure point of maximal expiration, to the zero gas density limit. In so doing, the purely viscosity dependent portion of the upstream resistance is obtained. This viscosity dependent part provides an estimate of the small airway resistance. D.H.

**A86-28813****COUNTERMEASURES FOR THE EFFECTS OF PROLONGED WEIGHTLESSNESS**

D. WOODARD (Wright State University, Dayton, OH) IN: The case for Mars II. San Diego, CA, Univelt, Inc., 1985, p. 655-663. refs

(AAS 84-187)

The need for artificial gravity during interplanetary flight could be eliminated by practical countermeasures to the degenerative changes induced by prolonged weightlessness. Current countermeasures are time-consuming, difficult to sustain, and only partially effective. Ground-based research suggests that the forms of exercise currently in use in space are not appropriate for maintaining muscle and bone strength, and that isokinetic exercise applying a maximal effort against a high resistance would be much more effective. Bone loss could be further reduced by use of anabolic steroid hormones. These appear safe and effective in reversing osteoporosis on earth. It is estimated that with these measures significant atrophic changes could be prevented with only about 30 minutes of exercise per day. An experiment to test these measures in earth orbit is proposed. Author

**A86-29091\*** National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

**IMMUNOLOGICAL ANALYSES OF U.S. SPACE SHUTTLE CREWMEMBERS**

G. R. TAYLOR, L. S. NEALE, and J. R. DARDANO (NASA, Johnson Space Center, Houston, TX) *Aviation, Space, and Environmental Medicine* (ISSN 0095-6562), vol. 57, March 1986, p. 213-217. refs

Changes in the immunoresponsiveness of 'T' lymphocytes following space flight have been reported previously. Additional data collected before and after 11 Shuttle space flights show that absolute lymphocyte numbers, lymphocyte blastogenic capability, and eosinophil percent in the peripheral blood of crewmembers are generally depressed postflight. These responses resemble those associated with physical and emotional stress and may not be related to flight per se. Additional data from Space Shuttle flights 41B and 41D, involving 11 crewmembers, indicate a postflight decrease in cells reacting with 'B' lymphocyte and monocyte monoclonal antibody tags. Further, the loss of 'T' lymphocyte blast capability correlates with the decreased monocyte count (correlation coefficient = 0.697). This finding implies that the previously reported loss of blastogenic capability may be a function of decreased monocyte control, as noted in several non-spaceflight related studies. Author

**A86-29093\*** Brandeis Univ., Waltham, Mass.  
**THE EFFECTIVE INTENSITY OF CORIOLIS, CROSS-COUPLED STIMULATION IS GRAVITOINERTIAL FORCE DEPENDENT - IMPLICATIONS FOR SPACE MOTION SICKNESS**  
 J. R. LACKNER and A. GRAYBIEL (Brandeis University, Waltham, MA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, March 1986, p. 229-235. refs  
 (Contract NAS9-15147)

The effect of gravity on the severity of the Coriolis-induced motion sickness was investigated in ten individuals subjected to high and low G-force phases of parabolic flight maneuvers using constant level Coriolis, cross-coupled angular acceleration stimulation. Using seven levels of severity in the diagnosis of motion sickness, it was found that the subjects were less susceptible at 0 G than at +2 Gz, and that the perceived intensity and provocativeness of Coriolis stimulation decreased in 0 G and increased in +2 Gz relative to the +1 Gz baseline values. The changes in the apparent intensity of Coriolis stimulation occur virtually immediately when the background gravito-inertial force level is varied. These findings explain why the Skylab astronauts were refractory to motion sickness during Coriolis stimulation in-flight. I.S.

**A86-29094**  
**TRANSDERMAL SCOPOLAMINE - HUMAN PERFORMANCE AND SIDE EFFECTS**

C. GORDON, J. ATTIAS, A. ROLNICK (Israel Navy, Motion Sickness Research Center, Haifa), and O. BINAH (Israel Navy, Motion Sickness Research Center, Technion Israel Institute of Technology, Haifa) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, March 1986, p. 236-240. refs

The effect of transdermal scopolamine on performance was tested on 23 naval volunteers. Performance was evaluated by using a battery of professional (naval-related) and cognitive tests. For all tests performed, there were no significant differences between the scores obtained in placebo and transdermal scopolamine conditions. These results were in close agreement with subjective estimations of performance. Transdermal scopolamine significantly reduced salivary flow, whereas mood state, visual acuity, and eye accommodation for near vision were not affected. It is concluded that transdermal scopolamine administration is not accompanied by decrement in performance abilities and can safely be used by naval crews. Author

**A86-29306**  
**THE STATE OF MAN'S ORGANISM UNDER CONDITIONS OF ELEVATED ATMOSPHERIC CARBON DIOXIDE [SOSTOIANIE ORGANIZMA V USLOVIAKH VOZDUSHNOI SREDY S POVYSHENNYM SODERZHANIEM UGLEKISLOGO GAZA]**  
 V. G. ALTUKHOV, M. A. GREBENIK, and A. A. SHAPOVALOV Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), Dec. 1985, p. 43, 44. In Russian.

Effects of elevated atmospheric CO<sub>2</sub> were studied in three groups of men subjected to prolonged habitation in atmospheric chambers equilibrated with CO<sub>2</sub> at the levels of (1) 0.80 percent, (2) 0.60 percent, and (3) 0.25 percent, respectively. Various physiological parameters, as well as the results of mental acuity tests and subjective evaluations of wellbeing, recorded every 10 days during the exposure and at the end of several 10-day periods after the test, were compared with the pre-test results. While the 0.25 pct CO<sub>2</sub> atmosphere did not adversely affect psychophysiological status of the subjects, the two regimens with higher CO<sub>2</sub> contents have led to marked increases of mental and physical fatigue signs, which were preceded by an increase of partial CO<sub>2</sub> pressure in the alveolar air and a drop in blood pH. I.S.

**A86-29499**  
**CONCERNS ARE BEING RAISED ABOUT LIVING IN THE SPACE ENVIRONMENT**  
 W. L. GIUFFRE Commercial Space (ISSN 8756-4831), vol. 1, Winter 1986, p. 69, 70.

An evaluation is made of current understanding and outstanding problems in the field of physiological adaptation to weightless environments. The primary concerns associated with long duration space flight encompass motion sickness and disorientation, muscle atrophy, bone decalcification, and radiation exposure. Data that are currently being analyzed from the Spacelab mission D1 may show that the process of readaptation into earth gravity does not occur as rapidly as had been thought. It is noted that while space motion sickness drugs are helpful, they are not completely preventive. Future NASA planning stresses the importance of physical exercise. O.C.

**N86-20628#** Army Missile Command, Redstone Arsenal, Ala.  
**EFFECTS OF CARBON MONOXIDE ON PERSONNEL**  
 M. MOSSA /n Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 2 p 1309-1341 Aug. 1984  
 (AD-P004882) Avail: NTIS HC A99/MF E03 CSCL 13L

New weapons and the vehicles on which they mount have and will continue to become increasingly complex. These weapons are potentially more demanding, and challenges need to be addressed. One important challenge is the need to accurately monitor and control the amount of toxic substances, generated by weapon systems, that may endanger the soldiers who will operate the systems. Toxic fumes generated from various sources can have debilitating effects on the efficiency of occupants and operators of vehicles and ground equipment. The insidious nature of these effects underscores the necessity for detecting, measuring, and eliminating these hazards to the extent possible. The overall problem that must be addressed is the potential exposure of soldiers to carbon monoxide, ammonia, oxides of sulfur, oxides of nitrogen, lead fumes, and other harmful substances. The exposures are likely to be relatively intense (above present Federal standards for occupational exposure), brief (1 hour or less), and rapidly repeated (as often as six times daily for periods as long as 14 days). Such exposures may occur when soldiers are trained to use various weapon systems or while in combat. GRA

**N86-20629#** Army Materiel Command, Aberdeen Proving Ground, Md.  
**AN EXAMINATION OF INJURY CRITERIA FOR POTENTIAL APPLICATION TO EXPLOSIVE SAFETY STUDIES**  
 D. N. NEADES and R. R. RUDOLPH /n Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 2 p 1343-1354 Aug. 1984  
 (AD-P004883) Avail: NTIS HC A99/MF E03 CSCL 13L

A state-of-the-art assessment of research into and the modeling of wounding mechanisms and phenomena is described. The results of an extensive survey of the literature are presented along with recommendations for replacement of the presently used 58 ft-lb rule. The data and models located have been evaluated with respect to applicability to explosive safety studies which typically require quantification of the fragment impact hazards to personnel. Major topics for discussion include penetrating and non-penetrating injury mechanisms and models, wounding thresholds, military incapacitation criteria, and existing safety criteria, as well as recommendations for formulation of new criteria. Author (GRA)

**N86-21013** Dortmund Univ. (West Germany). Inst. fuer Arbeitsphysiologie.

**NEUROPHYSIOLOGICAL ACTIVITY AND PSYCHOPHYSICAL EFFECTIVENESS OF ENVIRONMENTAL FACTORS [NEUROPHYSIOLOGISCHE VERARBEITUNG UND PSYCHOPHYSISCHE WIRKSAMKEIT VON UMWELTEINFLUESSEN]**

W. H. EHRENSTEIN *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 1-5 13 Aug. 1985 refs In GERMAN  
 Avail: Issuing Activity

The sensorial transmission of the body/environment relationship is presented as well as the correlation between subjective and objective data through sensorial organs. The correlation investigation method is successfully applied to vision investigation to study the neurophysiological activity and psychophysical effectiveness of environmental factors. Further application of the psychophysiological concepts and methods presented is recommended for medical meteorological research. The investigation of qualitative relationships using impression scales is recommended to determine the central processes in the psychobiological assessment of the environmental factors.

Author (ESA)

**N86-21014** Max-Planck-Inst. fuer Physiologische und Klinische Forschung, Bad Nauheim (West Germany).

**THE INTERFACE BETWEEN ATMOSPHERE AND ORGANISM**

F. K. PIERAU *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 6-8 13 Aug. 1985 refs

Avail: Issuing Activity

The effects of temperature, air currents, and humidity on the human body and the stimulation of skin receptors are studied. The somatosensory processes underlying the communication between man and his environment and the relay of sensory information into the central nervous system are discussed. The transformation of temperature and mechanical signals into bioelectric signals (generation of a depolarizing nonpropagated receptor potential), the encoding of the stimulus features and the principles of processing in the central nervous system are reviewed. Mechanisms to detect air humidity by nasal and/or hypothalamic temperature receptors (slowly adapting and rapidly adapting mechanoreceptors) are discussed. The high sensitivity (transient and proportional) of temperature receptors is used to sense changes in air humidity. Sudden increase of nasal temperature may contribute to sensation of humidity.

Author (ESA)

**N86-21016** Dortmund Univ. (West Germany). Inst. fuer Arbeitsphysiologie.

**MAN'S THERMAL BUDGET UNDER VARIOUS CLIMATES [WAERMEBILANZ DES MENSCHEN IN VERSCHIEDENEN KLIMATEN]**

H. G. WENZEL *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 12-16 13 Aug. 1985 refs In GERMAN

Avail: Issuing Activity

Facts on man's thermoregulation system, conditioning, clothing and food requirements, on heat transfer through blood and skin, and metabolism are presented. Physiological processes of autonomous thermoregulation are described. Boundary conditions based on rectal temperature variations under heavy climates are studied to determine man's tolerance to heat stroke and heat stress (sensations of uneasiness, drop in corporal and psychological efficiency, specific health troubles).

Author (ESA)

**N86-21017** Technische Univ., Munich (West Germany). Lehrstuhl fuer Bioklimatologie und Angewandte Meteorologie.

**APPLICATION OF A NONSTATIONARY ENERGY BUDGET MODEL TO DETERMINE THERMAL COMFORT [ANWENDUNGSMOEGlichkeiten EINES INSTATIONAEREN ENERGIEBILANZMODELLS ZUR BEWERTUNG DER THERMISCHEN BEHAGLICHKEIT]**

P. HOEPPE *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 17-18 13 Aug. 1985 refs In GERMAN

Avail: Issuing Activity

A nonstationary energy budget model based on the fundamental energy flux equations is applied to determine heat stress and heat storage under variable environmental conditions. Temperature variations in the body core and shell are calculated. A man walking on a 200 m long sunlit street section at a speed of 0.4 m/sec dressed in light summer clothing is exposed to 3 min direct sun radiation and street surface radiation. No sultriness is noted with the nonstationary model. Nonstationary energy budget models can be applied for cold and warm therapy since they can give information on the optimal exposure times to reach a given thermal body condition.

Author (ESA)

**N86-21018** Fraunhofer-Inst. fuer Bauphysik, Stuttgart (West Germany). Institutsbereich Waerme/Klima.

**PHYSICAL CAUSES OF AIR DRAFT PHENOMENA, NEW FACTS [PHYSIKALISCHE URSACHEN FUER ZUGERSCHENUNGEN - NEUE ERKENNTNISSE]**

E. MAYER *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 19-20 13 Aug. 1985 refs In GERMAN

Avail: Issuing Activity

The physical causes of air draught phenomena causing health troubles are analyzed (especially man's local convective cooling resulting in a surface temperature decrease) as well as the relationship between convective heat transfer factor and thermal comfort. Measurements of convection on a heated artificial head show a parabolic correlation between self-convection and the product of air velocity mean value with turbulence degree and convective heat transfer factor. The area under the hyperboles corresponds to thermal comfort. Measurements were performed in buildings with and without air conditioning. Experimental results show good agreement with inquiry results. More cases of air draft troubles are recorded in buildings with air conditioning than in buildings without air conditioning. Convective heat transfer factor is better adapted to thermal comfort evaluation than air velocity mean value.

Author (ESA)

**N86-21019** Technische Univ., Munich (West Germany). Inst. fuer Medizinische Balneologie und Klimatologie.

**CLIMATIC CURE ON A PRACTICAL LEVEL [KLIMATUR IN DER PRAXIS]**

A. SCHUH *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 21-22 13 Aug. 1985 refs In GERMAN

Avail: Issuing Activity

About 150 patients were submitted to cardiovascular training and thermoregulatory training during their cure period to improve their response to climatic stimuli by applying ambulatory therapy. Pulse and blood pressure were measured to determine the physiological reaction and eye stress under climatic conditions. Patients were taught the thermoregulation system so as to react economically to climatic conditions. They were interrogated on their thermal comfort during the walk. Lactate formation and rewarming time were measured. Improved response to cold stimuli can be achieved with the application of this form of climatic cure combining cardiopulmonar training and thermoregulatory training.

Author (ESA)

**N86-21020** Meteorologischer Dienst der DDR, Berlin (East Germany). Forschungsinst. fuer Bioklimatologie.

**ON THE IMPORTANCE OF COOLING IN CLIMATIC THERAPY [ZUR BEDEUTUNG DER ABKUEHLUNG IM RAHMEN DER KLIMATHERAPIE]**

L. KLINKER and E. TUROWSKI *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 23-24 13 Aug. 1985 refs *In* GERMAN

Avail: Issuing Activity

The effects of meteorological cold stimuli under constant social environment before, during, and after a cold air resting cure with whole body stress are analyzed. Resistance and vegetative transposition are reflected by an increase in the resting time for a cooling value of 188 kJ/sq m and by an increased excretion of creatinine and of a substitute product of adrenalin and noradrenalin. Increased blood pressure in cold pressure test, blood pressure fall to 5 to 15 mm, pulse frequency drop to 1.5 per min. and a drop in flicker fusion frequency and in the pupillary aperture are recorded during the acclimatization period. A better use of oxygen is observed during cooling therapy. Dosage recommendations for the different groups of patients according to their sensitivity to cold conditions are given. Author (ESA)

**N86-21021** National Inst. for Rheumatics and Physiotherapy, Budapest (Hungary).

**THE INFLUENCE OF HELIOMETEOROLOGIC FACTORS ON CIRCULATION AND SOME VEGETATIVE FUNCTIONS**

I. OERMENYI *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 25-26 13 Aug. 1985

Avail: Issuing Activity

Solar effects on circulation and vegetative functions were studied based on daily measurements of the systolic and diastolic blood pressure (SBP and DBP), and the arterial pulse number (APN) of 112 patients and 11 control individuals leading to a vegetative Index (VI). If VI is positive, sympathetic reactions increase; if VI is negative, parasympathetic reactions increase. Weather data and chromospheric flares are taken into account. The SBP and DBP increase during cold front passage, upper or lower, and during anticyclonic weather formation. The APN increases in presence of higher troposphere subtropical air. Tropospheric coding and continental cold air cause increased parasympathetic reactions. The latter increase in accordance with the direction of weather and geoactive solar activity. Sympathetic-like reactions appear with increased solar radio noise level around 200 MHz and 19 Ghz. The results of the study are used in forecasting physiological effects for public health. Author (ESA)

Author (ESA)

**N86-21022** Institute of Meteorology and Water Management, Podlesna (Poland). Dept. of Climatology.

**METEOROTROPIC DETERMINANTS OF ROAD COLLISIONS AND ACCIDENTS**

M. BARANOWSKA and B. GABRYL-WOJTACH *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 27-28 13 Aug. 1985 refs

Avail: Issuing Activity

The effects of traffic intensity fluctuations and rainfall and fog on human psychophysical performance are studied based on statistics of daily number of road collisions and accidents (Lkw) over a period of 8 yr. Correlation is found between Lkw and rainfall but not between Lkw and duration of fog. The relationship between Lkw and basic systems and atmospheric fronts as well as the influence of extreme environmental changes are investigated. A significant increase of accidents is noted during strong front passages. A correlation is noted between Lkw statistics and cyclonic processes and extreme environmental changes, whatever the seasonal rhythm. Author (ESA)

Author (ESA)

**N86-21023** Zentralanstalt fuer Meteorologie und Geodynamik, Vienna (Austria). Neurochirurgische Ambulanz am Ambulatorium. Sued.

**OBJECTIVE INVESTIGATIONS AND SUBJECTIVE OBSERVATIONS OF SENSITIVITY TO WEATHER [OBJEKTIVE UNTERSUCHUNGEN UND SUBJEKTIVE BEOBACHTUNGEN UEBER WETTERFUEHLIGKEIT]**

F. J. JENKNER *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 29-30 13 Aug. 1985 *In* GERMAN

Avail: Issuing Activity

The following criteria were investigated in 4,000 patients (women: 68%, men: 32%); sex, sensitivity to weather, light or painful troubles, shorter or longer period, with normal or increased blood, sedimentation rate, vertigo, headaches, lymphocyte count, pherogram, lymphocytosis. Women are more sensitive to weather changes than men with a higher frequency and increased blood sedimentation rate. Sensitive patients with a frequency of 75% for women and 25% for men have more painful troubles, a longer anamnesis period, more migraine and vertigo and a delay of the ovalbumin fraction. In insensitive patients the frequency is 62% for women and 38% for men. Further investigations are recommended to elicit the reasons of the statistically based differences. Author (ESA)

Author (ESA)

**N86-21024** Hydrometeorological Inst. of the Socialist Republic of Croatia, Zagreb (Yugoslavia).

**COLLOIDAL AND METEOROLOGICAL IN VITRO REACTIONS**

N. PLESKO *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 31-32 13 Aug. 1985 refs

Avail: Issuing Activity

A reaction measuring system was developed to determine the effects of differential mean mole weight colloids, and to investigate the state variations of colloidal systems in correlation with solar-terrestrial phenomena. The relationships between solar terrestrial phenomena and the measurement variations, and between the measurement variations and weather sensitivity in healthy and ill people are investigated. The measured data corrected by the two relationships can then be applied for prevention in medicine, transport, and industry. The closed measuring system is insensitive to vibrations, gravity, and temperature stable when stored, and automatically performs the measurement of large molecular polyvinylpyrrolidone (PVP) in solutions with few electrolytes. The pseudopolarization effects depend on the adsorption layer thickness due to the degree of association of dissolved PUP molecules and to solar terrestrial factors. Author (ESA)

Author (ESA)

**N86-21025** Universitaetsspital, Zurich (Switzerland). Biologisches Zentrallaboratorium.

**WEATHER SENSITIVITY AS DISCOMFORT [DIE WETTERFUEHLIGKEIT ALS DISKOMFORT]**

W. H. WEIHE *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 35-37 13 Aug. 1985 refs *In* GERMAN

Avail: Issuing Activity

Weather sensitivity due to a thermal imbalance between environment and organism leads to uneasiness or discomfort. Subjective and cognitive processes trigger the behavioral temperature regulation in order to sustain the autonomous physiological regulation. The behavioral temperature regulation can influence healing or aggravate the discomfort condition. Ill behavioral attitudes (unadapted dressing, inactivity, unbalanced eating and drinking, environment changes, etc.) are modified with training, decisiveness, will power, self-confidence and education. Weather sensitivity appears when individuals cannot perceive the relationship between thermal load error and temperature preferred conditions. Pharmacotherapy is recommended for special cases only. Further investigation of weather sensitivity is recommended to check the identity between sensitivity and thermal discomfort under natural weather changes. Individuals should be taught temperature balance. Author (ESA)

Author (ESA)

## 52 AEROSPACE MEDICINE

**N86-21026** Deutscher Wetterdienst, Freiburg (West Germany).  
Zentrale Medizin-Meteorologische Forschungsstelle.

**WEATHER AS A PHYSICAL PROCESS AND  
PARAMETERIZATION OF THE EFFECTS AS A  
METEOROLOGICAL CONTRIBUTION FOR INVESTIGATING  
THE CORRELATION BETWEEN WEATHER AND MAN [DAS  
WETTER ALS PHYSIKALISCHE PROZESS UND SEINE  
WIRKUNGSRELEVANTE PARAMETRISIERUNG ALS  
METEOROLOGISCHER BEITRAG ZUR UNTERSUCHUNG DER  
BEZIEHUNG WETTER - MENSCH]**

K. BUCHER *In* Deutscher Wetterdienst Annals of Meteorology,  
No. 22. International Symposium on Human Biometeorology p  
38-41 13 Aug. 1985 refs *In* GERMAN

Avail: Issuing Activity

Use of meteorological parameters as causal parameters for  
medical research on thermoregulatory troubles due to atmospheric  
processes is discussed. They can be used for characterization of  
specific atmospheric processes. An objective classification of  
meteorological parameters is based on biotropy influenced by  
weather change intensity and pressure areas and on the  
characterization of the transition areas between systems with  
differential air pressure. Air temperature and humidity changes are  
investigated for quantification of the description of meteorological  
processes. The change of the atmospheric dynamic relations  
determined by statistical investigations based on factor analysis  
influences the meteorological parameters measured near the  
ground. Author (ESA)

**N86-21027** Zentralanstalt fuer Meteorologie und Geodynamik,  
Vienna (Austria). Ambulatorium Sued.

**WEATHER AND MIGRAINE [WETTER UND MIGRAENE]**

F. L. JENKNER and A. MACHALEK *In* Deutscher Wetterdienst  
Annals of Meteorology, No. 22. International Symposium on Human  
Biometeorology p 43-44 13 Aug. 1985 refs *In* GERMAN

Avail: Issuing Activity

The relationship between headache intensity and weather  
situations is investigated statistically based on forms filled in by  
80 ambulant patients suffering from migraine from April to  
September 1982. The correlations are determined using univariate  
methods (correlation and regression analysis) and parameter-free  
methods (Chi-squared test and U-test) with respect to high pressure  
and low pressure weather situations, even pressure distribution,  
variable weather, and southern circulation form. Almost 60% of  
the patients are sensitive to weather. Less cases of high intensity  
headaches occur under low pressure weather conditions than under  
anticyclonal and zonal circulation weather situations. More serious  
headaches occur under atmospheric subsidence. No reliable  
statistical results can be obtained due to the medical data  
inhomogeneity. Improved terminology of biowater situations  
should give more accurate data on the relationship between  
headache intensity and frequency and weather. Author (ESA)

**N86-21028** Hydrometeorological Inst. of the Socialist Republic  
of Croatia, Zagreb (Yugoslavia).

**TEMPERATURE WIND SPEED HUMIDITY (TWH): A  
BIOMETEOROLOGICAL INDEX TESTING**

K. ZANINOVIC *In* Deutscher Wetterdienst Annals of Meteorology,  
No. 22. International Symposium on Human Biometeorology p  
45-46 13 Aug. 1985 refs

Avail: Issuing Activity

The temperature, wind velocity, humidity index (TWH) based  
on measured values of temperature, wind speed and air humidity,  
on Hill's equations for cooling power, and on Brazol's sensation  
scale is tested for extreme temperature conditions to assess  
thermal sensation and its applicability in bioclimate evaluation. The  
TWH was compared with air enthalpy average values of a 10-day  
period during 10 yr. The TWH index including wind cooling effects  
gives better results than air enthalpy. It reinforces the sensation  
of cold in winter and smooths the sensation of warmth in summer  
mornings and evenings. Author (ESA)

**N86-21029** Jugenddorf Christophorusschule, Berchtesgaden  
(West Germany). Asthmatherapiezentrum.

**WEATHER AND ASTHMA SYMPTOMS [WETTER UND  
ASTHMASYMPTOMATIK]**

J. LECHER and M. VOELKER *In* Deutscher Wetterdienst  
Annals of Meteorology, No. 22. International Symposium on Human  
Biometeorology p 47-48 13 Aug. 1985 refs *In* GERMAN

Avail: Issuing Activity

The influence of weather-dependent environmental factors  
outside the laboratory on asthma was investigated based on the  
observation of 46 heavily asthmatic children and teenagers  
undergoing a long therapy at 1200 m. Peak-flow forms are filled  
in indicating their lung function every morning and evening. The  
values are compared with those of the weather station with respect  
to temperature, air humidity, sunshine, rainfall amount in mm, and  
atmospheric pressure. Correlation is noted between peak flow  
measured lung function values and monthly average temperatures  
and average insolation time. A relationship between temperature  
collapses and lung function worsening is noted. During the first  
months of summer the influence of the weather-dependent factors  
is added to the allergy stress. A 2 yr observation time is  
recommended to obtain more accurate results. Author (ESA)

**N86-21030** Central Meteorological Service, Peking (China).

**STUDY OF A METEOROLOGICAL PREDICTION OF ACUTE  
MYOCARDIAL INFARCTION INCIDENCE**

Y. WANG and X. ZHANG (Lianyungang Ocean Station, China)  
*In* Deutscher Wetterdienst Annals of Meteorology, No. 22.  
International Symposium on Human Biometeorology p 49-50 13  
Aug. 1985 refs

Avail: Issuing Activity

The relationship between acute myocardial infarction incidence  
and weather in Beijing area is investigated. Excitation weather  
event and mitigating weather situation effects are analyzed to draw  
prediction model charts for infarction incidence. The whole-year  
synoptic situation is split into 65.5% for mitigating weather situation  
and 34.5% for excitation weather events. The disease occurrence  
is associated with cold front passage, low temperature, and high  
wind situations. Severe cold air before the front edge of cold high  
situation without any cold front passage is sufficient to affect a  
patient. Association of excitation weather event and precipitation  
eliminates the harmful effect. Further study of the disease  
inducement effects of excitation weather events is recommended.  
Author (ESA)

**N86-21031** Forschungsinstitut fuer Balneologie, Marianske Lazne  
(Czechoslovakia).

**METEOROTROPIC CHANGES OF CARDIAC PATIENTS' BLOOD  
PRESSURE AND PULSE FREQUENCY DURING A COMPLEX  
BATH CURE [METEOROTROPE VERAENDERUNGEN DES  
BLUTZUCKERS UND DER PULSFREQUENZ DER  
HERZKREISLAUF IM VERLAUF DER KOMPLEXEN  
BAEDERKUR]**

V. KVETON, J. MATOUSEK, and Z. SEBESTA *In* Deutscher  
Wetterdienst Annals of Meteorology, No. 22. International  
Symposium on Human Biometeorology p 51-52 13 Aug. 1985  
*In* GERMAN

Avail: Issuing Activity

Air temperature, air humidity, and barometric pressure effects  
on cardiac patients' blood pressure (systolic and diastolic) and  
pulse frequency were investigated during a complex bath cure  
using multidimensional linear regression analysis. The cure includes  
climatotherapy, diet, balneological and physical therapy,  
kinesotherapy, group training, and cycling. The barometric pressure  
influences the systolic and diastolic blood pressure. Daily  
temperature magnitude and passage from anticyclonal to zonal  
weather influence the pulse frequency. The synoptic coupling of  
biotropic efficient meteorological factors is assessed to deduce  
synoptic weather situations influencing the patients' blood pressure  
and pulse frequency. Author (ESA)



**N86-21032** Forschungsinstitut fuer Balneologie, Marianske Lazne (Czechoslovakia).

**WEATHER AND SUBJECTIVE HEALTH COMPLICATIONS IN CARDIAC PATIENTS [DAS WETTER UND DIE SUBJEKTIVEN GESUNDHEITSSCHWIERIGKEITEN DER HERZKRANKEN]**

V. KVETON /In Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 53-54 13 Aug. 1985 In GERMAN

Avail: Issuing Activity

The relationship between daily occurrence of complications in cardiac patients and the atmospheric environment (air pressure, air humidity, wind velocity, temperature) is analyzed based on data of 2 yr observation of patients suffering from myocardial infarction. Stress of the thermoregulatory system as well as ground meteorological elements increase the biological reaction. The deviation of the relative daily occurrence is determined for chest troubles and respiratory distress at rest and during walking, for heart beat, and exhaustion and fear situations with respect to sunshine, jog, rain, and bad weather conditions. Author (ESA)

**N86-21033** Deutscher Wetterdienst, Offenbach am Main (West Germany).

**INVESTIGATIONS OF THE POSSIBLE INFLUENCE OF AIR ELECTRICAL PHENOMENA ON DULLING AND GHOST ACHING IN AMPUTATED PATIENTS [UNTERSUCHUNGEN UEBER EINEN MOEGLICHEN EINFLUSS VON LUFTLEKTRISCHEN ERSCHEINUNGEN AUF STUMPF- UND PHANTOMSCHMERZEN BEI AMPUTIERTEN]**

J. PELZ (Freie Univ., Berlin, West Germany) and H. J. SWANTES /In its Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 55-56 13 Aug. 1985 refs In GERMAN

Avail: Issuing Activity

The effects of air electricity on dulling and ghost aching in amputated patients are investigated based on written patients' complaints, weather observations in weather stations, and on automatic measurement of the atmospheric impulse radiation. Ghost aching geographical distribution is shown statistically. Ghost aching occurrence increases parallel to increased impulse radiation. Dulling troubles have a similar distribution as the occurrence distribution. The occurrence geographical distribution of aching complaints per month and per patient from 1976 to 1979 is investigated, leading to a mapping of the complaint locations. The correlation between bad weather occurrence and aching occurrence cannot be made. The same mapping can be made for dulling troubles. Author (ESA)

**N86-21034** Zentralanstalt fuer Meteorologie und Geodynamik, Vienna (Austria).

**THE AUSTRIAN BIOMETEOROLOGICAL SERVICE [DER OESTERREICHISCHE BIOWETTERDIENST]**

A. MACHALEK and P. SABO /In Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 57-58 13 Aug. 1985 refs In GERMAN

Avail: Issuing Activity

The bioweather research project to analyze the effects of weather on healthy and sick persons is described. The investigation is based on high pressure weather; even pressure distribution; low pressure situation; western and north-western weather situation; southern and South-Western weather situation as well as on cold air incursions in ground and medium layers of the atmosphere and on atmospheric depression. Application of Bioweather requires the partition of Austria in bioweather areas according to bioclimatic conditions. Author (ESA)

**N86-21036** Jugenddorf Christophorusschule, Berchtesgaden (West Germany). Asthmatherapiezentrum.

**HEIGHT-DEPENDENT REDUCTION OF AIRBORNE POLLEN AND EFFECTS ON CHILDREN AND TEENAGERS AFFECTED BY BRONCHIAL ASTHMA [HOEHENABHAENGIGE REDUZIERUNG DES POLLENFLUGS UND DIE AUSWIRKUNG AUF KINDER UND JUGENDLICHE MIT ASTHMA BRONCHIALE]**

J. LECHLER, M. VOELKER, and R. WINKLER /In Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 63-64 13 Aug. 1985 refs In GERMAN

Avail: Issuing Activity

Forty asthmatic children and adolescents with seasonal sensitization and rhinoconjunctivitis were monitored and their symptomatology compared during the pollinosis season. The comparison shows a significant reduction of the bronchial symptomatology as well as of the allergic rhinoconjunctivitis due to a reduced allergen influx resulting from reduced airborne pollen in high mountains. Disappearance of the perennial allergens, better monitoring, and therapy optimization account for bronchial improvement. The seasonal allergen effects are reduced by height-dependent reduced airborne pollen. Author (ESA)

**N86-21038** Duesseldorf Univ. (West Germany). Medizinisches Inst. fuer Umwelthygiene.

**EFFECTS OF AIR POLLUTION ON MAN [WIRKUNG VON LUFTVERUNREINIGUNGEN AUF DEN MENSCHEN]**

H. W. SCHLIPKOETER and K. BEYEN /In Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 67-69 13 Aug. 1985 refs In GERMAN

Avail: Issuing Activity

Air pollution and airway diseases; effects of carbon monoxide on healthy and cardiac people; effects of smog on old people affected by serious airway and blood circulation diseases and effects of heavy dust; heavy metal effects of babies, and young children (neurophysiological troubles); effects of cadmium on old people's renal function; and air pollution and lung cancer due to polycyclic aromatic carbon monoxides are discussed.

Author (ESA)

**N86-21039** Giessen Univ. (West Germany). Hygiene-Inst.

**GROUP DIAGNOSIS AS RISK ASSESSMENT IN ENVIRONMENTAL HYGIENE [GRUPPENDIAGNOSTIK ALS RISIKOABSCHAETZUNG IN DER UMWELTHYGIENE]**

P. SCHMIDT and E. G. BECK /In Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 70-71 13 Aug. 1985 refs In GERMAN

Avail: Issuing Activity

Group diagnosis based on clinical epidemiology, laboratory investigation, and anthropological and statistical methods is performed for risk assessment and to determine the correlation between health, development maturity, living habits and environment pollution. An epidemiological investigation on a group of clinically healthy 10 yr old children over 5 yr shows that children in an urban air-polluted area have more enlarged lymphatic nodes, fewer red blood cells and hemoglobin, fewer antibodies, and are more sensitive to stress than children in relatively pure air areas.

Author (ESA)



**N86-21040** Freie Univ., Berlin (West Germany). Rittberg-Kinderklinik.

**IMMISSION AND WEATHER EFFECTS ON CHILDREN'S AIRWAY ILLNESSES IN BERLIN (1979-1982): METHODOLOGY AND RESULT SUMMARY [IMMISSIONS- UND WETTEREINFLUSSE AUF ATEMWEGSERKRANKUNGEN VON KINDERN IN BERLIN (1979-1982). METHODIK UND ERGEBNISUEBERBLICK]**

U. FEGELER, R. MOYZES, E. WEDLER, and K. EBERHARD /n Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 72-74 13 Aug. 1985 refs In GERMAN  
 Avail: Issuing Activity

The possible acute effects of inhalative air pollution and of meteorological environmental factors on the morbidity rate of children's upper and lower airway illnesses listed in four diagnosis groups (pseudo Croup, bronchitis-pneumonia, asthma, and influenza) are reviewed with respect to immission parameters. Independent variables (SO<sub>2</sub> concentration, equivalent temperature, interdiurnal air pressure, and relative indoor humidity) are linearly correlated with morbidity rate in monthly, weekly, and daily mean values. Air pollution immission and meteorological parameters influence the course of the infection rate of upper and lower airway illnesses. They have hazardous effects on the respiratory tissue separately or combined. Assumptions on the influence on infection rates of air chemical and thermal complex are given for Croup syndrome and asthma. Author (ESA)

**N86-21041** Zentralanstalt fuer Meteorologie und Geodynamik, Vienna (Austria).

**ENVIRONMENTAL FACTORS AND INFANT MORTALITY [UMWELTFAKTOREN UND SAEUGLINGSSTERBLICHKEIT]**

A. MACHALEK, H. KAPAUN, and E. JUNKER /n Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 75-76 13 Aug. 1985 refs In GERMAN  
 Avail: Issuing Activity

The Sudden Infant Death Syndrome (SIDS) was studied with respect to air chemistry. Hexachlorobenzol, nitrates in water, and acid rain cause SIDS. The effects of air substances are reviewed. The relationship between airway illnesses and air substances is statistically established for Croup syndrome. No seasonal influence is noted for SIDS. Two correlations are shown (but not statistically): appearance of SIDS culminations during the hot period after biospheric high pollution load and on days with temperature extremes in summer or in winter. Author (ESA)

**N86-21042** Gesamthochschule, Kassel (West Germany).

**AIRWAY INFECTIONS RELATED TO CITY CLIMATE AND LOCAL IMMISSION LOAD [ATEMWEGERKRANKUNGEN IN ABHAENIGKEIT VON STADTKLIMA UND LOKALER IMMISSIONSBELASTUNG]**

L. KATZSCHNER /n Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 77-79 13 Aug. 1985 refs In GERMAN  
 Avail: Issuing Activity

The effects of immission load on infants up to 6 yr old are investigated in relation to climate, airway infections, and SO<sub>2</sub> concentration. Air temperature significantly influences the onset of illnesses. Immission data are not sufficient to explain stress situations. Air polluting substances influence the immune system leading to body weakening and to an increased sensitization to viral agents. Author (ESA)

**N86-21043** Technische Univ., Munich (West Germany). Inst. fuer Medizinische Balneologie und Klimatologie.

**WHAT IN HUMAN BIOMETEOROLOGY CAN CONTRIBUTE TO ASSESSMENT OF THE EFFECTS OF HAZARDOUS SUBSTANCES ON HEALTH? [WAS KANN DIE HUMAN-BIOMETEOROLOGIE ZUR BEWERTUNG GESUNDHEITLICHER WIRKUNGEN VON SCHADSTOFFEN BEITRAGEN]**

K. DIRNAGL /n Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 80-81 13 Aug. 1985 refs In GERMAN  
 Avail: Issuing Activity

Anthropogenic atmospheric influence factors; relativism in the assessment of the quantification of the hazardous effects on health and limit values; a political assessment of quantitative data; and disproportion between measurement and monitoring programs and investigations of the hazardous effects are discussed. Quantitative assessment should be avoided. The popularity gained by scientific results on weather effects on man's health should be used to avoid an erroneous vision of assessment of environmental effects. Author (ESA)

**N86-21044** Freie Univ., Berlin (West Germany). Inst. fuer Meteorologie.

**IMMISSION AND WEATHER EFFECTS ON CHILDREN'S AIRWAY TROUBLES IN BERLIN (1979-1982). TIME SERIES INVESTIGATIONS: CROUP SYNDROME AND ASTHMATIC AIRWAY TROUBLES [IMMISSIONS- UND WETTEREINFLUSSE AUF ATEMWEGSERKRANKUNGEN VON KINDERN IN BERLIN (1979-1982) ZEITREIHENUNTERSUCHUNGEN: CROUP-SYNDROM UND ASTHMATISCHE ATEMWEGSERKRANKUNGEN]**

U. FEGELER, R. MOYZES, E. WEDLER, and K. EBERHARD /n Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 82-85 13 Aug. 1985 refs In GERMAN  
 Avail: Issuing Activity

Croup syndrome and asthma airway troubles in children aged 0 to 6 yr divided into 3 age groups were clinically investigated to determine the effects of immission and weather conditions on the infection percentage according to annual, interannual, and weekly variations, and SO<sub>2</sub> concentration periods and days. Croup affection percentage increases from summer to fall, during the cold period due to an increased immission. Linear correlations are made between SO<sub>2</sub> concentration, indoor humidity, and infection percentage. Maximum occurrence of asthma affections is in winter and from May to July due to pollen allergens. A positive correlation is made between asthma and SO<sub>2</sub> concentration, a negative one between asthma and indoor humidity. The injection epidemiological effect (mycoplasma pneumoniae) is excluded for Croup syndrom. It is taken into account for asthma. Author (ESA)

**N86-21045** Freie Univ., Berlin (West Germany). Inst. fuer Meteorologie.

**EMMISSION AND WEATHER EFFECTS ON CHILDREN'S AIRWAY TROUBLES IN BERLIN (1979-1982). COMPARISON OF TWO DIFFERENT IMMISSIONS: LOADED RESIDENTIAL AREAS IN WEST BERLIN POLLUTED AREAS [IMMISSIONS- UND WETTERFLUESSE AUF ATEMWEGSERKRANKUNGEN VON KINDERN IN BERLIN (1979-1982). VERGLEICH ZWEIER UNTERSCHIEDLICH IMMISSIONSBELASTETER WOHNBEREICHE IM BELASTUNGSGEBIET BERLIN (WEST)]**

U. FEGELER, R. MOYZES, E. WEDLER, and K. EBERHARD /n Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 86-87 13 Aug. 1985 refs In GERMAN  
 Avail: Issuing Activity

Two SO<sub>2</sub> emission-loaded residential areas are compared based on affection ratios of children suffering from Croup syndrome and asthma in the two investigation hospitals. More children suffer from asthmatic troubles in a polluted area with SO<sub>2</sub> emission over the average than the one with SO<sub>2</sub> immission below the

average. More children suffer from Croup syndrome in a polluted area with SO<sub>2</sub> emission below the average than in the one with SO<sub>2</sub> immission over the average. Author (ESA)

**N86-21046** Technische Univ., Munich (West Germany). Inst. fuer Medizinische Balneologie.  
**AIR QUALITY DETERMINATION IN HEALTH RESORTS [LUFTQUALITAETSBESTIMMUNG IN KURORTEN]**  
A. SCHUH /in Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 88-89 13 Aug. 1985 refs In GERMAN  
Avail: Issuing Activity

The medium pollution and short-time peak concentration of SO<sub>2</sub>, CO and other gaseous air constituents were measured to assess air quality in health resorts. The spatial distribution and air constituent content were assessed in weekly analyses of Petri dish sulfur and nitrogen oxide content. The filter was exposed to heavy air pollution to test the measuring procedure. Comparison with the previous concentration measurements shows good agreement with the filter measurements. Author (ESA)

**N86-21047** Deutscher Wetterdienst, Freiburg (West Germany). Zentrale Medizinmeteorologische Forschungsstelle.  
**THE BIOLOGICAL EFFICIENCY OF DUST EMISSION: DETERMINATION BASED ON THE WITHERING DEGREE OF EXPOSED LICHENS [DIE BIOLOGISCHE WIRKSAMKEIT VON STAUBIMMISSIONEN: ERMITTELT ANHAND DES ABSTERBEGRADES EXPONIRTER FLECHTEN]**  
R. RABE and E. SCHULTZ /in its Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 90-91 13 Aug. 1985 In GERMAN Prepared in cooperation with Rheinische Westfaelische Technischer Ueberwachungs-Verein e.V., Essen, West Germany  
Avail: Issuing Activity

Air hygiene and air quality in cities and health resorts were determined using the method of lichen exposition to dust emission based on the relationship between lichen withering degree and immission constituent efficiency and their effects on health. Results show good agreement between lichen withering degree and mortality or morbidity. The results are confirmed by epidemiological investigations based on dust foil measurement. A correlation between soot deposition and lichen withering degree is noted. The quantity deposition ratio for particle combustion products allows assessment of air quality in health resorts using the adherence foil method. Author (ESA)

**N86-21049** Deutscher Wetterdienst, Offenbach am Main (West Germany).  
**PROBLEMS OF CITY PLANNING [PROBLEME DER STADTPLANUNG]**  
B. FROMMES /in Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 95-98 13 Aug. 1985 refs In GERMAN  
Avail: Issuing Activity

The limits of meteorology for city planning; purpose of city and building climatology; architects' and planners' expectations regarding meteorology; and relevance of the meteorological information in planners decision making are discussed. Interactions between climate, buildings and city; and inhabitants' protection against bad weather and health troubles are considered. Author (ESA)

**N86-21050** Technische Univ., Munich (West Germany). Lehrstuhl fuer Bioklimatologie und Angewandte Meteorologie.  
**PROBLEMS IN CITY CLIMATE EVALUATION IN HUMAN BIOMETEOROLOGICAL TERMS [PROBLEMATIK BEI DER HUMANBIOMETEOROLOGISCHE BEWERTUNG DES STADTKLIMAS]**  
H. MAYER /in Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 99-100 13 Aug. 1985 refs In GERMAN  
Avail: Issuing Activity

The city climate is split into air hygiene (city air quality) and thermal components (city air energy) for relevant assessment of the city climate in human biometeorological terms for decision making in city planning. The relations between hazardous substances in the city causing health troubles in man should be further investigated with respect to inner city differentiations (city elements, constructions, entire city districts). Relevant meteorological data include the height of man's center of gravity and spatial radiation field. Author (ESA)

**N86-21058** Austrian Automobile Touring Club, Vienna. Medizin-meteorologischer Beratungsdienst.  
**HUMAN BIOCLIMATIC CLASSIFICATION METHODS ILLUSTRATED WITH EXAMPLES OF SELECTED COUNTRIES [HUMANBIOKLIMATISCHE KLASIFIZIERUNGSMETHODEN AM BEISPIEL AUSGEWAELTER LAENDER]**  
O. HARLFINGER /in Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 119-121 13 Aug. 1985 refs In GERMAN  
Avail: Issuing Activity

The analysis of meteorological parameters for tourism, recreation, and outdoor activities with respect to climatic comfort and discomfort is illustrated. Consideration of the thermal hygrometric area using model calculations or bioclimatologically complex factors to determine the boundary between comfort and discomfort; methods for determination of tourist season based on climatic parameters; and a combination of the first two methods with differential weighting of climatic and bioclimatic factors are used in bioclimatic holiday counseling. Author (ESA)

**N86-21059** Zentralanstalt fuer Meteorologie und Geodynamik, Vienna (Austria).  
**COMPARISON BETWEEN METEOROLOGICAL COMPLEX VALUES AND A MODEL OF MAN'S ENERGY BUDGET [VERGLEICH ZWISCHEN METEOROLOGISCHEN KOMPLEXGROESSEN UND EINEM ENERGIEBILANZMODELL DES MENSCHEN]**  
N. HAMMER, E. KOCH, and E. RUDEL /in Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 122-123 13 Aug. 1985 refs In GERMAN  
Avail: Issuing Activity

Heat and cooling parameters are compared to comfort criteria resulting from a model of man's energy budget with respect to sitting, slow and rapid walking, and dressing according to seasons. Assessment using equivalent temperature limits shows good agreement with energy budget methods during a 300 W activity and the cooling factor during a light sport activity. The results show a need for further investigation using the energy budget model to give physicians information on therapeutic applications of climate. Author (ESA)

**N86-21064** Deutscher Wetterdienst, Offenbach am Main (West Germany).

**LOCAL CLIMATIC PARTICULARITIES AND THEIR IMPORTANCE FOR RECREATION AREA (EXAMPLE, SAARLAND-LOWER BLIESTAL) [LOKALKLIMATISCHE BESONDERHEITEN IN IHRER BEDEUTUNG FUER ERHOLUNGSGEBIETE (AM BEISPIEL SAARLAND-ERHOLUNGSRAUM UNTERES BLIESTAL)]**

H. J. SWANTES *In its* Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 132-133 13 Aug. 1985 refs In GERMAN

Avail: Issuing Activity

A medico-meteorological-bioclimate assessment of Saarland (West Germany) was made for construction of a recreation network. It is based on investigations of local wind circulation and cloud cover and air pollution in valleys. Air temperature and air humidity are measured. Inquiry forms are distributed to farmers, walkers, and highway engineers to obtain further information on local climatic particularities. Results of the measurement and written inquiry campaign are mapped to give information on the investigated area planning and utilization for adequate recreation forms according to bioclimatic criteria. Author (ESA)

**N86-21065** Deutscher Wetterdienst, Freiburg (West Germany). Zentrale Medizin-Meteorologische Forschungsstelle.

**SPATIAL DISTRIBUTION OF HEAT AND COLD STRESS IN THE FEDERAL REPUBLIC OF GERMANY [DIE RAEUMLICHE VERTEILUNG VON WAERMEBELASTUNG UND KAELETRESS IN DER BUNDESREPUBLIK DEUTSCHLAND]**

G. JENDRITZKY *In its* Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 134-136 13 Aug. 1985 refs In GERMAN

Avail: Issuing Activity

A stochastic climate model based on data of cooling effects on the thermoregulatory system was developed to design monthly differential climate maps for description of the thermal environment in city and environmental planning. The model is standardized with respect to individual thermoregulation differences, to Sun-shadow difference and to heat loss conditions. The small-scale effects on orography or vegetation as well as UV radiation, oxygen partial pressure, and air hygiene are not taken into account. The maps constitute a standardized basis for space comparison with respect to efficiency, thermal comfort, and human health. Author (ESA)

Author (ESA)

**N86-21067** Institute of Balneology and Climatology, Poznan (Poland).

**APPLICATION OF METEOROLOGICAL AND SOLAR DATA IN HEALTH RESORT CLIMATHERAPY**

S. TYCZKA and I. PONIKOWSKA *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 140-141 13 Aug. 1985

Avail: Issuing Activity

A quantitative analysis of the thermal and photochemical effects of solar radiation on 150 healthy patients aged 18 to 60 is made to determine the effectiveness of heliotherapy using long-term actinometric data and the intensity of ultraviolet solar radiation corresponding to the Sun exposure time necessary to obtain a skin photoerythema. Global solar radiation is analyzed in relation to the mean photoerythema dose, to the Sun's altitude and to cloudiness. The skin photoerythema dose is the product of solar radiation intensity and Sun exposure time. The results are valid for insolation conditions similar to those on the Baltic coast with solar altitude of 50 to 60 deg. Author (ESA)

**N86-21103** New South Wales Univ., Kensington (Australia). Centre for Biomedical Engineering.

**ANALYSIS TECHNIQUES FOR CONTINUOUS TWENTY FOUR HOUR AMBULATORY BLOOD PRESSURE PATTERNS Abstract Only**

D. J. ROFFE 1985 3 p

Avail: Issuing Activity

The Oxford ambulatory blood pressure recording system records each arterial blood pressure complex during a 24 hour period onto a miniature cassette tape. A hierarchy of analysis techniques was developed on a DEC LSI-11/03 minicomputer. Subsequent statistical analysis and graphical representation describe the patient's arterial blood pressure variation throughout the recording period. Inspection of 24 hour continuous ambulatory blood pressure record shows many marked, apparently spontaneous blood pressure fluctuations. Detection of these blood pressure transients as they occur may help sort out their causal mechanisms. A microprocessor device was constructed to monitor direct blood pressure in real time and compile a history of the blood pressure and heart rate. E.A.K.

**N86-21104** Central Electricity Generating Board, London (England).

**THE EFFECT OF EQUALLY EFFECTIVE NEUTRON AND X-RAY RADIATION DOSES ON THE EPITHELIAL CELLS OF THE HAIR BULB**

S. M. VALTER, E. L. GINSBURG, A. V. BOGATYREV, G. I. KALONYKOVA, and A. G. SVERDLOV 6 Nov. 1985 13 p refs Transl. into ENGLISH from Radiobiologia (USSR), v. 22, issue 5, 1982 p 637-642

(BLL-CE-TRANS-8221-(9022.090)) Avail: British Library Lending Div., Boston Spa, Engl.

Two stages in the response of rat hair follicle cells to X-ray and neutron irradiation with equally effective doses were examined. Enlargement of endoplasmic reticulum canals, swelling of some of the mitochondria, and appearance of autophagous vacuoles in cells were detected during the first day following irradiation. After 5 to 7 days, the changes which occurred were characteristic of the process of hair follicle transfer from the active to resting stage. No qualitative distinctions are detected in the radiation response of the cells studied. E.A.K.

E.A.K.

**N86-21105\*#** Baylor Coll. of Medicine, Houston, Tex. Dept. of Medicine.

**IN VIVO NUCLEAR MAGNETIC RESONANCE IMAGING Final Report, Oct. 1984**

A. LEBLANC, H. EVANS, R. N. BRYAN, P. JOHNSON, E. SCHONFELD, and S. G. JHINGRAN Oct. 1984 25 p refs (Contract NAS9-16442)

(NASA-CR-171928; NAS 1.26:171928) Avail: NTIS HC A02/MF A01 CSCL 06P

A number of physiological changes have been demonstrated in bone, muscle and blood after exposure of humans and animals to microgravity. Determining mechanisms and the development of effective countermeasures for long duration space missions is an important NASA goal. The advent of tomographic nuclear magnetic resonance imaging (NMR or MRI) gives NASA a way to greatly extend early studies of this phenomena in ways not previously possible; NMR is also noninvasive and safe. NMR provides both superb anatomical images for volume assessments of individual organs and quantification of chemical/physical changes induced in the examined tissues. The feasibility of NMR as a tool for human physiological research as it is affected by microgravity is demonstrated. The animal studies employed the rear limb suspended rat as a model of muscle atrophy that results from microgravity. And bedrest of normal male subjects was used to simulate the effects of microgravity on bone and muscle. Author

**N86-21106\*#** Nevada Univ., Reno. Fast Motion Perception Lab.

**CONTRIBUTIONS TO WORKLOAD OF ROTATIONAL OPTICAL TRANSFORMATIONS Final Technical Report**

R. P. ATKINSON and T. L. HARRINGTON 1985 123 p refs  
(Contract NCC2-272)  
(NASA-CR-176542; NAS 1.26:176542) Avail: NTIS HC A06/MF A01 CSCL 06S

An investigation of visuomotor adaptation to optical rotation and optical inversion was conducted. Experiment 1 examined the visuomotor adaptability of subjects to an optically rotating visual world with a univariate repeated measures design. Experiment 1A tested one major prediction of a model of adaptation put forth by Welch who predicted that the aversive drive state that triggers adaptation would be habituated to fairly rapidly. Experiment 2 was conducted to investigate the role of motor activity in adaptation to optical rotation. Specifically, this experiment contrasted the reafference hypothesis and the proprioceptive change hypothesis. Experiment 3 examined the role of cognition, error-corrective feedback, and proprioceptive and/or reafferent feedback in visuomotor adaptation to optical inversion. Implications for research and implications for practice were suggested for all experiments.

Author

**N86-21107\*#** San Francisco State Univ., Calif.  
**STIMULUS SPECIFICITY AND INDIVIDUAL STEREOTYPY OF AUTONOMIC RESPONSES TO MOTION STRESSORS M.S. Thesis**

M. G. MORGAN Aug. 1985 54 p refs  
(Contract NCC2-115)  
(NASA-CR-176543; NAS 1.26:176543) Avail: NTIS HC A04/MF A01 CSCL 06S

Motion sickness research shows a lack of agreement regarding the contribution of the autonomic nervous system (ANS). The resolution of this question is exigent for Space Adaptation Syndrome, zero gravity sickness. A case is drawn for the necessity to apply a methodological approach that incorporates: (1) standardization of parameters in relation to the individual differences in variability and prestimulus levels; (2) a concern for patterning of responses; and (3) the physiological association with subjective reports. Vasomotor, heart rate, respiration rate, skin conductance and subjective reports of malaise were collected from 22 subjects while participating in three motion stressors; vertical acceleration, Coriolis stimulation, and combined optokinetic and Coriolis stimulation. The results demonstrate that ANS response patterns can be separated into three mutually exclusive components: (1) a generalized response to motion sickness; (2) a stimulus specific response to the type of stressor being presented; and (3) individualized stereotypical response patterns that are associated with subjective reports of malaise.

Author

**N86-21108\*#** California Univ., San Francisco. NCC2-115  
**EXPLORATORY STUDIES OF PHYSIOLOGICAL COMPONENTS OF MOTION SICKNESS: CARDIOPULMONARY DIFFERENCES BETWEEN HIGH AND LOW SUSCEPTIBLES Progress Report**  
K. NAIFEH 1985 18 p refs  
(NASA-CR-176541; NAS 1.26:176541) Avail: NTIS HC A02/MF A01 CSCL 06S

A comprehensive examination of cardiovascular autonomic response to motion sickness was studied and whether differences in cardiopulmonary function exist in high and low susceptibility groups were determined. Measurement techniques were developed as was test equipment for its ability to provide accurately new measures of interest and to test the adequacy of these new measures in differentiating between susceptibility groups. It was concluded that these groups can be differentiated using simple, brief stressors and measurements of cardiodynamic function.

Author

**N86-21109\*#** California Univ., San Francisco.  
**SHUTTLE FLIGHT EXPERIMENT 30-DAY SUMMARY REPORT**  
1985 25 p  
(Contract NCC2-115)  
(NASA-CR-176539; NAS 1.26:176539) Avail: NTIS HC A02/MF A01 CSCL 06S

A total of 12 AFT training sessions were administered to SL 3 Payload Specialists over a 7 month period. Nine of these sessions were 2 hours in duration and three were 3 hours in duration. A total of three rotating chair tests were conducted in this time frame with four subjects. The performance of these crewmen across tests is shown. Test 1, a baseline motion sickness test, was conducted approximately 10 months prior to the mission, before any AFT was administered. Test 2 was administered after 2 hours of AFT, test 3 after 4 hours and test 4 after 6 hours (total) of training in symptom control. Improvement in performance is reflected by a subject's ability to tolerate a greater number of rotations across tests. Additional training for crewman was not possible within the constraints of the mission. Results of the mission indicate that, as predicted preflight, subject #32 was relatively symptom free inflight while subject #33 was not. Other preflight and postflight tests and analyses are reported.

Author

**N86-21110#** Office of Naval Research, London (England).  
**THE 10TH MEETING OF THE INTERNATIONAL SOCIETY FOR NEUROCHEMISTRY HELD AT RIVA DEL GARDA, ITALY ON 19-24 MAY 1985**

C. E. ZOMZELY-NEURATH 8 Oct. 1985 12 p Meeting held at Riva del Garda, Italy, 19-24 May 1985  
(AD-A160668; ONRL-C-10-85) Avail: NTIS HC A02/MF A01 CSCL 06A

The Tenth Meeting of the International Society for Neurochemistry was held in Riva del Garda, Italy, from 19 through 24 May 1985. This report discusses presentations on molecular neurobiology, post-translational modification, neurotransmitter receptors, neuropeptide processing, and specific macromolecules in cell-cell interactions in the nervous system.

Author (GRA)

**N86-21111#** Army Research Inst. of Environmental Medicine, Natick, Mass.  
**COMPARISON OF MALE AND FEMALE MAXIMUM LIFTING CAPACITY**

M. A. TEVES, J. A. VOGEL, and J. E. WRIGHT Sep. 1985 15 p  
(AD-A160687; USARIEM-M40/85) Avail: NTIS HC A02/MF A01 CSCL 06S

A large influx of women into traditionally male fields of employment has drawn much attention to the strength differences between men and women. Two tests of isometric strength (handgrip and upright pull) and two tests of maximum lift capacity (a weight lift machine-IDL 152 and a weighted box lift MLC 132) were administered to 90 male and 107 female soldiers at the end of their Basic Training in order to examine differences in female/male (F/M) strength ratio. Skinfold measurements were made to obtain an estimate of lean body mass (LBM). Females exhibited 63% of the isometric strength and 55-59% of the lifting capacity of males. When the scores were normalized for body weight (BW) females were 75% as strong as males on isometric measures, and were able to lift 66% as much on IDL 152 and 72% as much on MLC 132. Comparison of the two lifting tasks revealed that on the average, males were able to lift 18% more weight and 24% more weight on the free lift than on the machine lift. This would suggest that if a machine lift is used for pre-employment screening purposes, the absolute weight an applicant is required to lift on the machine need not equal the maximum weight to be lifted on the job. As the difference between a machine lift and a free lift task was greater in females, a machine lift test may pose a greater disadvantage to female candidates than would isometric or free weight lift testing.

GRA

**N86-21112#** Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.

**HEAD-SPINE STRUCTURE MODELING: ENHANCEMENTS TO SECONDARY LOADING PATH MODEL AND VALIDATION OF HEAD-CERVICAL SPINE MODEL Final Technical Report, May 1980 - May 1984**

T. BELYTSCHKO, M. RENCIS, and J. WILLIAMS Jul. 1985 132 p

(Contract F33615-80-C-0523)

(AD-A161425; AAMRL-TR-85-019) Avail: NTIS HC A07/MF A01 CSDL 06S

SAM (for Structural Analysis of Man) is a three-dimensional discrete element mathematical model developed for the prediction of the dynamic response of the head-spine-torso structure to severe impact environments. The model mathematically describes the equations of motion for a system of rigid bodies representing, for example, the head, torso segments and the pelvis, interconnected by deformable elements representing, for example, the intervertebral discs, ligaments and other connective tissues. SAM consists of two distinct components; a general purpose, large displacement, dynamic structural analysis program and a data base containing a number of data sets each which contains material, geometric and inertial property, connectivity and loading environment data. This report describes: the development of a model of the diaphragm which, when incorporated into the HSM, will significantly enhance its ability to replicate the effects of the secondary +Gz loading path through the viscera-abdominal wall/diaphragm/rib-cage system; a discussion of spinal injuries associated with pilot ejection and proposed injury criteria for the cervical spine; an axisymmetric finite element analysis of a lumbar vertebral body with comparisons to other models and specific attention to the question of material distribution effects on stresses; and frontal (-Gx) and lateral (+Gy) impact simulations using the recently developed Head-Cervical Spine Model and comparisons of simulation results with experimental data. GRA

**N86-21113#** Monsanto Research Corp., Miamisburg, Ohio. Mound.

**LIGHT-WEIGHT RADIOISOTOPE HEATER UNIT SAFETY ANALYSIS REPORT (LWRHU-SAR). VOLUME 1. A. INTRODUCTION AND EXECUTIVE SUMMARY. B. REFERENCE DESIGN DOCUMENT (RDD)**

E. W. JOHNSON Oct. 1985 96 p

(Contract DE-AC04-76DP-00053)

(DE86-001457; MLM-3293-VOL-1) Avail: NTIS HC A05/MF A01

The orbiter and probe portions of the NASA Galileo spacecraft contain components which require auxiliary heat during the mission. To meet these needs, the Department of Energy's (DOE's) Office of Special Nuclear Projects (OSNP) has sponsored the design, fabrication, and testing of a one-watt encapsulated plutonium dioxide-fueled thermal heater named the Light-Weight Radioisotope Heater Unit (LWRHU). This report addresses the radiological risks which might be encountered by people both at the launch area and worldwide should postulate mission failures or malfunctions occur, which would result in the release of the LWRHUs to the environment. Included are data from the design, mission descriptions, postulated accidents with their consequences, test data, and the derived source terms and personnel exposures for the various events. DOE

**N86-21114#** Joint Publications Research Service, Arlington, Va. **USSR REPORT: SPACE BIOLOGY AND AEROSPACE MEDICINE, VOLUME 19, NO. 6, NOVEMBER - DECEMBER 1985**

O. G. GAZENKO, ed. 19 Feb. 1986 154 p refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 95 p (JPRS-USB-86-001) Avail: NTIS HC A08/MF A01

Reports of U.S.S.R. research in space biology and aerospace medicine are presented. Orthostatic tolerance under various conditions in humans and animals was an important topic of interest. Weightless effects on muscular function in animals and humans were also investigated. Studies were also carried out on

the physiological effect of high altitude on the cardiovascular system and the brain.

**N86-21115#** Joint Publications Research Service, Arlington, Va. **SPATIAL ILLUSIONS OF VESTIBULAR GENESIS DURING FLIGHTS IN AIRCRAFT**

E. V. LAPAYEV and O. A. VOROBYEV *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 11-16 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 11-15

Avail: NTIS HC A08/MF A01

Vestibular illusions (incidence, pattern, manifestation, negative effect on pilot's activity) that occur in the atmospheric flight were studied. A special questionnaire was used to interview anonymously 484 flying crewmembers. Spatial illusions were detected in 71.1% of the crewmembers; they developed in 50.6% when turns were performed and they were perceived in 76.2% as a false bank. Over 50% (54.3%) of the crewmembers interviewed reported that spatial illusions adversely affected pilot's performance and 3.6% of them indicated that they adversely influenced the flight program as a whole. Spatial illusions can be generated by various factors which should be taken into account in order to improve countermeasures against spatial illusions in the flying personnel.

Author

**N86-21116#** Joint Publications Research Service, Arlington, Va. **VESTIBULAR FUNCTION IN OLDER INDIVIDUALS SUBMITTED TO ANTIORTHOSTATIC HYPOKINESIA FOR 30 DAYS**

V. K. GAVRILIN and L. N. ZAKHAROVA *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 17-25 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 15-20

Avail: NTIS HC A08/MF A01

Vestibular responses of 15 men (aged 42 to 50) to 30-day head-down tilt (-8 deg) were investigated. The test subjects showed atherosclerotic symptoms and neurocirculatory dystonia of the hypertensive type. They were exposed to the Fitzgerald-Hallpike caloric test, indirect otolithometry (eye counter-rolling reflex according to the method of successively presented images), and motion sickness according to Bryanov. In the pretest period vestibular changes were seen at the level of labyrinths and central formations (change in the nystagmic pattern, dissociation of the components of the caloric reaction, vestibular asymmetry, negative counter-rolling). During head-down tilt cupular reflexes remained essentially unaltered, except for the asymmetry and enhancement of the sensory and autonomic components of the caloric reaction. The otolith function was modified in all the test subjects. After exposure tolerance to motion sickness was not deteriorated.

Author

**N86-21117#** Joint Publications Research Service, Arlington, Va. **CHARACTERISTICS OF ACCELERATIONS IN AEROBATIC FLIGHT AS A SPORT**

V. G. VOLOSHIN, Y. I. BYKOVA, A. V. OPRYSKO, and N. A. LAPSHINA *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 26-28 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 20-22

Avail: NTIS HC A08/MF A01

Thirty well-qualified flying sportsmen, aged 22 to 42, who performed 210 aerobic flights, onboard a sporting airplane Yak-50, were examined, using an automatic monitoring system. The flyers were exposed to +9 Gz and -6 Gz as a maximum the duration of which was 10 s and 5 s, respectively. The onset rate varied from 0.5 to 2.5 G/s (with the mean rate 1 G/s), reaching 4.2 G/s as a maximum. On the average, the training flight lasts 25 min, 45 to 50% of which the pilot experiences acceleration of

various values and different sign. The most common acceleration values are: +6 and +7 Gz or -4 and -5 Gz. Author

**N86-21118#** Joint Publications Research Service, Arlington, Va. **DISTINCTIONS IN REACTIONS TO ACTIVE ORTHOSTATIC AND WATER-LOADING TESTS OF SUBJECTS DIFFERING IN TOLERANCE TO POSITIVE GZ ACCELERATIONS**

I. G. DLUSSKAYA and M. N. KHOMENKO *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 29-35 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 22-27  
Avail: NTIS HC A08/MF A01

Thirty-seven healthy male test subjects, aged 19 to 21, with different +Gz acceleration tolerance were examined. Their blood pressure (BP) and heart rate (HR) during 5-min tilt tests and 2% water loading tests were measured 2 to 3 weeks prior to centrifugation. Quantitative evaluation of orthostatic tolerance using an orthostatic index and BP and HR responses to tilt tests before and after water loading revealed specific features of cardiovascular regulation in the subjects with high and low +G acceleration tolerance. The negative predictive indicators include: decreased BP, HR and cardiac index in the supine position in combination with high orthostatic tolerance, as well as decreased orthostatic tolerance in combination with a lower function of vasoconstrictor mechanisms in the upright position and a lower sensitivity of carotid sinus reflexes to blood volume changes during tilt and water loading tests. Author

**N86-21119#** Joint Publications Research Service, Arlington, Va. **EFFECT OF IMMERSION HYPOKINESIA ON CHARACTERISTICS OF PROGRAMMED VOLUNTARY MOVEMENTS**

A. V. KIRENSKAYA, I. B. KOZLOVSKAYA, and M. G. SIROTA *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 36-43 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 27-32  
Avail: NTIS HC A08/MF A01

The effect of immersion hypokinesia on the precision of program-type voluntary movements was investigated using standard test movements and quantitative analytical methods. The exposure did not cause disorders in the programme mechanisms but reduced significantly the precision range of the motor control system. The loss of precision was at its maximum (by 100% and over) on immersion day 3. The universality and consistency of the above changes indicated their close association with the specific exposure while the fast rate of their development suggested their reflex nature. Author 10;m K;m K

**N86-21120#** Joint Publications Research Service, Arlington, Va. **CEREBRAL CIRCULATION AND OXYGENATION IN HEALTHY MAN DURING GRADED EXERCISE IN ANTIORTHOSTATIC POSITION**

V. Y. KATKOV and N. V. PRAVETSKIY *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 44-47 19 Feb. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 32-34  
Avail: NTIS HC A08/MF A01

Eleven healthy male test subjects performed exercises of 600 kgm/min (98 W) for 20 min in the head-down position (-15 deg). A day before exercises they were catheterized, with catheters implanted into the internal jugular vein and brachial artery. It was shown that exercises in the head-down position an increase in cerebral circulation, a decrease in oxygen utilization and a decrease in jugular pressure. CO<sub>2</sub> tension in arterial blood and blood outflowing from the brain remained comparatively stable, while base deficiency and buffer capacity decreased by a similar value. Author

**N86-21121#** Joint Publications Research Service, Arlington, Va. **FORCED EXPIRATION PARAMETERS IN HEALTHY MAN SUBMITTED TO SIMULATED WEIGHTLESSNESS**

N. M. ASYAMOLOVA, V. G. SHABELNIKOVA, V. M. BARANOV, A. N. KOTOV, and M. Y. VOLKOV *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 48-52 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 34-37  
Avail: NTIS HC A08/MF A01

Lung volumes and forced expiratory volumes during 3-hour water immersion as well as in the upright and supine positions were measured. Water immersion up to the neck decreased the functional residual capacity, peak and maximum velocities of air flows during inspiration and expiration with various lung volumes and increased the forced expiratory time and pulmonary time constant. These changes seem to be produced by a higher inelastic resistance as well as additional hydrostatic pressure upon the chest and abdomen. During the transfer from the upright to the supine position these changes were identical but of smaller magnitude. Author

**N86-21122#** Joint Publications Research Service, Arlington, Va. **EFFECT OF RESTRICTED MOTOR ACTIVITY ON ALANINE LEVEL IN HUMAN PLASMA**

T. F. VLASOVA, Y. B. MIROSHNIKOVA, and A. S. USHAKOV *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 53-57 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 37-40  
Avail: NTIS HC A08/MF A01

The plasma alanine concentration was measured in 28 healthy male test subjects exposed to head-down tilt of various duration (2-hour exposure at -12 deg, 7-day exposure at -6 deg, 49-day exposure at -4 deg, and 120-day exposure at -4 deg). Head-down tilt led to alanine changes that correlated with exposure time. These results suggest that alanine concentrations in blood reflect to a certain extent the rate of hepatic gluconeogenesis and depend significantly on the hypokinetic time. The findings can be clinically used as a measure of hepatic gluconeogenesis in bed-ridden patients that may require preventive or therapeutic treatment. Author

**N86-21123#** Joint Publications Research Service, Arlington, Va. **EFFECT OF WEIGHTLESSNESS AND SOME OF ITS MODELS ON MECHANICAL PROPERTIES OF ANIMAL BONES SUBMITTED TO TORSION**

M. A. DOBELIS, Y. Z. SAULGOZIS, V. Y. NOVIKOV, Y. A. ILIN, and V. S. OGANOV *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 58-65 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 40-45  
Avail: NTIS HC A08/MF A01

Mechanical properties (stress and strain) of bones from rats of different ages exposed to weightlessness, hypodynamia or hypokinesia were examined upon torsion. As compared to the controls, the femur of Cosmos-1129 rats showed high deformability. Also, skeletal bones of young rats proved more sensitive to hypodynamia than those of adult animals. Author

**N86-21124#** Joint Publications Research Service, Arlington, Va. **ROLE OF VITAMIN D3 ACTIVE METABOLITES IN REGULATION OF CALCIUM METABOLISM IN HYPOKINETIC RATS**

I. N. SERGEYEV, B. V. AFONIN, N. V. BLAZHEYEVICH, B. V. MORUKOV, and M. S. BELAKOVSKIY *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 66-71 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 46-50

Avail: NTIS HC A08/MF A01

The rats exposed to prolonged hypokinesia showed hypocalcemia, lower PTH and higher calcitonin concentrations in the serum, decreased calcium absorption in the small intestine, and a trend toward nephro- and arteriocalcinosis. Prophylactic administration of 24,25-hydroxy D sub 3, 1,25-hydroxy D sub 3 and their combinations enhanced calcium absorption and alleviated hypocalcemia. The changes in the hormonal regulation of calcium homeostasis can be viewed as a factor responsible for calcium metabolic disorders associated with hypokinesia. Author

**N86-21125#** Joint Publications Research Service, Arlington, Va. **COMPARISON OF BONE REACTIONS OF RATS SUBMITTED TO CLINOSTATIC AND ANTIORTHOSTATIC HYPOKINESIA**

V. N. SHVETS, A. S. PANKOVA, O. Y. KABITSKAYA, and Z. Y. VNUKOVA *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 72-78 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 50-54

Avail: NTIS HC A08/MF A01

Examination of spongy bones of rats exposed to clino- and antiorthostatic hypokinesia showed that changes in bone mass, bone cells and their precursors were similar in both cases. The bone resorption-bone formation process remained balanced. However, bone responses to clino- and antiorthostatic hypokinesia exhibited certain differences. Clinostatic hypokinesia produced greater osteoporosis in the femoral bone, whereas bone losses in the humerus, sternum and pelvis were identical. Antiorthostatic hypokinesia led to osteoporosis that was identical in every bone examined. In addition, clino- and antiorthostatic hypokinesia caused different reactions of stromal precursor cells, the latter model producing a greater effect on them. It is concluded that immobilization-induced skeletal disorders are associated with a decreased rate of bone histogenesis which proceeds at a lower level rather than with the stress-reaction. Author

**N86-21126#** Joint Publications Research Service, Arlington, Va. **CONDITION OF THYROID GLAND AND C CELLS DURING LONG-TERM ROTATION (MORPHOLOGICAL AND BIOCHEMICAL INVESTIGATION)**

G. I. PLAKHUTA-PLAKUTINA, Y. A. SAVINA, and B. V. AFONIN *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 79-83 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 54-57

Avail: NTIS HC A08/MF A01

The thyroid and parathyroid glands of 65 Wistar rats centrifuged for 30 days at 1.1 and 2.0 G were examined histologically and biochemically. The centrifugation led to a higher activity to C cells, an increased rate of thyro-calcitonin (TCT) synthesis and excretion, i.e., C-cell degranulation, and a significant (twofold) increase of TCT in plasma. The stimulation effect of the TCT-producing system persisted during 7-postrotation days and was very distinct in the animals exposed to 2.0 G. There were no morphological changes in the parathyroid glands or in the PTH concentration in the plasma. Author

**N86-21127#** Joint Publications Research Service, Arlington, Va. **CONDITION OF CARDIOVASCULAR SYSTEM IN PRESENCE OF ACUTE MOUNTAIN SICKNESS**

M. M. MIRRAKHIMOV, R. O. KHAMZAMULIN, and V. A. LARKOV *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 84-90 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 57-62

Avail: NTIS HC A08/MF A01

Fifteen subjects with uneventful adaptation and 28 subjects with acute high mountain sickness were kept at an altitude of 3600 m. Prior to the exposure all the test subjects, aged 18 to 20, were essentially healthy. As compared to the controls, the subjects with acute high mountain sickness showed a greater increment in heart rate, blood pressure in the brachial artery, pulmonary hypertension and vasoconstriction. It was found that the subjects susceptible to acute high mountain sickness exhibited (at sea level) higher values of heart rate and R wave in the ECG II lead and lower systolic pressure in the brachial artery. These findings can serve as predictors of acute high mountain sickness. Author

**N86-21128#** Joint Publications Research Service, Arlington, Va. **RAT BRAIN IMPEDANCE IN STATIONARY MAGNETIC FIELD**

L. D. KLIMOVSKAYA, N. P. SMIRNOVA, and A. S. DYAKONOV *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 91-94 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 62-64

Avail: NTIS HC A08/MF A01

The cortical impedance of the large hemispheres of nembutal-anesthetized rats exposed to a constant magnetic field of 0.1, 0.4 and 1.6 T was investigated. During 20 min. exposure the impedance decreased (at the expense of a decrease in both of its components--capacity and active resistance). The impedance decrease was more pronounced (up to 93%) and statistically significant in a field of 1.6 T. After exposure the impedance decrease persisted for 10 min. Author

**N86-21129#** Joint Publications Research Service, Arlington, Va. **EXPERIMENTAL ARRHYTHMIA AND ITS PREVENTION**

L. L. STAZHADZE, T. A. VENTSLAVSKAYA, and V. V. KORZHOVA *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 95-101 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 64-68

Avail: NTIS HC A08/MF A01

The preventive antiarrhythmic effect of a new derivative of seleno-containing aralkyl amines, i.e., selenophene-24, was compared with the routinely used drugs--novocain amide, isoptin and inderal. With respect to the preventive effect and spectrum of action selenophene-24 was shown to be advantageous on various experimental models of arrhythmias: aconitium, strophanthium, pituitrinum or calcium chloride. Author

**N86-21130#** Joint Publications Research Service, Arlington, Va. **EVALUATION OF CONDITION OF HUMAN SKIN IN A CLOSED ENVIRONMENT BY MEANS OF CHROMATOGRAPHY**

D. M. DUBININ, V. P. NAYDINA, and S. N. ZALOGUYEV *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 102-108 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 69-73

Avail: NTIS HC A08/MF A01

Gas-liquid chromatography was used to study the skin and sebum cutaneum of 6 male test subjects (aged 45 to 55) before and after 30-day enclosure. The greatest changes were seen in the composition of free fatty acids of lipids of the facial skin



(increase of palmito-oleic acid). The lipid composition of the sebum cutaneum of the healthy subjects differed from that of the acne-bearing subjects. It is recommended to use the ratio of palmitic acid to palmito-oleic acid as a measure of changes of fatty acids in the sebum cutaneum of healthy people in an unusual environment. Author

**N86-21131#** Joint Publications Research Service, Arlington, Va. **TOXICOLOGICAL EVALUATION OF GAS EMISSION FROM HEAT-STABLE TETRAFLUOROETHYLENE-BASED POLYMERS WHEN HEATED**

V. F. USHAKOV, G. I. SOLOMIN, G. P. TIKHONOVA, A. I. GORSHUNOVA, I. I. LYUBARSKAYA, L. V. MARCHENKO, E. I. CHUKHNO, N. Y. OSTASHEVA, Y. A. DEMCHENKO, and S. S. PASHIN *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 109-114 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 73-77

Avail: NTIS HC A08/MF A01

The purpose of this study was to investigate the composition and toxicity of fluoroplastic F-40 thermodestruction products at 300 to 500 C and to identify the maximally allowable temperature for their safe use. When heated over 400 C, the products of fluoroplastic F-40 evolution included such compounds as hydrogen fluoride, fluoroorganic compounds, carbon monoxide, formaldehyde. When heated at 500 C, the thermodestruction products caused the highest mortality rate of mice. The pathogenesis and clinical development of fluoroplastic F-40 poisoning are primarily associated with fluoro-compounds. It is concluded that the temperature 300 C is the maximum temperature at which tetrafluoroethylenebased polymers can be used. Author

**N86-21133#** Joint Publications Research Service, Arlington, Va. **DEVICE FOR COMBINED STUDY OF VISUAL TRACKING AND VERBAL ACTIVITY**

B. A. KARPOV and A. I. PUDOV *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 120-123 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 80-82

Avail: NTIS HC A08/MF A01

The diverse forms of industrial and research work often require that man combine intensive visual tracking with verbal activity. A pilot or cosmonaut may be compelled to keep attentive watch over relatively mobile reference points, targets and other objects and, at the same time, hold responsible conversations, receive or give orders, receive important information orally, etc. It is necessary to make synchronous records of the subject's eye movements, his speech as well as speech addressed to him for a quantitative evaluation of tracking distinctions associated with a verbal load. An experimental device designed to solve this problem should meet the following conditions: (1) eye movements must be recorded by a rather sensitive method, so that all elements of functional significance to tracking of eye movements in the macro- and microrange (with the exception of tremor) are distinctly recorded, (2) the test signals delivered for tracking must be few in number and standard, typical, and (3) the tracing obtained as a result of the examination must provide a clear idea about the oculomotor and verbal activity of the subject, as well as the speech of individuals with whom he converses. A device for simultaneous and combined recording of two processes in graphic form--eye movements when tracking visual stimuli and concomitant conversation is described. B.W.

**N86-21135#** Joint Publications Research Service, Arlington, Va. **EFFECT OF ACTIVE ANTIORTHOSTATIC CONDITIONING ON TOLERANCE TO CRANIAL REDISTRIBUTION OF BLOOD**

A. F. ZAVADOVSKIY, M. M. KOROTAYEV, S. V. KOPANEV, I. A. PLYASOVA-BAKUNINA, and Y. N. VAVAKIN *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 126-129 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 83-85

Avail: NTIS HC A08/MF A01

At the present time, antiorthostatic position of the body is used extensively in aerospace medicine as a model for investigation of reactions of the cardiovascular system to gravity-caused redistribution of blood. In particular, one can predict, to some extent, tolerance of the circulatory system to weightlessness, particularly in the acute period of adaptation, by means of the antiorthostatic test at angles of -15 and -30 deg. A distinction is made between active and passive orthostatic tests. In the active form, the subject assumes an antiorthostatic position by himself and voluntary muscular tension is mandatory; in the passive form, the position is usually obtained by means of a turntable. Under these conditions one observes muscular relaxation. The objective here was to investigate the flexibility of regulatory mechanisms of the cardiovascular system and the possibility of enhancing the body's tolerance to gravity-related redistribution of blood by using active antiorthostatic tests. Author

**N86-21136#** Joint Publications Research Service, Arlington, Va. **SOME ASPECTS OF HUMAN AMINO ACID METABOLISM AT HIGH ALTITUDE**

Y. A. SINYAVSKIY, T. F. VLASOVA, M. S. BELAKOVSKIY, Y. A. SENKEVICH, and B. I. KIM *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 130-133 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 85-87

Avail: NTIS HC A08/MF A01

The problem of adaptation to altitude hypoxia has become particularly timely recently in view of the active economic development of mountainous regions and the need to perform difficult forms of physical and intellectual work at high altitudes. In addition, high-altitude climate is used extensively for prevention and treatment of cardiovascular and pulmonary pathology, as well as for holding training meets for representatives of different sports. But stays at high altitudes and concomitant hypoxial lead to functional changes in different systems of the body, eliciting changes in energy, protein and amino acid metabolism, yet the latter has not been sufficiently investigated. This study was undertaken in order to assess amino acid metabolism as related to hypoxic conditions and physical exercise in top-ranking sport mountain climbers, who were candidates for an expedition to Mount Everest, at the time of their adaptation to high-altitude conditions and after an ascent to more than 4000 m above sea level. Author

**N86-21137#** Joint Publications Research Service, Arlington, Va. **ELECTROCARDIOGRAM IN NEHB TYPE LEADS OF MACACA MULATTA MONKEYS**

V. P. MELNICHENKO, M. D. GOLDOVSKAYA, I. O. GIRYAYEVA, Y. V. SHEVCHENKO, G. G. CHAMURLIYEV, and V. S. MAGEDOV *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 134-138 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 87-89

Avail: NTIS HC A08/MF A01

Macaca mulatta (rhesus) monkeys are used extensively in model experiments, which reproduce various physiological and pathological states, including cardiovascular diseases. There are a considerable number of publications dealing with the normal



electrocardiogram (ECG) of lower primates, including *Macaca mulatta*, which were recorded in standard and amplified monopolar leads from the extremities. At the same time, when monitoring the heart's bioelectric activity in chronic experiments there are some advantages to using the system of bipolar precordial leads of Nehb, since it permits recording the ECG when there is a high signal level in several projection planes of the resultant vector of the heart's electromotive force with a minimum of implanted exploring electrodes. However, there is no information in the literature concerning the standard features of the ECG in the Nehb leads for monkeys. The objective here was to examine the ECG distinctions of monkeys as recorded in the leads of Nehb using chronically implanted electrodes. Author

**N86-22093\*** National Aeronautics and Space Administration, Washington, D.C.

**AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 282)**

Mar. 1986 67 p  
(NASA-SP-7011(282); NAS 1.21:7011(282)) Avail: NTIS HC A04 CSCL 06E

This bibliography lists 154 reports, articles, and other documents introduced into the NASA scientific and technical information system in February 1986. Author

**N86-22094\*#** National Aeronautics and Space Administration, Washington, D.C.

**THE HISTORY OF AERONAUTICAL MEDICINE IN VENEZUELA**

D. R. IRIARTE Feb. 1986 20 p Transl. into ENGLISH of "Historia de la Medicina Aeronautica en Venezuela" presented at the 6th Seminar of Aeronautical Medicine, 1985 p 1-15 Seminar held in Caracas, Venezuela, 27-28 Sep. 1985 Transl. by Kanner (Leo) Associates, Redwood City, Calif.

(Contract NASW-4005)  
(NASA-TM-77709; NAS 1.15:77709) Avail: NTIS HC A02/MF A01 CSCL 06E

The Aerial Medical Service of the Ministry of Transportation and Communications of Venezuela was created on June 1949, and later became the Department of Aeronautical Medicine. Its functions include the medical examinations of future pilots, navigators and flight engineers. The importance of good mental and physical health in all flight and ground personnel to ensure the safety of air travel is discussed. Author

**N86-22095\*#** Hershey (Milton S.) Medical Center, Hershey, Pa. Div. of Gastroenterology.

**VECTION-INDUCED GASTRIC DYSRHYTHMIAS AND MOTION SICKNESS Annual Report, 1 May 1985 - 30 Apr. 1986**

K. L. KOCH and R. M. STERN 1 Apr. 1986 64 p refs  
(Contract NAG9-118)  
(NASA-CR-176620; NAS 1.26:176620; AR-1) Avail: NTIS HC A04/MF A01 CSCL 06S

Gastric electrical and mechanical activity during vection-induced motion sickness was investigated. The contractile events of the antrum and gastric myoelectric activity in healthy subjects exposed to vection were measured simultaneously. Symptomatic and myoelectric responses of subjects with vagotomy and gastric resections during vection stimuli were determined. And laboratory based computer systems for analysis of the myoelectric signal were developed. Gastric myoelectric activity was recorded from cutaneous electrodes, i.e., electrogastragrams (EGGs), and antral contractions were measured with intraluminal pressure transducers. Vection was induced by a rotating drum. gastric electromechanical activity was recorded during three periods: 15 min baseline, 15 min drum rotation (vection), and 15 to 30 min recovery. Preliminary results showed that catecholamine responses in nauseated versus symptom-free subjects were divergent and pretreatment with metoclopramide HC1 (Reglan) prevented vection-induced nausea and reduced tachygastrias in two previously symptomatic subjects. Author

**N86-22096#** National Aerospace Lab., Tokyo (Japan).  
**ELECTRODERMAL CHANGES CORRESPONDING TO THE DEGREE OF DISCOMFORT INDUCED BY MOTION SICKNESS**  
1985 19 p refs In JAPANESE; ENGLISH summary  
(NAL-TR-880; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

The qualitative correspondence between the degree of discomfort induced by motion sickness and the following electrodermal changes was examined; skin potential level (SPL), skin resistance level (SRL), and skin potential reflex (SPR). A depolarizing change in SPL and a lowering of SRL were observed which corresponded to lasting discomfort. These changes were detected in the thermal sweat areas. It was suggested that the change in SPL also occurred in the arousal sweat area. Arousal response appears in the arousal sweat area rather than in the sweat areas. SPL showed better correspondence than SRL, especially in the time required for recovery after the discomfort stimulation. On the other hand, SPR was observed in the arousal sweat area accompanied by transient discomfort induced by Coriolls stimulus. It was indicated that the amplitude of the positive wave (P wave) in SPR might correlate quantitatively to the degree of discomfort. SPR was not remarkably detected in the thermal sweat areas. Author

**N86-22097#** California Univ., Irvine, Dayton, Ohio.  
**TOXIC HAZARDS RESEARCH UNIT ANNUAL TECHNICAL REPORT: 1985 Report, Jun. 1984 - May 1985**

J. D. MACEWEN and E. H. VERNOT Sep. 1985 202 p  
(Contract F33615-80-C-0512)  
(AD-A161558; AAMRL-TR-85-058; REPT-22) Avail: NTIS HC A10/MF A01 CSCL 06T

The research program of the Toxic Hazards Research Unit (THRU) for the period of June 1984 through May 1985 is reviewed in this report. Chronic toxicity and oncogenic studies were carried out with hydrazine, JP-4, and JP-8. Results of histopathologic examination became available for a number of studies including chronic inhalation exposures to monomethylhydrazine, methylcyclohexane, and Otto Fuel II; and subchronic to petroleum and oil shale diesel fuel marine. These studies are now complete. Other investigations are complete except for histopathologic results. These include chronic exposures to petroleum JP-4, RJ-5, JP-7, JP-TS, and JP-10; subchronic exposures to petroleum JP-4 and JP-8; and weekly exposures to hydrazine. Three studies have concluded the exposure phases and are now being held postexposure - 90 day continuous exposures to shale JP-4 and dimethyl methylphosphonate and rat strain susceptibility to shale JP-4. A series of short-term toxicity studies was conducted on a variety of chemicals and chemical agents used by the Army, Air Force, and Navy. GRA

**N86-22098#** Naval Health Research Center, San Diego, Calif.  
**MECHANISMS OF BIOENERGETIC HOMEOSTASIS DURING EXERCISE: A GENERAL MODEL Interim Report**

C. G. GRAY May 1985 27 p  
(Contract MR0-00001)  
(AD-A161678; NAVHLTHRSCHC-85-19) Avail: NTIS HC A03/MF A01 CSCL 06P

Studies over the past several years have identified limitations of substrate utilization as a primary determinant of physical endurance capacity. These studies have shown that muscles have a preference and a great capacity to utilize fats as a source of energy. However, the preponderance of these studies have been directed at extending endurance by increasing glucose availability through increasing muscle glycogen stores or supplementing endogenous glucose supplies during exercise with various forms of sugar containing solutions. Some studies have shown that oral administration of glucose solutions during exercise can improve performance, while prefeeding with glucose decreases endurance performance. However, physical training and adaption to low carbohydrate diets drive the system toward greater fatty acid oxidation during exercise. The main problem appears to be integration of the observed effects of training and dietary manipulation into a comprehensive solution for maximizing physical endurance under a variety of circumstances. This report presents

a brief review of information of the mechanisms which regulate cellular substrate metabolism in the central nervous system, liver, muscles, and adipose tissue. The concepts are organized into a systematic metabolic model which interlaces the mechanisms that work within each subsystem. Examples of regulation of substrate flows is presented for exercise under three conditions: fasted, post-prandial, and after adaptation to a low carbohydrate diet. By using the proposed scheme of integrative metabolism, complex dietary and physical training programs for extending endurance performance are suggested. GRA

**N86-22099#** Thermedics, Inc., Woburn, Mass.  
**DEVELOPMENT OF AN ULTRAFAST-CURING WOUND DRESSING Annual Report, 30 Sep. 1983 - 30 Sep. 1984**  
 M. SZYCHER and J. L. ROLFE 15 Mar. 1985 31 p  
 (Contract DAMD17-83-C-3240; DA PROJ. 3S1-62775-A-825)  
 (AD-A162471; TE4337-53-85) Avail: NTIS HC A03/MF A01 CSCL 06L

This document describes a second-generation, drug-dispensing wound dressing. The wound dressing, which can be applied by the wounded soldier himself, incorporates thrombin as a coagulant to stop bleeding, and gentamycin sulfate as a wide-spectrum antibiotic to prevent bacterial infection. The new wound dressing is a trilaminar composite. The air side of the trilaminar is a fabric impregnated with an aliphatic, medical grade polyurethane elastomer; the middle laminate is a controlled release layer, containing the microencapsulated pharmacoactive agents, and the third laminate is a 1.0-mil-thick layer of acrylic-based, pressure-sensitive adhesive. The middle layer is fabricated from a mixture of urethane and silicone oligomers, which are precompounded with pharmacoactive agents, and is subsequently solidified (cured) upon mere exposure to low-intensity UV radiation at room temperature. Solidification at room temperature is a vital consideration, because most drugs are rapidly inactivated upon mild heating. Once cured, the oligomer layer containing pharmacoactive agents becomes a controlled-release monolith, capable of dispensing drugs at a continuous and predictable rate. GRA

**N86-22100#** Iowa Univ., Iowa City. Coll. of Medicine.  
**THE ROLE OF ENDORPHINS IN THE PATHOPHYSIOLOGY OF HEMORRHAGIC AND ENDOTOXIC SHOCK IN THE SUBHUMAN PRIMATE Annual Report, 1 Jun. 1980 - 31 May 1981 and Final Report, 15 Sep. 1981 - 15 Mar. 1985**  
 N. J. GURLL, D. G. REYNOLDS, T. VARGISH, and C. V. GISOLFI 15 Mar. 1985 65 p  
 (Contract DAMD17-80-C-0094; DAMD17-81-C-1177; DA PROJ. 3S1-62772-A-874)  
 (AD-A162483) Avail: NTIS HC A04/MF A01 CSCL 06O

In order to investigate the pathophysiological role of endogenous morphine-like substances (endorphins) in shock, we studied cynomolgus monkeys and dogs subjected to hemorrhagic or endotoxic shock. Blockade of opiate receptors with naloxone improved cardiovascular function and survival in both species and both models but requires correction of acidosis and hypothermia. Shock is associated with elevations in plasma levels of endorphins. Using different sites of injection and various anatomical and pharmacological ablations, we have shown that naloxone's beneficial effects in hemorrhagic shock are due to potentiation of the effect of released catecholamines on cardiac opiate receptors. The myocardial depression found in shock is due to an endorphin-mediated attenuation of catecholamine activity on the heart. We believe this is mediated by interaction with cardiac receptors and is expressed via G-protein activation of adenylate cyclase and cyclic-AMP. This hypothesis needs to be tested by biochemical determination of these substances, and our observations need to be extended to endotoxic shock. Nevertheless, naloxone and other antiendorphin substances may be important in the treatment of shock by reversing one of the important pathophysiological mechanisms of cardiovascular depression. GRA

**N86-22101#** Pennsylvania State Univ., University Park. Dept. of Industrial and Management Systems Engineering.  
**INCORPORATION OF ACTIVE ELEMENTS INTO THE ARTICULATED TOTAL BODY MODEL Final Report, 26 Sep. 1983 - 30 Jun. 1985**  
 A. FREIVALDS 30 Jun. 1985 113 p  
 (Contract F33615-83-C-0506)  
 (AD-A162518; AAMRL-TR-85-061) Avail: NTIS HC A06/MF A01 CSCL 06P

The Articulated Total Body (ATB) Model, based on rigid-body dynamics with Euler equations of motion and Lagrange type constraints, is used by the Harry G. Armstrong Aerospace Medical Research Laboratory to predict the forces and motions experienced by air crew personnel in typical flight operations. To provide a more realistic representation of human dynamics, active neuromusculature was added to the ATB Model using elements of the newly developed advanced harness system. A lumped three-parameter muscle model with a contractile element, a damping element and a parallel elastic element was developed. The contractile element included a length-tension relationship, a force-velocity relationship and an active state function. The basic fiber mechanisms were integrated into muscle systems utilizing motor unit organization, orderly recruitment of motor units and adjustments in force due to fatigue and reflex action. The complete muscle systems were then used to replicate the human neuromusculature of the trunk and neck and for the elbow, shoulder, hip and knee joints. GRA

**N86-22102#** Army Research Inst. of Environmental Medicine, Natick, Mass.  
**HEAT ACCLIMATIZATION DEVELOPED DURING SUMMER RUNNING IN NORTHEASTERN UNITED STATES**  
 L. E. ARMSTRONG, R. W. HUBBARD, J. P. DELUCA, and E. L. CHRISTENSEN Dec. 1985 27 p  
 (Contract DA PROJ. 3E1-62777-A-879)  
 (AD-A162728) Avail: NTIS HC A03/MF A01 CSCL 06P

Five highly trained distance runners (DR) were observed during controlled 90-min thermoregulation trials in spring and late summer to document the extent of heat acclimatization developed during summer running in Northeastern United States. These trials simulated environmental and exercise stresses encountered by DR during daily training. Between spring and late summer, DR trained outdoors for weeks but consequently showed few physiological adaptations classically associated with HA. Statistical comparison indicated no significant differences in mean heart rate, rectal temperature, sweat, plasma, or change in plasma, volume during exercise; mean weighted skin temperature was unchanged (except at 50 min of exercise) and sweat rate was also unchanged (except during the initial 30 min segments). Significant decreases in submaximal oxygen uptake were observed, at treadmill speeds of 80, 120, and 200 m min respectively. It is concluded that distance runners did not require summer heat exposure to adequately thermoregulate during the spring trial, which simulated the hottest summer days recorded during this study. GRA

**N86-22103#** California Univ., San Diego, La Jolla.  
**ADVANCED CLINICAL RESEARCH IN SHOCK AND TRAUMA Final Report, 1976 - Feb 1985**  
 R. M. PETERS Feb. 1985 6 p  
 (Contract N00014-76-C-0282)  
 (AD-A162730) Avail: NTIS HC A02/MF A01 CSCL 06E

This final report covers the years from 1976 through February, 1985. The overall subject of this research has been the best methods of resuscitation and maintaining patients who have hypovolemic shock of major surgery, particularly the support of the cardiac and the respiratory function. The number of subjects covered is described with the years in which those projects were completed and their conclusion. Table I lists the publications that have resulted from these investigations. GRA

## 52 AEROSPACE MEDICINE

**N86-22104#** Army Research Inst. of Environmental Medicine, Natick, Mass.

### **AN AUTOMATED SYSTEM FOR COMPREHENSIVE ASSESSMENT OF VISUAL FIELD SENSITIVITY**

J. L. KOBRICK, A. R. LUSSIER, S. MULLEN, and C. WITT Apr. 1985 19 p  
(AD-A162755; USARIEM-T10/85) Avail: NTIS HC A02/MF A01 CSCL 06P

A device for comprehensive assessment of the capability of operators for detection and location of visual signals throughout the functional visual field is described. The system is completely automated and computerized, and provides documentation files and graphic descriptions of each operator performance immediately upon completion of testing. Sensitivity can be measured for three stimulus colors (red, yellow, green), in a testing situation which mimics commonplace viewing. An abbreviated listing of the main operating program software is provided. GRA

**N86-22105#** Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.

### **MODELING ELECTROCARDIOGRAMS USING INTERACTING MARKOV CHAINS**

P. C. DOERSCHUK, R. R. TENNEY, and A. S. WILLSKY Jul. 1985 64 p  
(Contract AF-AFOSR-0258-82)  
(AD-A162758; LIDS-P-1491; AFOSR-85-1118TR) Avail: NTIS HC A04/MF A01 CSCL 06E

A methodology for the statistical modeling of cardiac behavior and electrocardiograms (ECG's) is developed that emphasizes a) the physiological event/detailed waveform hierarchy; and b) the importance of control and timing in describing the interactions among the several anatomical subunits of the heart. This methodology has been motivated by a desire to develop improved algorithms for statistical rhythm analysis that capture cardiac behavior in a more fundamental way but that stops short of complete accuracy in order to highlight decompositions that can be exploited to simplify statistical inference based on these models. The models consist of interacting finite-state processes, where a very few of the transition probabilities for each process can take on a small number of different values depending upon the states of neighboring processes. Each finite-state process is constructed from a very small set of elementary structural elements. The methodology is illustrated by describing models for three cardiac rhythms and include simulation results for one of these, namely the rhythm known as Wenckebach. GRA

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### **BEHAVIORAL SCIENCES**

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

**A86-28435**

### **AXIOMATIC AND NUMERIC CONJOINT MEASUREMENT - A COMPARISON OF THREE METHODS FOR OBTAINING SUBJECTIVE WORKLOAD (SWAT) RANKINGS**

T. E. NYGREN (Ohio State University, Columbus) IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2. New York, Institute of Electrical and Electronics Engineers, 1985, p. 878-883. refs

A study comparing three different conjoint scaling data collection methods was done using CMSCAL, the general axiomatic and numerical conjoint measurement algorithms underlying the Subjective Workload Assessment Technique (SWAT). Subjects rank ordered stimulus combinations from a 3 x 3 x 3 factorial design. They did this twice, once as either (1) a full sort of all 27 combinations, or as (2) a partial half set, consisting of a subset of 15 of the 27 stimulus combinations, or (3) as tradeoff combinations

of pairs of the three factors. For each of 84 subjects, a CMSCAL conjoint scaling analysis was done on both of their data sets. When the three procedures were compared, the half set method produced significantly better additive solutions than did the full sorting method. Implications of these findings for the applied researcher are discussed. Author

**A86-28450#**

### **THE DISSOCIATION BETWEEN SUBJECTIVE AND PERFORMANCE-BASED MEASURES OF OPERATOR WORKLOAD**

W. L. DERRICK (U.S. Air Force Academy, Colorado Springs, CO) IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2. New York, Institute of Electrical and Electronics Engineers, 1985, p. 1020-1025. refs

A study is reported of workload dissociation, in which different estimates of workload are obtained for the same task performed by the same people according to whether system performance data or operator opinions are used in the determination. Findings are discussed from a program of research attempting to explain the measure dissociation in terms of a cognitive model of processing resources. The implications of this dissociation for system design are summarized. D.H.

**A86-28451**

### **EFFECTS OF TASK DIFFICULTY AND LEARNING STRATEGIES IN MULTIPLE-TASK TRAINING**

P. S. WINNE (Norfolk General Hospital, VA), R. B. MOE, and B. B. MORGAN, JR. (Old Dominion University, Norfolk, VA) IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2. New York, Institute of Electrical and Electronics Engineers, 1985, p. 1026-1031. refs

In two experiments, dual-task acquisition of mental arithmetic skills was investigated. In Experiment I, subjects practiced single-digit math under one of two dual-task combinations differing in functional similarity. In Experiment II, subjects practiced two-digit math under four combinations load and variety. The results indicated that learning was influenced by the task load imposed and specific-task characteristics. Analysis of the performance strategies involved provided a useful means for diagnosing sources of task overload. Author

**A86-28452\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

### **VISUAL SCANNING BEHAVIOR**

R. L. HARRIS, SR. and A. A. SPADY, JR. (NASA, Langley Research Center, Hampton, VA) IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2. New York, Institute of Electrical and Electronics Engineers, 1985, p. 1032-1039. refs

This report summarizes the results and knowledge of scan behavior gained in various simulation and laboratory studies. Results were obtained through various analysis techniques such as real-time viewing of the pilot's scanning behavior and quantitative analysis of scan behavior performance parameters (average dwell time, dwell percentages, instrument transition paths, dwell percentages, instrument transition paths, dwell histograms, and entropy rate measures). Pilot scan behavior is discussed in the following areas; scanning is a subconscious conditioned activity, scanning is situation dependent, pilots' scanning pattern is centered around a home base. Scanning behavior data have been shown to be useful in determining pilot's workload, evaluating pilot's strategy and role, determining the rate of information transfer of various displays, and aiding in pilot training. Author

**A86-28812\*** California Univ., Davis.

**PSYCHOLOGICAL AND INTERPERSONAL ADAPTATION TO MARS MISSIONS**

A. A. HARRISON (California, University, Davis) and M. M. CONNORS (NASA, Ames Research Center, Moffett Field, CA) IN: The case for Mars II. San Diego, CA, Univelt, Inc., 1985, p. 643-654. refs  
(AAS 84-186)

The crucial importance of a thorough understanding of the psychological and interpersonal dimensions of Mars flights is indicated. This is necessary both to reduce the chances that psychological problems or interpersonal frictions will threaten the success of Mars missions and to enhance the quality of life of the people involved. Adaptation to interplanetary flight will depend on an interplay of the psychological stresses imposed by the missions and the psychological strengths and vulnerabilities of the crewmembers involved. Stresses may be reduced through environmental engineering, manipulating crew composition, and the structuring of situations and tasks. Vulnerabilities may be reduced through improving personnel selection procedures, training personnel in psychological and group dynamics, and providing mechanisms for emotional support. It is essential to supplement anecdotal evidence regarding the human side of space travel with the results of carefully conducted scientific research. D.H.

**A86-28814**

**PSYCHOLOGICAL CONSIDERATIONS IN LONG-DURATION SPACE MISSIONS AN OVERVIEW**

V. M. LITTLEFIELD (Minnesota, University, Morris) IN: The case for Mars II. San Diego, CA, Univelt, Inc., 1985, p. 665-680. refs  
(AAS 84-188)

Practical and potential contributions of psychology and the behavioral sciences to space missions to improve their chances of success are examined. Previous contributions have been minimal. Increase contributions have been suggested, such as selecting personnel who possess unique psychological characteristics and interpersonal skills appropriate to space missions. To this end, behavior has been studied in earth analogs that appear to model space mission environments. Denying that space missions are unique, other researchers have suggested a 'business-as-usual' perspective. Consideration of long-duration space missions, such as Mars missions, as routine phenomena opens the door to a previously excluded body of general individual and social psychological literature. This broader viewpoint is exemplified in (1) the presentation of an environmental learning view of individual psychology and (2) examination of social psychological research in group structure and processes from a primary group perspective. D.H.

**A86-28864\*** Virginia Polytechnic Inst. and State Univ., Blacksburg.

**EVALUATION OF 16 MEASURES OF MENTAL WORKLOAD USING A SIMULATED FLIGHT TASK EMPHASIZING MEDIATIONAL ACTIVITY**

W. W. WIERWILLE, M. RAHIMI, and J. G. CASALI (Virginia Polytechnic Institute and State University, Blacksburg) Human Factors (ISSN 0018-7208), vol. 27, Oct. 1985, p. 489-502. Research supported by the Virginia Polytechnic Institute and State University. refs  
(Contract NAG2-17)

As aircraft and other systems become more automated, a shift is occurring in human operator participation in these systems. This shift is away from manual control and toward activities that tap the higher mental functioning of human operators. Therefore, an experiment was performed in a moving-base flight simulator to assess mediational (cognitive) workload measurement. Specifically, 16 workload estimation techniques were evaluated as to their sensitivity and intrusion in a flight task emphasizing mediational behavior. Task loading, using navigation problems presented on a display, was treated as an independent variable, and workload-measure values were treated as dependent variables. Results indicate that two mediational task measures, two rating scale measures, time estimation, and two eye behavior measures

were reliably sensitive to mediational loading. The time estimation measure did, however, intrude on mediational task performance. Several of the remaining measures were completely insensitive to mediational load. Author

**A86-28866\*** Purdue Univ., West Lafayette, Ind.  
**ON SCALING PERFORMANCE OPERATING CHARACTERISTICS - CAVEAT EMPTOR**

B. H. KANTOWITZ and M. WELDON (Purdue University, West Lafayette, IN) Human Factors (ISSN 0018-7208), vol. 27, Oct. 1985, p. 531-547. refs  
(Contract NCC2-228)

Problems associated with scaling and normalizing empirical performance operating characteristics (POCs) are examined. Normalization methods proposed by Wickens (1980) and by Mountford and North (1980) are critically evaluated. Computer simulations are used to generate raw-score and normalized POCs. The interpretation of transformed empirical POCs (Wickens, Mountford, and Schreiner, 1981) is shown to contain inconsistencies. The normalization techniques reviewed fail to resolve POC scaling problems. Caution must be exercised when interpreting transformed POCs. Author

**A86-28867\*** Illinois Univ., Champaign.

**POCS AND PERFORMANCE DECREMENTS - A REPLY TO KANTOWITZ AND WELDON**

C. D. WICKENS and Y.-Y. YEH (Illinois, University, Champaign) Human Factors (ISSN 0018-7208), vol. 27, Oct. 1985, p. 549-554. refs  
(Contract NAG2-169)

**A86-29090**

**A REVIEW OF THE PSYCHOLOGICAL ASPECTS OF SPACE FLIGHT**

J. M. CHRISTENSEN (Federation of American Societies for Experimental Biology, Bethesda, MD; Universal Energy Systems, Inc., Dayton, OH) and J. M. TALBOT (Federation of American Societies for Experimental Biology, Bethesda, MD) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, March 1986, p. 203-212. refs

The major observations and conclusions of the FASEB's ad hoc Working Group's report to NASA on the aspects of human behavior and performance related to the Shuttle Program and to the planned U.S. Space Station are presented. The report focuses on the performance requirements for the long-term manned missions; human perceptual, cognitive, and motor capabilities and limitations in space; crew composition, individual competences, selection criteria, and special training; and environmental factors influencing behavior. Consideration is also given to the psychosocial aspects of multi-person spacecrews on long-term missions; career determinants in NASA; investigational methodology and equipment; and psychological support. Suggestions for near-term planning cover uses of the Shuttle onboard video and audio resources for the behavioral observations, and include the perceptual, cognitive, and psychomotor parameters and group dynamics into space station mock-up studies. For the long-term research, the need of methodology and instrumentation for objective measurements of psychophysiological processes, status, and performance is emphasized. I.S.

**A86-29095**

**PERFORMANCE OVERNIGHT IN SHIFTWORKERS OPERATING A DAY-NIGHT SCHEDULE**

R. G. BORLAND, A. S. ROGERS, A. N. NICHOLSON, P. A. PASCOE, and M. B. SPENCER (RAF, Institute of Aviation Medicine, Farnborough, England) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, March 1986, p. 241-249. refs

Performance was measured during the day (0800-1700 hours) and during the night (1700-0800 hours) of a day-night schedule, and the effect of caffeine (300 mg) was studied during the overnight periods of work. The sleep electroencephalogram was recorded together with oral temperature and urinary electrolyte excretion.

## 53 BEHAVIORAL SCIENCES

Impairment of performance within 9 h after the beginning of the daytime work period was minimal, and was limited to a test of continuous performance, but impairment of performance within 9 h after the beginning of the overnight work period was more pronounced and included lowered vigilance. Impaired performance overnight was related to time on task and circadian rhythmicity, and was alleviated to some extent by the use of caffeine.

Author

**A86-29098**

### **HYSTERICAL DEAFNESS - AN UNUSUAL PRESENTATION OF STRESS IN AN AIR TRAFFIC CONTROL OFFICER**

V. B. MAXWELL and D. N. BROOKS (Gatley Health Centre, England) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, March 1986, p. 263-266.

**N86-21138\*#** Federation of American Societies for Experimental Biology, Bethesda, Md. Life Sciences Research Office.

### **RESEARCH OPPORTUNITIES ON IMMUNOCOMPETENCE IN SPACE**

W. R. BEISEL, ed. and J. M. TALBOT, ed. Dec. 1985 54 p refs

(Contract NASW-3924)

(NASA-CR-176482; NAS 1.26:176482) Avail: NTIS HC A04/MF A01 CSCL 05I

The most significant of the available data on the effects of space flight on immunocompetences and the potential operational and clinical significance of reported changes are as follows: (1) reduced postflight blastogenic response of peripheral lymphocytes from space crew members; (2) postflight neutrophilia persisting up to 7 days; (3) gingival inflammation of the Skylab astronauts; (4) postflight lymphocytopenia, eosinopenia, and monocytopenia; (5) modifications and shifts in the microflora of space crews and spacecraft; and (6) microbial contamination of cabin air and drinking water. These responses and data disclose numerous gaps in the knowledge that is essential for an adequate understanding of space-related changes in immunocompetence.

Author

**N86-21139\*#** Illinois Univ., Urbana-Champaign. Engineering Psychology Research Lab.

### **THE DISSOCIATION OF SUBJECTIVE MEASURES OF MENTAL WORKLOAD AND PERFORMANCE Final Report**

Y. H. YEH and C. D. WICKENS Oct. 1984 98 p

(Contract NAG2-169)

(NASA-CR-176609; NAS 1.26:176609; EPL-84-2/NASA-84-2) Avail: NTIS HC A05/MF A01 CSCL 05I

Dissociation between performance and subjective workload measures was investigated in the theoretical framework of the multiple resources model. Subjective measures do not preserve the vector characteristics in the multidimensional space described by the model. A theory of dissociation was proposed to locate the sources that may produce dissociation between the two workload measures. According to the theory, performance is affected by every aspect of processing whereas subjective workload is sensitive to the amount of aggregate resource investment and is dominated by the demands on the perceptual/central resources. The proposed theory was tested in three experiments. Results showed that performance improved but subjective workload was elevated with an increasing amount of resource investment. Furthermore, subjective workload was not as sensitive as was performance to differences in the amount of resource competition between two tasks. The demand on perceptual/central resources was found to be the most salient component of subjective workload. Dissociation occurred when the demand on this component was increased by the number of concurrent tasks or by the number of display elements. However, demands on response resources were weighted in subjective introspection as much as demands on perceptual/central resources. The implications of these results for workload practitioners are described.

Author

**N86-21140#** Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

### **THE EFFECT OF ACCELERATION STRESS ON HUMAN WORKLOAD**

W. B. ALBERY, S. L. WARD, and R. T. GILL May 1985 26 p (Contract AF PROJ. 7231)

(AD-A156770; AMRL-TR-85-039) Avail: NTIS HC A03/MF A01 CSCL 06S

The effects of +Gz stress on operator task performance and workload are assessed. Subjects were presented a two-dimensional maze on a CRT, and were required to solve it as rapidly as possible while under G-stress at levels from +Gz to +6Gz. The G-stress was provided by a human centrifuge. The effects of this stress were assessed by two techniques: objective performance measures on the primary maze - solving task, and subjective workload measures obtained using the Subjective Workload Assessment Technique (SWAT). It was found that while neither moderate (+3Gz) nor high (+5Gz and +6Gz) levels of G stress affected maze solving performance, the high G levels did significantly increase the subjective workload of the maze task.

Author

**N86-21141#** Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.

### **ATTENTION ALLOCATION, DISTRACTION, AND THE TYPE A/TYPE B BEHAVIOR PATTERN M.S. Thesis**

A. J. GUARDINO Aug. 1985 100 p

(AD-A160671; AFIT/CI/NR-85-109T) Avail: NTIS HC A05/MF A01 CSCL 05J

This thesis sought to determine whether individuals identified as having a Type A or Type B behavior pattern allocate attention differently in the presence of a distractor. Thirty-seven university students, grouped by type through use of the Jenkins Activity survey, and further divided into distractor and control groups, performed two discrete tasks for eight blocks under single- then dual-task conditions. The distractor was presented during the dual-task condition on Blocks 6 and 7. While the results did not support the hypothesized relation, this study did support previous findings of a differential effect of noise on multiple-task performance: Both quiet groups' performance improved on both tasks, whereas both noise groups' performance improved on the primary task but leveled off on the secondary task during and after the distractor. Further research is required.

GRA

**N86-21142#** Colorado Univ., Boulder.

### **PRINCIPLES OF INSTRUCTION FOR SUCCESSFUL ASSEMBLY AND REPAIR Final Report, 1 Nov. 1983 - 31 Nov. 1984**

P. BAGGETT 31 Nov. 1984 14 p

(Contract N00014-84-C-0112)

(AD-A161280) Avail: NTIS HC A02/MF A01 CSCL 05I

In this one-year project the aim was to continue the previous three years' research on designing multimedia instructions for procedures so that people could use and learn from them more easily. There were both theoretical and practical aspects to the work. We viewed the conceptual structure of a task as a (hierarchical) tree (later a directed acyclic graph) with nodes representing information from different modalities (motoric, visual, and linguistic). The overview will be preceded by a short summary, stating the five main studies, the total number of subject hours run, stimulus materials used, and computer programming done. At the end are listed technical reports, conference papers, and publications. Main Studies: (1) Transforming a task's tree structure to lessen short term memory load in instructions, (2) Developing generic and functional terminology, (3) Theoretical hypotheses about what narration in dual media presentations should consist of, (4) Transfer of learning in assembly tasks, and (5) Empirical investigation of adequacy of knowledge representation for repair in a computerized tutor.

GRA

**N86-21143#** California Univ., San Diego. Jolla.  
**INTERACTIVE ACTIVATION MODELS OF PERCEPTION AND COMPREHENSION Status Report, 1 Dec. 1984 - 1 Oct. 1985**  
 J. L. ELMAN and J. L. MCCLELLAND 1 Oct. 1985 15 p  
 (Contract N00014-85-K-0076)  
 (AD-A161362) Avail: NTIS HC A02/MF A01 CSCL 05J

The objective of this research is to construct a computationally sufficient, biologically plausible, and behaviorally adequate account of human information processing skills in visual and auditory language processing. We have the following specific research goals for our contract: (1) To implement a model of reading printed text through a series of fixations. The model is intended to account for the integration of visual information over successive fixations, and the interaction of visual and contextual information in reading. (2) To implement a new version of our model of speech perception (TRACE), using programmable connections to allow the model to tune itself, in the course of processing, to changes in global parameters such as rate. This new model (which we will call the Programmable TRACE) is intended to account for human sensitivity to global as well as local contextual influences on the speech signal while retaining all the virtues of the present version of TRACE. (3) To begin work on the development of simulation models designed to capture aspects of interactions between lexical, syntactic, and semantic constraints on the construction of syntactic and functional representations of sentences. GRA

**N86-21144#** Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.

**A PROCEDURE-BASED APPROACH TO HUMAN INFORMATION PROCESSING MODELS**

K. L. BOETTCHER and R. R. TENNEY Nov. 1985 37 p  
 (Contract N00014-77-C-0532; N00014-84-K-0519)  
 (AD-A162454; LIDS-P-1499) Avail: NTIS HC A03/MF A01 CSCL 05J

An approach is suggested for modeling human processing time in routine tasks. The existence of mental processing methods, or procedures, is presumed and the approach uses information theoretic concepts to develop a functional relationship between task variables and processing time for a given procedure. The resulting model contains parameters that must be estimated using processing time data. In addition to considering the single-procedure model, the modeling framework is extended to include situations where multiple procedures are used in an alternate fashion. The information theoretic framework provides a specific model form for the extra time required for switching to, or activating, a procedure. The modeling approach is tested experimentally in two ways. First, a single procedure task is devised for which a model is developed. Second, a multiple procedure task is devised to test the model for switching. Experimental results in both cases give evidence in support of the approach as a method for describing task processing time in terms of task variables. Author (GRA)

**N86-21145#** Leiden Univ. (Netherlands). Inst. of Mathematics.  
**ON INTERACTING POPULATIONS THAT DISPERSE TO AVOID CROWDING: THE EFFECT OF A SEDENTARY COLONY**

M. BERTSCH, M. E. GURTIN (Carnegie-Mellon Univ., Pittsburgh, Pa.), D. HILHORST, and L. A. PELETIER Mar. 1983 30 p refs  
 (REPT-4) Avail: NTIS HC A03/MF A01

A population model in which a finite number of interacting groups attempt to avoid crowding is considered. A habitat containing a mobile and a sedentary species is studied. It is shown that when the mobile population is sufficiently large relative to the sedentary population, the mobile species eventually populates the entire habitat. However, when mobile species density is less than that of the sedentary species, the mobile individuals do not reach the portion of the habitat that lies to the other side of the sedentary colony. Author (ESA)

**N86-22106** Arizona Univ., Tucson.  
**VISUAL PERCEPTION IN CORRELATED NOISE Ph.D. Thesis**  
 K. J. MYERS 1985 149 p  
 Avail: Univ. Microfilms Order No. DA8522817

The ability of human observers to perform detection tasks in medical images that contain structured noise was investigated. Physical measures of image quality, such as signal-to-noise ratio (SNR), resolution, modulation transfer function (MTF), and contrast, do not accurately predict how well an observer can detect lesions in an image. For images with equal pixel SNR, humans can detect a low contrast object more readily in images that have a low-pass noise structure, as opposed to a high-pass noise structure. This finding is important in the comparison of images generated by a classical pinhole-imaging system with images generated by a computed tomography imager. A figure of merit was wanted for imaging systems that is more than an evaluation of the physician's performance, measured using human observers and an accepted method such as receiver operating characteristic techniques. The hypothesis is that the human observer acts approximately as an ideal observer who does not have the ability to prewhiten the noise in an image. Without this ability, the ideal observer's detection performance for even a simple task is degraded substantially in correlated noise. This is just the effect found for human observers. Dissert. Abstr.

**N86-22107#** Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.

**PERSONALITY TYPE ANALYSIS OF AIR FORCE INSTITUTE OF TECHNOLOGY SCHOOL OF SYSTEMS AND LOGISTICS GRADUATE DEGREE 85S CLASS USING MYERS-BRIGGS TYPE-INDICATOR M.S. Thesis**

R. A. CARTER Sep. 1985 146 p  
 (AD-A161053; AFIT/GLM/LSM/85S-11) Avail: NTIS HC A07/MF A01 CSCL 05J

The objective of this research was to identify significant learning differences in the AFIT School of Systems and Logistics (AFIT/LS) using the personality type theory developed by psychologist Jung and identified by the Myers-Briggs Type Indicator (MBTI). The data were collected from graduate students of AFIT/LS through the MBTI and a Preferred Academic Environment Questionnaire. Results of the MBTI categorized each of the subjects into personality types. The Preferred Academic Environment Questionnaire determined student habits test taking preferences: AFIT situations which the student felt improved academic performance; and AFIT learning situations which were important to the student. The data were analyzed according to the distribution of MBTI type, the effect of MBTI type upon grade point average, and student preference for instructional technique and learning styles as they related to MBTI type. GRA

**N86-22108#** Naval Submarine Medical Research Lab., Groton, Conn.

**THE EFFECTS OF COLOR-CODING IN GEOSIT DISPLAYS. 1: COLOR AS A REDUNDANT CODE Interim Report**

A. R. JACOBSEN, D. F. NERI, and W. H. ROGERS 13 Sep. 1985 20 p  
 (AD-A161107; NSMRL-1061) Avail: NTIS HC A02/MF A01 CSCL 05H

The effect of color-coding symbols in geographical situation (GEOSIT) displays on response time was studied using 12 observers. Three levels of the threat dimension (friendly, unknown, and hostile) were redundantly coded by both color and shape, while the three levels of the platform dimension (submerged, surface, and airborne) were coded only by shape. Compared to the standard monochrome coding scheme, response time on the color-coded threat dimension was enhanced by over 100%. Performance on the noncolor-coded platform dimension was unaffected by color-coding of the threat dimension. Several other significant effects were also found. This study demonstrates that the use of color in GEOSIT displays can dramatically improve performance without any decrement in performance on noncolor-coded information. GRA



**N86-22109#** Naval Health Research Center, San Diego, Calif.  
**HEALTH AND PERFORMANCE OF ANTARCTIC WINTER-OVER PERSONNEL: A FOLLOW-UP STUDY Final Report**

L. A. PALINKAS Jun. 1985 15 p  
 (AD-A161773; NAVHLTHRSCHC-85-18) Avail: NTIS HC A02/MF A01 CSCL 06J

Despite extensive previous research on the health and performance of Antarctic winter-over personnel while they are on the ice, little is known about the long-term effects of the winter-over experience. Using the records of enlisted personnel who applied to the Operation Deep Freeze program between 1963 and 1973, the health and service history data available on these individuals at the Naval Health Research Center were examined to determine if incidence rates and performance criteria were significantly different between a group of winter-over personnel and a control group of enlisted personnel who were rated as acceptable by a screening team but who did not winter over. Results indicated that the overall incidence rate for the winter-over group was significantly lower than the rate for the control group. The winter-over group also had significantly fewer first hospitalizations for neoplasms, endocrine, nutritional, and metabolic disorders, and diseases of the musculoskeletal system. Results suggest that wintering over does not adversely affect subsequent health and performance of enlisted personnel, and that the screening program has been successful in selecting the best candidates in terms of these criteria. GRA

**N86-22110#** Army Construction Engineering Research Lab., Champaign, Ill.

**THE ROLE OF VIBRATION AND RATTLE IN HUMAN RESPONSE TO HELICOPTER NOISE Final Report**

P. D. SCHOMER and R. D. NEATHAMMER Sep. 1985 161 p  
 (AD-A162486; CERL-TR-N-85/14) Avail: NTIS HC A08/MF A01 CSCL 05J

Our understanding of community reaction to helicopter noise remains incomplete. A technique called A-weighting appears to produce realistic data outdoors and at modest noise levels, and the community response in terms of percentage of population highly annoyed can be correlated with respect to the Day/Night Average Sound Level (DNL) descriptor. However, questions remain as to the effect of perceived building vibrations and rattle in human response to helicopter noise. To answer these questions, this study examined the role of vibration and rattle in human response to helicopter noise. Many volunteer subjects were tested under real noise conditions. The helicopter noise was generated by an Army UH-1H (Huey) helicopter. Subjects were located either in the living room of a new mobile home, outdoors, or in the living room or dining room of an old frame farmhouse near Champaign IL. The control or comparison sound was generated electronically through loudspeakers at each location using a 500-Hz octave band of white noise. By performing paired comparison tests between the helicopter and control noises, it was possible to establish equivalency between these two stimuli. Author (GRA)

**N86-22111#** Yale Univ., New Haven, Conn. Dept. of Psychology.

**ATTENTION WITHIN AUDITORY WORD PERCEPTION Final Report, 1 Jan. 1982 - 31 Dec. 1983**

A. G. SAMUEL and W. H. RESSLER Nov. 1985 58 p  
 (Contract N00014-82-C-0160)  
 (AD-A162550; REPT-85-1-ONR) Avail: NTIS HC A04/MF A01 CSCL 06P

Phonemic restoration is a powerful auditory illusion that arises when a phoneme is removed from a word and replaced with noise, resulting in a percept which sounds like the intact word with a spurious bit of noise. It is hypothesized that the configurational properties of the word impair attention to the individual phonemes and thereby induce perceptual restoration of the missing phoneme. If so, this impairment might be unlearned if listeners can process individual phonemes within a word selectively. Subjects received training with the potentially restorable stimuli (972 trials with feedback); in addition, the presence or absence of an attentional cue, contained in a visual prime preceding each

trial, was varied between groups of subjects. Cueing the identity and location of the critical phoneme of each test word allowed subjects to attend to the critical phoneme, thereby inhibiting the illusion, but only when the prime also identified the test word itself. When the prime only provided the identity or location of the critical phoneme, or only the identity of the word, subjects performed identically to those subjects for whom the prime contained no information at all about the test word. Furthermore, training did not produce any generalized learning about the types of stimuli used. A limited interactive model of auditory word perception is discussed, in which attention operates through the lexical level. GRA

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**MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT**

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

**A86-26493#**

**TELEROBOTICS FOR THE SPACE STATION**

M. M. CLARKE and M. A. BRONEZ (Rockwell International Corp., Space Station Systems Div., Downey, CA) Mechanical Engineering (ISSN 0025-6501), vol. 108, Feb. 1986, p. 66-72.

An evaluation is made of the configurational possibilities of the NASA Space Station, with a view to the range of EVA efforts that will have to be undertaken by Space Shuttle-based construction crews, and with emphasis on the character and effectiveness of the remote operation, or 'teleoperator' and robotic systems that such construction crews may employ to more effectively conduct Space Station assembly. Teleoperators are dexterous, general purpose man/machine systems that project human vision and manipulation capabilities across distances and through physical barriers. Telerobots are teleoperators to which cybernetic sensor and control systems have imparted a degree of autonomy from human direction. Attention is given to the sensor and actuation systems proposed for implementation of teleoperators and telerobots. O.C.

**A86-26616#**

**KINEMATICS AND REACTION MOMENT COMPENSATION FOR A SPACEBORNE ELBOW MANIPULATOR**

R. E. LINDBERG, R. W. LONGMAN, and M. F. ZEDD (U.S. Navy, Naval Research Laboratory, Washington, DC) AIAA, Aerospace Sciences Meeting, 24th, Reno, NV, Jan. 6-9, 1986. 26 p. (AIAA PAPER 86-0250)

When a robot arm is mounted on a satellite, the commanded arm motions induce motions of the satellite and therefore of the robot base. As a result, the robot joint angles that would normally be commanded to produce a prescribed robot end effector position and orientation will result in missing the target. Also as a result of uncontrolled base motion, the terminal end effector state is not a function of terminal joint angles, but is rather determined by the entire joint angle history. The kinematics of the system is therefore coupled with the dynamics of system, and the inverse kinematics problem cannot be solved in closed form. This paper develops a new type of robot kinematic equation set that computes joint angle commands that account for base translation, under the assumption that base rotation is negated by a momentum compensation system mounted on the satellite. Author

**A86-27094**  
**MODELING OF PERCEPTION AND DECISION-MAKING PROCESSES [MODELIROVANIE PROTSESSOV VOSPRIIATII I PRINIATIIA RESHENII]**

V. O. KURT-UMEROV and O. I. KHOMA *Otbor i Peredacha Informatsii* (ISSN 0474-8662), no. 72, 1985, p. 54-61. In Russian.

A model of perception and decision making with the description of functional blocks is proposed. The model relies on the concept of a thesaurus, consisting of three set-images, analysis and synthesis methods, and action algorithms. Other principles include the novel information concept, and the time constants of image adaptation to sequence monotonicity and self-learning in the class of images analyzed. Appropriate schematics are presented. B.J.

**A86-27500**  
**A MODEL FOR THE FORMATION OF THE STRUCTURE OF THE EXTERNAL ELECTRIC FIELD OF HUMANS [OB ODNOI MODELI FORMIROVANIIA STRUKTURY VNESHNEGO ELEKTRICHESKOGO POLIA CHELOVEKA]**

IU. V. TORNUEV (Institut Fiziologii, Novosibirsk, USSR) *Bionika* (ISSN 0374-6569), no. 19, 1985, p. 97-100. In Russian. refs

The frequency and spatial characteristics of the external electric field (EEF) of humans are analyzed. A model for the formation of the EEF structure is proposed which is based on the representation of the human body in the form of a complex system of dielectrics with a complex permittivity. Experimental data obtained for various physiological states confirm the validity of the model. B.J.

**A86-27671**  
**VESTIBULAR AND VISUAL CONTROL ON POSTURE AND LOCOMOTOR EQUILIBRIUM**

M. IGARASHI, ED. and F. O. BLACK, ED. *Basel and New York, Karger, 1985, 375 p.* No individual items are abstracted in this volume.

The topics discussed include conceptual and biomechanical models of postural control, quantitative analysis of postural control mechanisms, visual and vestibular control of equilibrium function, space environment and equilibrium psychophysiology, neurophysiology in relation to postural and motor control, developmental and oculomotor studies, and pathological disorders and postural control. Papers are presented on conceptual models of human postural control, analysis of labyrinthine equilibrium disturbances by fitting a five-dimensional feedback model, four steps of application of postural control mechanism to clinical diagnosis, habituation of postural readjustments induced by motion of visual scenes, and subjective vertical in weightlessness. Consideration is also given to mechanisms of posture maintenance in weightlessness, otolith-spinal reflexes, contribution of peripheral vision to vestibulo-ocular reflex suppression, and postural control in four classes of vestibular abnormalities. I.S.

**A86-28074**  
**DESIGN TECHNIQUES FOR ROBOTS - SPACE APPLICATIONS**  
 R. J. HAMANN (Fokker, Schiphol, Netherlands) *Robotics* (ISSN 0167-8493), vol. 1, Dec. 1985, p. 223-250.

Analytical techniques and technologies required for the design and development of robotic manipulators in space are defined and investigated. A space manipulator system is defined and described, and manipulator kinematics and dynamics, methods for path construction, obstacle avoidance techniques, and robot languages are discussed. Control aspects are investigated, including robot control methods, the selection of a Manipulator Arm control system, and the definition of simulation cases. Manipulator Arm functions to be performed and their requirements in terms of processing power, memory size, and data flows are listed and used to define the electrical architecture, bus requirements, and software organization. A program for future design studies for the Manipulator Arm is briefly discussed. C.D.

**A86-28285**  
**EUROPEAN ANNUAL CONFERENCE ON HUMAN DECISION MAKING AND MANUAL CONTROL, 4TH, ZEIST, NETHERLANDS, MAY 28-30, 1984, PROCEEDINGS**

Soesterberg, Netherlands, Institute for Perception TNO, 1985, 294 p. No individual items are abstracted in this volume.

Various papers on human decision making and manual control are presented. The general topics addressed include: rehabilitation, artificial intelligence, fault management and decision making, industrial processes, human behavior in aircraft piloting and car driving, information and control. Some individual topics discussed include: information processing and driving ability of patients with diffuse brain injury, theory and tests in fault management, development of individual assembly strategies, gravitational torques in manual control, the dynamics of a car driver's lane-keeping behavior, systems ergonomic analysis of ship engine control tasks, using time-series information in an optimization task, evaluation of overview pictures for process supervision, and internal models of process dynamics in slow human-machine systems. C.D.

**A86-28431**  
**COMPARISON OF TRANSIENT AND STEADY STATE CORTICAL EVOKED POTENTIALS**

A. M. JUNKER (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, OH), K. M. KENNER (Synergy, Inc., Washington, DC), D. L. KLEINMAN (Connecticut, University, Storrs), and T. D. MCCLURG (Systems Research Laboratories, Inc., Dayton, OH) IN: *NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2.* New York, Institute of Electrical and Electronics Engineers, 1985, p. 854-860. refs  
 (Contract AF TASK 2312V2)

To better describe the linear-dynamic properties of the human visual-cortical response system, transient and steady state visual evoked response potentials (VERP) were observed. The stimulus presentation device provides both the evoking stimulus (flickering or pulsing lights) and a video task display. The steady state stimulus was modulated by a complex, ten-frequency, sum-of-sines, wave. The transient VERP is the time-locked averaged of the EEG to a series of narrow light pulses (pulse width of 10 msec). The Fourier transform of the averaged pulses has properties that approximate band limited white noise, i.e. a flat spectrum over the frequency region spanned by the 10 sum of sines. The Fourier transform of both the steady-state and the transient evoked potentials yields measures of: output/input gain ratios, phase differences, and background EEG. The transfer function from the transient VERP corresponds to the steady-state VERP transfer function. Author

**A86-28432**  
**A LINEAR, DYNAMIC MODEL FOR THE VISUAL-CORTICAL EVOKED RESPONSE SYSTEM**

K. M. KENNER (Synergy, Inc., Washington, DC), A. M. JUNKER (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, OH), and W. H. LEVISON (Bolt Beranek, and Newman, Inc., Cambridge, MA) IN: *NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2.* New York, Institute of Electrical and Electronics Engineers, 1985, p. 861-867. refs

A technique for developing an unobtrusive workload metric based upon steady-state EEG may be useful for in-flight crew monitoring. In the process of developing this technique, linear-dynamic properties of the human visual-cortical response system have been observed. Mathematical modeling has been successfully applied to these observations. The development of this model indicates the potential for applying the control-theoretic perspective to neurosensory functioning. Further statistical analysis of an expanded data-base could lead to the development of an unobtrusive workload metric. Author



A86-28433

**A WORKLOAD INDEX FOR ITERATIVE CREWSTATION EVALUATION**

R. A. NORTH (Honeywell Systems and Research Center, Minneapolis, MN) IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2. New York, Institute of Electrical and Electronics Engineers, 1985, p. 868-872. refs

A crewstation design tool is reviewed which allows the human factors engineer to assess the attentional demands that will be imposed on the human operator given the tasks, times of performance, time-sharing demands, individual task difficulties, and human interfaces to be used. Attention and performance theories used in the workload model are discussed. A crewstation design problem example is used to illustrate the utility of the tool in pointing to automation needs and potential reallocation of tasks to display/control surfaces. Author

A86-28434

**WORKLOAD ASSESSMENT TECHNIQUES IN SYSTEM REDESIGN**

W. H. ACTON (Systems Research Laboratories, Inc., Dayton, OH) and M. S. CRABTREE (Universal Energy Systems, Inc., Dayton, OH) IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2. New York, Institute of Electrical and Electronics Engineers, 1985, p. 873-877. refs

This paper describes the workload assessment portion of a human factors effort to help develop an improved version of an existing military command, control, and communications system. In the phase, the current system was studied in order to identify specific design features that detrimentally affected operator performance and workload. Both subjective and objective workload data were collected. In the second phase of the effort, a mock-up version of the modified system (currently being developed) was evaluated for workload using a projective technique for subjective workload assessment (ProSWAT). Workload levels for the new system appeared acceptable, and operator acceptance was favorable. The paper emphasizes important considerations for the selection and application of workload metrics. Author

A86-28436

**COMPUTER-BASED TOOLS FOR COCKPIT DESIGN**

L. C. BUTTERBAUGH, J. K. MCBRIDE (USAF, Wright Aeronautical Laboratories, Wright-Patterson AFB, OH), and P. W. GRIFFITH (BDM Corp., Dayton, OH) IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2. New York, Institute of Electrical and Electronics Engineers, 1985, p. 886-891. refs

A collection of computer-based human factor design tools is described that can assist crew system engineers to evaluate various cockpit layouts in the preliminary design phase. The current capabilities include: reach analysis, workload analysis, system modeling, and display format design. The tools are accessed through a common interface called the User-Interface Module or UIM. A key feature of the UIM is its user-friendly menu-driven series of prompts to access a tool. The combined set of tools and the UIM make up the Computer-Aided Design and Evaluation (CADET) system. D.H.

A86-28437

**A METHODOLOGY FOR ADDRESSING SYSTEM OPERABILITY ISSUES**

R. N. CHARETTE and R. H. WALLACE (SofTech, Inc., Middletown, RI) IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2. New York, Institute of Electrical and Electronics Engineers, 1985, p. 900-905. refs

A methodology has been developed to deal with the 'system operability problem', which results from the exclusion of the human resource from the systems engineering process with the consequence that new systems often exhibit only marginal gains in effectiveness. The new methodology is called SOEM, for System

Operability Evaluation Methodology. It consists of three methods: the U.S. Air Force's IDEF (Integrated Computer Aided Manufacturing Definition Method), the U.S. Navy Research Laboratory's SCRIP (Software Cost Reduction Project) techniques, and the U.S. Air Force's simulation language and methodology SAINT (System Analysis of Integrated Networks of Tasks). SOEM is a fully integrated methodology which models the human, equipment, mission and operating environment aspects of a system. D.H.

A86-28438

**INCORPORATING HUMAN OPERATOR CONSIDERATIONS INTO EXISTING WEAPON SYSTEM ANALYSIS AND QUANTIFICATION CAPABILITIES**

C. M. HOYLAND, K. H. EVERS (SofTech, Inc., Dayton, OH), and D. E. SNYDER (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, OH) IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2. New York, Institute of Electrical and Electronics Engineers, 1985, p. 911-916. refs

An approach is discussed for combining two existing models to provide an analysis and simulation capability that combines the effects of the hardware/software as well as the human operator components of a weapon delivery system. A specific example is considered, based on an existing hardware/software simulation called SAMS (Surface-to-Air Missile Simulation) and a digital simulation of a human operator of a SAM system called SPAMSS (SAINT Performance Assessment Model of a SAM System). Through an integration process, the system's hardware/software and human operator components can be simulated without redesigning the simulations that already exist. D.H.

A86-28439#

**TARGET DESIGNATION BY SPEECH, JOYSTICK, AND TOUCH CONTROL FORMAT DESIGN IMPLICATIONS**

D. G. CURRY, J.M. REISING, and J. P. ZENYUH (USAF, Flight Dynamics Laboratory, Wright-Patterson AFB, OH) IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2. New York, Institute of Electrical and Electronics Engineers, 1985, p. 923-928. refs

This paper discusses an experiment comparing three different methods of positioning cursors on an interactive display device for use in future aircraft cockpits. The methods evaluated include standard joysticks, touch sensitive overlays, and an unconstrained voice recognition system. All comparisons were performed with subjects wearing both normal flight gear and equipment from the aircrew chemical protective ensemble, with all subjects performing a primary loading task similar in nature to flying a single-seat fighter. Format design implications for each control mode are discussed, with particular attention being focused on the difficulties involved in developing an effective voice cursor format. Author

A86-28440

**EVALUATION OF HELMET DISPLAY FORMATS**

J. DE MAIO, C. HARMAN, T. STRYBEL, R. PENNER, and J. BROCK (Honeywell Systems and Research Center, Minneapolis, MN) IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2. New York, Institute of Electrical and Electronics Engineers, 1985, p. 929-936. refs

Research was performed to evaluate the readability of flight control, navigation, and sensor pointing symbology on monocular, helmet-mounted display. Display readability was evaluated under two task-loading conditions: (1) single-task display reading only; and (2) multitask, head-down panel I/O task plus head-up target detection plus display reading. Two helmet display formats were evaluated. Configuration 1 was essentially of current attack helicopter symbology. Configuration 1 used reformatted symbology designed to reduce obscuration of the outside visual scene and to enhance readability. In the single-task conditions subjects scanned a static display for a target deviation of one parameter from a pre-assigned value. Dependent measures were error rate

and reaction time. In the multi-task experiment, reaction time was measured from completion of the detection task. Display reading accuracy was high for both display configurations. Results are discussed in terms of display readability. Author

**A86-28441****UTILIZING COMPUTER GRAPHICS DISPLAY TECHNOLOGY**

J. P. YORCHAK and J. E. ALLISON (Martin Marietta Corp, Denver, CO) IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2. New York, Institute of Electrical and Electronics Engineers, 1985, p. 937-942. refs

A review is given of recently published research concerned with cognition and computer graphics. Lessons learned from two experiments conducted at Martin Marietta Denver Aerospace, using complex interactive computer graphics displays, are discussed. In the first experiment, subjects tailored a tilted platter display of the earth (an azimuthal equidistant projection) to make it to their liking; they then had to make a true-false decision about a statement describing the altitude and coverage area of a particular satellite on each display. In the second experiment, some subjects were given additional cues in the form of polar and equatorial views from space of a satellite orbiting the earth (supplementing the standard Mercator projection showing the ground track). D.H.

**A86-28442****AUDITORY SIGNALS IN MILITARY AIRCRAFT - ERGONOMIC PRINCIPLES VERSUS PRACTICE**

T. J. DOLL and D. J. FOLDS (Georgia Institute of Technology, Atlanta) IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2. New York, Institute of Electrical and Electronics Engineers, 1985, p. 958-965. refs  
(Contract F33615-82-D-0601)

The complete ensembles of auditory signals in selected USAF aircraft (the F-4D, F-15, two models of the F-16, the C-5, and the C-141) are described and evaluated. Human factors research related to the design of speech and non-speech auditory signals is reviewed. Major findings are: that auditory signals are not well standardized among the aircraft, even between those with similar combat roles; that a relatively large number of non-speech auditory signals are used, which may make it difficult for the aircrew to recall the meanings of all the signals; that some non-speech signals are sufficiently similar that they may be confused, particularly in high workload and stressful conditions; and that the criticality of the warnings is not reliably indicated by any characteristics of the signals. Four problem areas requiring further research are discussed: reduction of signal loudness, enhancement of the distinctiveness and masking resistance of non-speech signals, effects of concurrent warning signals on aircrew performance, and additional uses of auditory information. Author

**A86-28444****DYNAMIC RETRAINING APPROACHES FOR AN AIRBORNE SPEECH RECOGNITION SYSTEM**

R. A. NORTH and K. GRAFFUNDER (Honeywell Systems and Research Center, Minneapolis, MN) IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2. New York, Institute of Electrical and Electronics Engineers, 1985, p. 970-974.  
(Contract F33615-83-C-3608)

Results of a preliminary investigation of the viability of dynamic updating of a word recognizer are reported. An isolated word recognizer was used to capture original templates and task oriented utterances for an aircraft cockpit radio frequency selection task performed by a group of student pilots. The task-oriented utterances were produced in low and high workload conditions to represent differing operational stress. Match scores between original templates and real-time utterances were compared with match scores between real-time vs. real-time utterances. Two strategies were formulated for improvement of match scores using certain

real-time utterances as new templates, and one is demonstrated with laboratory data. Author

**A86-28445****SPEECH COMPRESSION AS A POTENTIAL AID TO AUTOMATED VOICE WARNINGS IN THE COCKPIT**

K. M. DRESEL (Boeing Military Airplane Co., Wichita, KS), D. J. GARDNER, A. APRILL, D. DEFROUTER, M. KEITH (Kearney State College, NE) et al. IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2. New York, Institute of Electrical and Electronics Engineers, 1985, p. 975-978.

Previous research has investigated compressed speech in the continuous speed context but has not investigated the effect of compression on short phrases such as might be uttered by an automated voice warning system. The potential benefits of this technology are decreased system memory requirements, decreased message transmission time or increased message length. Undergraduates (N = 137) were tested in small groups to determine intelligibility of aviation-related short phrases. The design involved three rates of speech compression, three levels of pitch adjustment, male or female speaker, and male or female listeners. Significant differences were found for amount of compression, amount of pitch adjustment and the compression x pitch x sex of speaker interaction. These results are interpreted as supporting the use of compressed speech for automated voice warning systems in the cockpit. Author

**A86-28446\*** Psycho-Linguistic Research Associates, Menlo Park, Calif.

**SELECTING COCKPIT FUNCTIONS FOR SPEECH I/O TECHNOLOGY**

C. A. SIMPSON (Psycho-Linguistic Research Associates, Menlo Park, CA) IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2. New York, Institute of Electrical and Electronics Engineers, 1985, p. 979-986. Army-supported research. refs  
(Contract NAS2-11341)

A general methodology for the initial selection of functions for speech generation and speech recognition technology is discussed. The SCR (Stimulus/Central-Processing/Response) compatibility model of Wickens et al. (1983) is examined, and its application is demonstrated for a particular cockpit display problem. Some limits of the applicability of that model are illustrated in the context of predicting overall pilot-aircraft system performance. A program of system performance measurement is recommended for the evaluation of candidate systems. It is suggested that no one measure of system performance can necessarily be depended upon to the exclusion of others. Systems response time, system accuracy, and pilot ratings are all important measures. Finally, these measures must be collected in the context of the total flight task environment. D.H.

**A86-28453****WICKENS' RESOURCE ALLOCATION MODEL - IMPLICATIONS FOR THE DESIGN OF HUMAN-MACHINE SYSTEMS**

L. A. WHITAKER (Missouri-St. Louis, University, St. Louis) IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2. New York, Institute of Electrical and Electronics Engineers, 1985, p. 1040-1044. refs

A fundamental question of systems design is examined: can one person operate a given system or will it take two? The answer depends on the load that the system imposes on the operator. The model of Wickens, Sandry and Vidulich (1983) suggests that a single operator can draw from a number of separate internal resources to perform a complex task (such as fly an aircraft, provide air traffic control, or execute underwater maintenance tasks). If this model is correct, then systems can be designed to make optimal use of these separate resources within a single operator. The model is discussed and available evidence tending to support or refute it is examined. Implications for the design of air traffic control communications are noted. D.H.

**A86-28513**  
**IMPROVING INTELLIGIBILITY IN AUDIO DISTRIBUTION SYSTEMS**

P. J. GRECO (Telephonics Corp., Huntington, NY) IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2. New York, Institute of Electrical and Electronics Engineers, 1985, p. 1564-1569. refs

Some of the most current techniques for increasing intelligibility in audio distribution systems operating in high ambient noise environments (engine noise, weapons launch, helicopter rotor slap, etc.) are examined. As part of a program to develop the new Tri-Service Digital Audio Distribution System (DADS), a systems approach has been taken to improving intelligibility. The solutions include better noise canceling microphones, active signal enhancement at the audio input, and both passive and active noise canceling devices as the headset. Initial data show that intelligibility scores of better than 75 percent in pink noise environments greater than 115 dB SPL have been achieved.

D.H.

**A86-28801**  
**ADVANCED SPACESUIT GLOVE DESIGN**

W. M. CLAPP (MIT, Cambridge, MA) IN: The case for Mars II. San Diego, CA, Univelt, Inc., 1985, p. 469-488. refs (AAS 84-175)

A lightweight pressure suit glove for the Martian environment has been developed based on the elastic pressurization concept. Elastic pressurization makes it possible to apply a mechanical counterpressure to the hand which is equal to the pressure of the air that a human would breathe in a conventional pressure suit. It is shown that the glove offers superior dexterity and tactile feedback in comparison with the Apollo A7L-B glove, and is less fatiguing to wear. Covering the glove with a protective layer to guard against micrometeoroids and radiation was found to be unnecessary in the case of the Martian environment, and the hand need only be protected from the comparatively moderate extremes of temperature. It is suggested that a full-length pressure suit could be developed on the basis of the elastic pressurization concept.

I.H.

**A86-28806**  
**THE RETRIEVAL, STORAGE, AND RECYCLING OF WATER FOR A MANNED BASE ON MARS**

D. JONES, M. R. LAPOINTE, H. M. HART, A. LARSON (Colorado, University, Boulder), and C. F. WEBB (General Electric Co., Beverly, MA) IN: The case for Mars II. San Diego, CA, Univelt, Inc., 1985, p. 537-556. refs (AAS 84-180)

A system is described for supplying fresh water - a resource of primary importance to the success of a permanently manned base on Mars - for a 12-18 person base located in the Martian northern hemisphere. The integrated system provides scavenging of all water from waste gases, production of liberal quantities of buffer gas, the supply of water ice from the remnant northern cap during northern hemisphere summers, and efficient water usage and recycling. The scavenging system captures moisture with a molecular sieve and removes argon and oxygen from the atmosphere and airlock gases. Ice is shipped from a polar outpost via robot rovers to provide for expansion of water resources. The water recycling system is based on a Thermoelectric Integrated Membrane Evaporation system which purifies wastewater to drinking water standards. The load on the purification system is reduced through the use of a gray water system for washwater applications. Although no single system is enough to fulfill the water requirements of a permanently manned base on Mars, the integrated system can efficiently close the water cycle of the base.

D.H.

**A86-28807**  
**WATER SUPPLY FOR A MANNED MARS BASE**

W. M. CLAPP (MIT, Cambridge, MA) IN: The case for Mars II. San Diego, CA, Univelt, Inc., 1985, p. 557-566. refs (AAS 84-181)

A water supply system for a manned Mars base is designed. Water is extracted from the Martian air by compressing it, then refrigerating it at constant pressure. When a compression ratio of 1.66 is selected, the energy required to produce one kilogram of water is minimized at 69.92 kw-Hr, of which 30.70 kw-Hr is used for the compression in a single-stage axial compressor of efficiency 0.98, and 39.22 kw-Hr is used for refrigeration in a vapor-cycle refrigerator using subcooling to achieve a coefficient of performance of 1.85. The system mass is approximately 20 kilograms, and the capacity of the system to produce water can be expanded by operating it for longer periods of time than the six hours per day upon which the above calculations are based.

Author

**A86-28810**  
**MASS-BALANCE MODEL FOR A CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEM ON MARS**

T. R. CAUDILL (Colorado, University, Boulder) IN: The case for Mars II. San Diego, CA, Univelt, Inc., 1985, p. 611-626. refs (AAS 84-184)

The colonization of Mars is an instrumental step in the future expansion of the human race into the outer reaches of the solar system. One of the most difficult problems facing long term colonization of Mars is the supply of vital resources. This paper describes a model using a Controlled Ecological Life Support System (CELSS) which would help alleviate many logistical problems. The model outlines the usage of available Martian resources to maintain life. The results show that a closed system is theoretically feasible but there are many technical problems which must be solved before such a system can be utilized.

Author

**A86-28865**  
**REVIEW AND EVALUATION OF EMPIRICAL RESEARCH IN TROUBLESHOOTING**

N. M. MORRIS and W. B. ROUSE (Search Technology, Inc., Norcross, GA) Human Factors (ISSN 0018-7208), vol. 27, Oct. 1985, p. 503-530. refs (Contract N66001-83-R-0340)

Following an analysis of task requirements for successful troubleshooting, this paper considers human abilities, limitations, and inclinations with respect to troubleshooting. Research on the effects of various approaches to the training of troubleshooting is reviewed. The extent to which troubleshooting performance is influenced by instruction is highly related to the level of explicitness of action-related information provided. An approach that forces people to use their system knowledge explicitly is a promising alternative to explicit instruction in algorithms or diagnostic heuristics, but such an approach is not supported by data from transfer studies. A combination of the two approaches may be the most effective means of teaching troubleshooting, and research evaluating the soundness of this idea should be conducted.

Author

**A86-29092**  
**HEAD-UP/HEAD-DOWN TRANSITION - MEASUREMENT OF TRANSITION TIMES**

J.-P. R. MENU (Centre d'Etudes et de Recherches de Medecine Aerospatiale, Paris, France) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, March 1986, p. 218-222. DRET-supported research. refs

A method to measure transition times between a head-up display (HUD) signal and a response given to a head-down display (HDD) was developed, using a three-segmented paradigm and testing various vocal and manual arrangements in a fighter aircraft mock-up. The shortest transition times were obtained for voice responses (1600 msec between a HUD signal and a simple response to the HDD). A comparison of the perception and

transition times of a 'positive' contrast (green symbols on black background) with a 'negative' contrast (black symbols on green) has indicated both shorter perception and shorter transition times for the positive contrast. This method permits of the effects evaluation of changes in psychological conditions (such as heavier information processing) and physiological conditions (changing accommodation, gaze axis, and convergence) of a dynamic aeronautical environment on the speeds of acquisition and processing of information. I.S.

**A86-29100**

**SHIP/RIG PERSONNEL ABANDONMENT AND HELICOPTER CREW/PASSENGER IMMERSION SUITS - THE REQUIREMENTS IN THE NORTH ATLANTIC**

C. J. BROOKS (Department of National Defence, Maritime Command, Halifax, Canada) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, March 1986, p. 276-282. refs

**A86-29497**

**PROCESSING AND PACKAGING - PREPARATION TECHNIQUES ENHANCE MEALS ON THE SHUTTLE**

C. PREBLE Commercial Space (ISSN 8756-4831), vol. 1, Winter 1986, p. 58, 59, 61.

In addition to being nutritious, NASA Space Shuttle menu items are expected to be appealing and easily digestible. It is noted that it is not easy to predict how foods will taste in space; space food is also subject to engineering restrictions concerning its weight and compactibility, as well as its resistance to temperature and pressure changes, acceleration, and vibration. Packaging must protect and stabilize food for up to 30 days, as well as facilitate meal preparation and disposal of leftovers. Typical space foods encompass rehydratable beverages and solids, together with irradiated, freeze-dried, and thermostabilized solids. Meal components are held onto trays by friction fit, and magnets keep the utensils from floating away. O.C.

**N86-20638#** Lone Star Army Ammunition Plant, Texarkana, Tex.

**EVALUATION OF MATERIALS FOR THERMAL PROTECTION**

J. I. MARTIN /In Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 2 p 1671-1687 Aug. 1984

(AD-P004901) Avail: NTIS HC A99/MF E03 CSCL 13L

An on-going program to provide improved thermal protection for pyrotechnic operators is described. The critical first step in providing improved personal protection is to insure that the best available materials is used to provide the outer shield. Researchers and manufacturers are continually introducing new materials, but they have not been tested against the special kind of thermal threat presented by pyrotechnics. A method of comparative testing of fabrics and other materials is described, and the results obtained with some of the latest available varieties of fabrics are discussed. Author (GRA)

**N86-21146** Central Electricity Generating Board, London (England).

**RADIOPROTECTION UPDATE**

J. LECLERCQ 14 Nov. 1985 19 p Transl. into ENGLISH from Epure (France), no. 7, Jul. 1985 p 49-57

(BLL-CE-TRANS-8223-(9022-09)) Avail: British Library Lending Div., Boston Spa, Engl.

The problems involved in the radiation protection of nuclear power plant workers are illustrated. It is shown how and the safety of these workers, which is already ensured by the strict observance of public health requirements relating to occupational irradiation, can be improved by means of rational management. Radiation dosage, radiation distribution in the plants, reactor coolant chemistry, shutdown procedures, and nuclear fuels are among the topics discussed. R.J.F.

**N86-21147\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

**MOBILE REMOTE MANIPULATOR VEHICLE SYSTEM Patent Application**

H. G. BUSH, M. M. MIKULAS, JR., R. E. WALLSOM, and J. K. JENSEN, inventors (to NASA) 31 Jul. 1985 27 p (NASA-CASE-LAR-13393-1; NAS 1.71:LAR-13393-1; US-PATENT-APPL-SN-760799) Avail: NTIS HC A03/MF A01 CSCL 05H

A mobile remote manipulator system is disclosed for assembly, repair and logistics transport on, around and about a space station square bay truss structure. The vehicle is supported by a square track arrangement supported by guide pins integral with the space station truss structure and located at each truss node. Propulsion is provided by a central push-pull drive mechanism that extends out from the vehicle one full structural bay over the truss and locks drive rods into the guide pins. The track switches allow the vehicle to travel in two (2) orthogonal directions over the truss structure which coupled with the bi-directional drive, allow movement in four (4) directions on one plane. The top layer of this tri-layered vehicle is a logistics platform. This platform is capable of 360 degrees of rotation and will have two (2) astronaut foot restraint platforms 18 and a space crane integral. NASA

**N86-21148#** Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

**INSTRUMENT LIGHTING LEVELS AND AN/AVS-6 USAGE Final Report**

W. M. SLUSHER Aug. 1985 48 p

(Contract AF PROJ. 718-4)

(AD-A161538; AAMRL-TR-85-055) Avail: NTIS HC A03/MF A01 CSCL 14B

Two experimental investigations were performed to determine the effects of the AN/AVS-6 Aviators Night Vision Imaging System (ANVIS) display luminance on the setting of instrument lighting levels. In a laboratory study using a simulated A-10 night lighting mockup, eight subjects adjusted instrument lighting levels to what they judged to be the minimum required for safe readability of instruments. Prior to the adjustment of instrument lighting, the subjects were preadapted to various ambient lighting conditions, including a simulated ground luminance of a full moonlit night and two simulated ANVIS display luminances. Results show primary instrument lighting levels were set higher, by a factor of 1.6 following adaptation to the 1.0 foot lambert (ft-L) ANVIS luminance test condition when compared to lighting levels set following adaptation to a 0.00065 ft-L ambient luminance condition. GRA

**N86-21149#** Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.

**HUMAN ENGINEERING GUIDELINES FOR THE EVALUATION AND ASSESSMENT OF VIDEO DISPLAY UNITS**

W. E. GILMORE Jul. 1985 537 p

(TI85-016435; NUREG/CR-4227) Avail: NTIS HC A23/MF A01

The Nuclear Regulatory Commission is provided with a single source that documents known guidelines for conducting formal Human Factors evaluation of Video Display Units (VDUs). The handbook is a cookbook of acceptance guidelines for the reviewer faced with the task of evaluating VDUs already designed or planned for service in the control room. The areas addressed are video displays, controls, control/display integration, and workplace layout. Guidelines relevant to each of those areas are presented. The existence of supporting research is also indicated for each guideline. A Comment section and Method for Assessment section are provided for each set of guidelines. Author

**N86-22112\*** National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

**DROP FOOT CORRECTIVE DEVICE Patent**

B. C. DEIS, inventor (to NASA) 28 Jan. 1986 5 p Continuation of US-Patent-Appl-SN-876298, filed 9 Feb. 1978, abandoned (NASA-CASE-LAR-12259-2; US-PATENT-4,566,447; US-PATENT-APPL-SN-280152; US-PATENT-CLASS-128-80-E) Avail: US Patent and Trademark Office CSCL 05H

A light weight, economical device to alleviate a plurality of difficulties encountered in walking by a victim suffering from a drop foot condition is discussed. A legband girdles the leg below the knee and above the calf providing an anchor point for the upper end of a ligament having its lower end attached to a toe of a shoe or a toe on the foot. The ligament is of such length that the foot is supported thereby and retained in a normal position during walking.

Official Gazette of the U.S. Patent and Trademark Office

**N86-22113\*#** Jet Propulsion Lab., California Inst. of Tech., Pasadena.

**DIRECT MODEL REFERENCE ADAPTIVE CONTROL OF A FLEXIBLE ROBOTIC MANIPULATOR**

D. R. MELDRUM 15 Dec. 1985 90 p refs (Contract NAS7-918)

(NASA-CR-176659; JPL-PUB-85-100; NAS 1.26:176659) Avail: NTIS HC A05/MF A01 CSCL 05H

Quick, precise control of a flexible manipulator in a space environment is essential for future Space Station repair and satellite servicing. Numerous control algorithms have proven successful in controlling rigid manipulators with collocated sensors and actuators; however, few have been tested on a flexible manipulator with noncollocated sensors and actuators. In this thesis, a model reference adaptive control (MRAC) scheme based on command generator tracker theory is designed for a flexible manipulator. Quicker, more precise tracking results are expected over nonadaptive control laws for this MRAC approach. Equations of motion in modal coordinates are derived for a single-link, flexible manipulator with an actuator at the pinned-end and a sensor at the free end. An MRAC is designed with the objective of controlling the torquing actuator so that the tip position follows a trajectory that is prescribed by the reference model. An appealing feature of this direct MRAC law is that it allows the reference model to have fewer states than the plant itself. Direct adaptive control also adjusts the controller parameters directly with knowledge of only the plant output and input signals. Author

**N86-22114\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

**RECONFIGURABLE WORK STATION FOR A VIDEO DISPLAY UNIT AND KEYBOARD Patent Application**

N. L. SHIELDS (Essex Corp.), M. F. FAGG (Essex Corp.), D. E. HENDERSON (Essex Corp.), and F. D. ROE, inventors (to NASA) 5 Dec. 1985 17 p

(NASA-CASE-MFS-26009-1SB; NAS 1.71:MFS-26009-1SB; US-PATENT-APPL-SN-805011) Avail: NTIS HC A02/MF A01 CSCL 05H

A reconfigurable workstation is illustrated having video, keyboard, and hand operated motion controller capabilities. The workstation includes main side panels between which a primary work panel is pivotally carried in a manner in which primary work panel may be adjusted and set in a negatively declined or positively inclined position for proper forearm support while operating hand controllers. A keyboard table supports a keyboard in such a manner that the keyboard is set in a positively inclined position with respect to the negatively declined work panel. Various adjustable devices are provided for adjusting the relative declinations and inclinations of the work panels, tables, and visual display panels. NASA

**N86-22115#** New Mexico State Univ., Las Cruces. Behavioral Engineering Lab.

**A MULTIPLE-REGRESSION MODEL OF PILOT PERFORMANCE IN VERTICAL AND TRANSLATIONAL FLIGHT**

J. WIEDEMANN and S. N. ROSCOE May 1985 102 p

(Contract N00014-81-K-0439)

(AD-A161364; BEL-85-2/ONR-85-2) Avail: NTIS HC A06/MF A01 CSCL 01D

An experiment was conducted to advance the development of a multiple regression model of VTOL pilot performance as a function of various control/display system and flight mission variables. Second-order response surfaces as a function of two control system design variables (translational control order and vertical control gain reduction factor) and three downward-looking display design variables (horizontal position error magnification, translational prediction time, and translational tracking mode) were derived from Pilot performances on each of three mission scenarios. The optimum values for each of the five system design variables were determined for each scenario independently using the same central composite experimental design with three groups of four subjects each. Comprehensive analyses of variance and canonical analyses were used to refine the fitted surfaces to determine the true nature of the pilot performance effects for each flight scenario and to select a single set of system design parameters that would yield near-optimum performances on all three scenarios. GRA

**N86-22116#** Federal Aviation Administration, Washington, D.C. Office of Aviation Medicine.

**EVALUATION OF A PASSENGER MASK MODIFIED WITH A REBREATHING BAG FOR PROTECTION FROM SMOKE AND FUMES**

E. A. HIGGINS, J. T. SALDIVAR, P. J. LYNE, and G. E. FUNKHOUSER Oct. 1985 25 p

(AD-A162473; DOT/FAA/AM-85-10) Avail: NTIS HC A02/MF A01 CSCL 06K

A series of experiments were conducted in an altitude chamber at ground level, 8,000 ft, 14,000 ft, and 21,500 ft, both with and without exercise, to evaluate the potential for providing protection from smoke and fumes for airline passengers while wearing a standard continuous-flow passenger mask modified by the addition of a rebreather bag. It was determined that it would provide increased protection for those individuals who had tidal volumes of 1.5 L or less. However, it would not function properly for those individuals who had tidal volumes greater than 1.5 L. Either the carbon dioxide levels were too great (above 15 mm Hg partial pressure) or the rebreather bag collapsed. These results indicate that the addition of the rebreather bag to the passenger mask has the potential for providing protection from smoke and fumes, but the system must have appropriately balanced valve resistances and appropriately sized valve openings. This critical balance has not yet been achieved for those individuals with large tidal volumes. GRA

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### PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

**A86-26671**

**PHOTOMETRIC AND PHOTO ACOUSTIC MEASUREMENT OF THE ABSORBANCE OF MICRO-ORGANISMS AND ITS RELATION TO THE MICRO-ORGANISM-GRAIN HYPOTHESIS**

S. YABUSHITA, K. WADA (Kyoto University, Japan), T. INAGAKI (Osaka Kyoiku University, Tennoji, Japan), and T. ITO (Tokyo University, Japan) Astrophysics and Space Science (ISSN 0004-640X), vol. 117, no. 2, Dec. 1985, p. 401-406. refs

Absorption of E. Coli and other microorganisms are measured by standard optical spectroscopy and by the photoacoustic method. The former method does not yield an extinction peak at 220 nm

but yields a weak one at 270 nm, while with the latter method absorption peaks at 220 nm and a weaker one at 270 nm have been found for the spore of *Bacillus subtilis*. The well-known amino acid tryptophan shows absorption peaks at 220 and 280 nm. It is tentatively concluded that for the microorganism model of interstellar grains to be viable, they may have to be spores rather than ordinary cells. Author

**A86-28721\*** Rensselaer Polytechnic Inst., Troy, N.Y.  
**PHOTOCHEMICAL REACTIONS IN INTERSTELLAR GRAINS**  
**PHOTOLYSIS OF CO, NH<sub>3</sub>, AND H<sub>2</sub>O**

V. K. AGARWAL, J. P. FERRIS (Rensselaer Polytechnic Institute, Troy, NY), W. SCHUTTE, J. M. GREENBERG (Leiden, Rijksuniversiteit, Netherlands), R. BRIGGS (New York State, Dept. of Health, Albany) et al. *Origins of Life* (ISSN 0302-1688), vol. 16, no. 1, 1985, p. 21-40. refs  
 (Contract NGR-33-018-148)

The interstellar grains are currently considered to be the basic building blocks of comets and, possibly, meteorites. To test this theory, a simulation of the organic layer accreted onto interstellar dust particles was prepared by slow deposition of a CO:NH<sub>3</sub>:H<sub>2</sub>O gas mixture on an Al block at 10 K, with concomitant irradiation with vacuum UV. The results of the HPLC and IR analyses of the nonvolatile residue formed by photolysis at 10 K are compared with those observed at 77 K and 298 K. Some of the compounds that may be present on the surfaces of interstellar dust particles have been identified, and some specific predictions concerning the types of molecular species present in comets could be drawn. The results also suggest that photochemical reactions may have been important for the formation of meteorite components. The implication of the findings to the questions of the source of organic matter on earth and the origin of life are discussed. Author

**A86-28722**  
**TRACE ELEMENTS IN CHEMICAL EVOLUTION. I. II -**  
**SYNTHESIS OF AMINO ACIDS UNDER SIMULATED PRIMITIVE**  
**EARTH CONDITIONS IN THE PRESENCE OF TRACE**  
**ELEMENTS**

K. KOBAYASHI and C. PONNAMPERUMA (Maryland, University, College Park) *Origins of Life* (ISSN 0302-1688), vol. 16, no. 1, 1985, p. 41-55, 57-67. refs

Studies concerned with the importance of trace elements in biochemical evolution are presented together with some new experimental evidence on the role of metals in the synthesis of biomolecules. The role of individual elements as either integral parts of the enzyme active centers, as the constituents of redox complexes, or as Lewis acids in enzymatic reactions is discussed. The reasons for the universal essentiality of Fe, Zn, Mo, and some other elements are seen in the combination of the relative abundance of these elements in the primeval ocean and their useful bioorganic characteristics. In an electric discharge experiment, the presence of trace metals was shown to significantly increase yields of complex amino acids (e.g., valine and glutamic acid) in the primordial-like atmosphere of CH<sub>4</sub>, NH<sub>3</sub>, and H<sub>2</sub>O, compared with the metal-less condition. The mechanism for this metal-effected promotion is seen in the first fixation of some organic compounds by Fe and Mo in a gas phase, thus facilitating their transfer into aqueous phase, where Zn may have catalyzed reactions in the water phase. I.S.

**A86-28723\*** Alabama Univ., Birmingham.  
**RATIONALIZATION OF SOME GENETIC ANTICODONIC**  
**ASSIGNMENTS**

J. C. LACEY, JR., L. M. HALL, and D. W. MULLINS, JR. (Alabama, University, Birmingham) *Origins of Life* (ISSN 0302-1688), vol. 16, no. 1, 1985, p. 69-79. refs  
 (Contract NGR-01-010-001)

The hydrophobicity of most amino acids correlates well with that of their anticodon nucleotides, with Trp, Tyr, Ile, and Ser being the exceptions to this rule. Using previous data on hydrophobicity and binding constants, and new data on rates of esterification of polyadenylic acid with several N-acetylaminoacyl imidazolides, several of the anticodon assignments are rationalized.

Chemical reasons are shown supporting the idea of the inclusion of the Ile in the catalog of biological amino acids late in the evolution, through a mutation of the existing tRNA and its aminoacyl-tRNA-synthetase. It was found that an addition of hexane increases the incorporation of hydrophobic Ac-Phe into poly-A, in support of the Fox (1965) and Oparin (1965) emphasis on the biogenetic importance of phase-separated systems. I.S.

**A86-28724**  
**LIMITS ON ASYMMETRIC ORTHOPOSITRONIUM FORMATION**  
**IN HIGH Z OPTICALLY ACTIVE MOLECULES**

J. VAN HOUSE, A. RICH (Michigan, University, Ann Arbor), and P. W. ZITZEWITZ (Michigan, University, Dearborn) *Origins of Life* (ISSN 0302-1688), vol. 16, no. 1, 1985, p. 81-87. refs

New experimental results are presented for testing the Vester-Ulbricht (V-U) hypothesis, which states that the observed signs of biological chirality in the amino acids and sugars are caused by asymmetric radiolysis by beta particles. The experimental asymmetries, expressed in terms of A(Ps) values, created in amino acid samples by bombardment by a beam of low-energy positrons with a net helicity, were correlated with theoretically predicted values of A(Ps). The A(Ps) values for two high-Z amino acids, selenocystine and thyroxine, were found to be below the value of 0.0003, excluding the part of the theoretically predicted range of A(Ps). The experimental limit on the A(R) value, derived from the values of A(Ps), was found to be above 10 to the -9th, thirty times lower than a previous measurement in leucine (Z = 6), but still not small enough to rule out the V-U hypothesis. I.S.

**N86-21150\*#** National Aeronautics and Space Administration, Washington, D.C.

**PUBLICATIONS OF THE EXOBIOLOGY PROGRAM FOR 1984:**  
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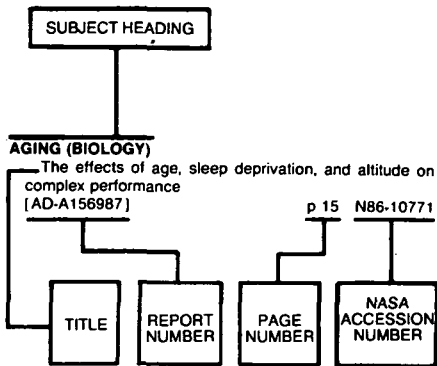
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A bibliography of NASA exobiology programs is given. Planetary environments; chemical evolution; organic geochemistry; extraterrestrial intelligence; and the effect of planetary solar and astrophysical phenomena on the evolution of complex life in the universe are among the topics listed. R.J.F.

**Typical Subject Index Listing**



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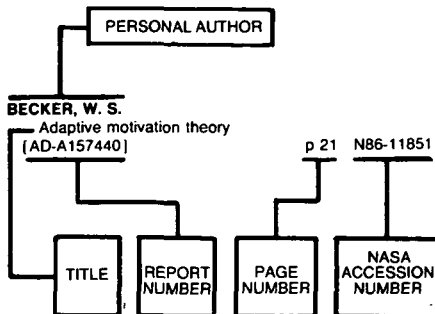
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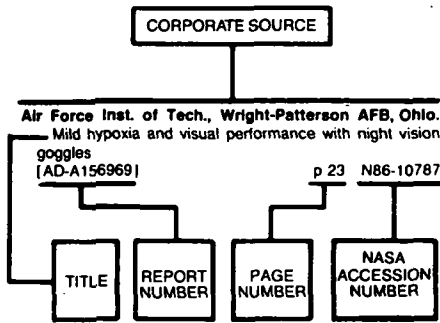
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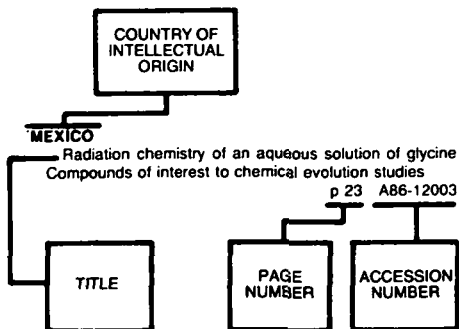
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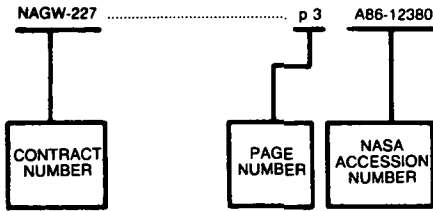
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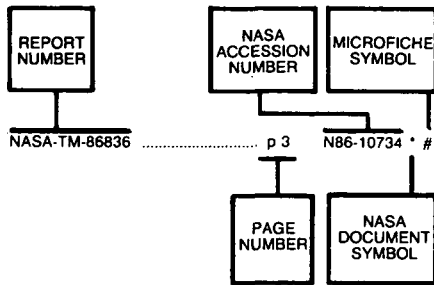
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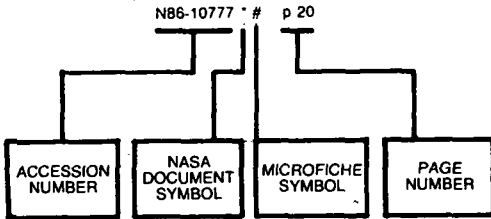
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