



Aerospace Medicine
and Biology
A Continuing
Bibliography
with Indexes

NASA SP-7011(299)
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Aerospace Medicine and Biology

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ACCESSION NUMBER RANGES

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AEROSPACE MEDICINE AND BIOLOGY

**A CONTINUING BIBLIOGRAPHY
WITH INDEXES**

(Supplement 299)

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 1987 in

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



Scientific and Technical Information Office

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INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* lists 96 reports, articles and other documents announced during June 1987 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.

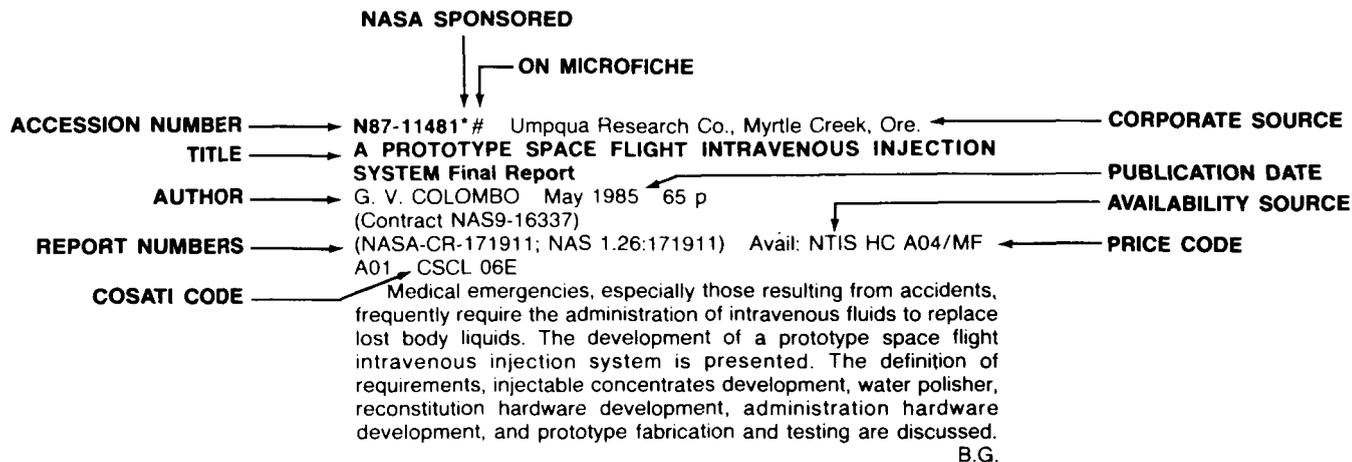
An annual index will be prepared at the end of the calendar year covering all documents listed in the 1987 Supplements.

Information on the availability of cited publications including addresses of organizations and NTIS price schedules is located at the back of this bibliography.

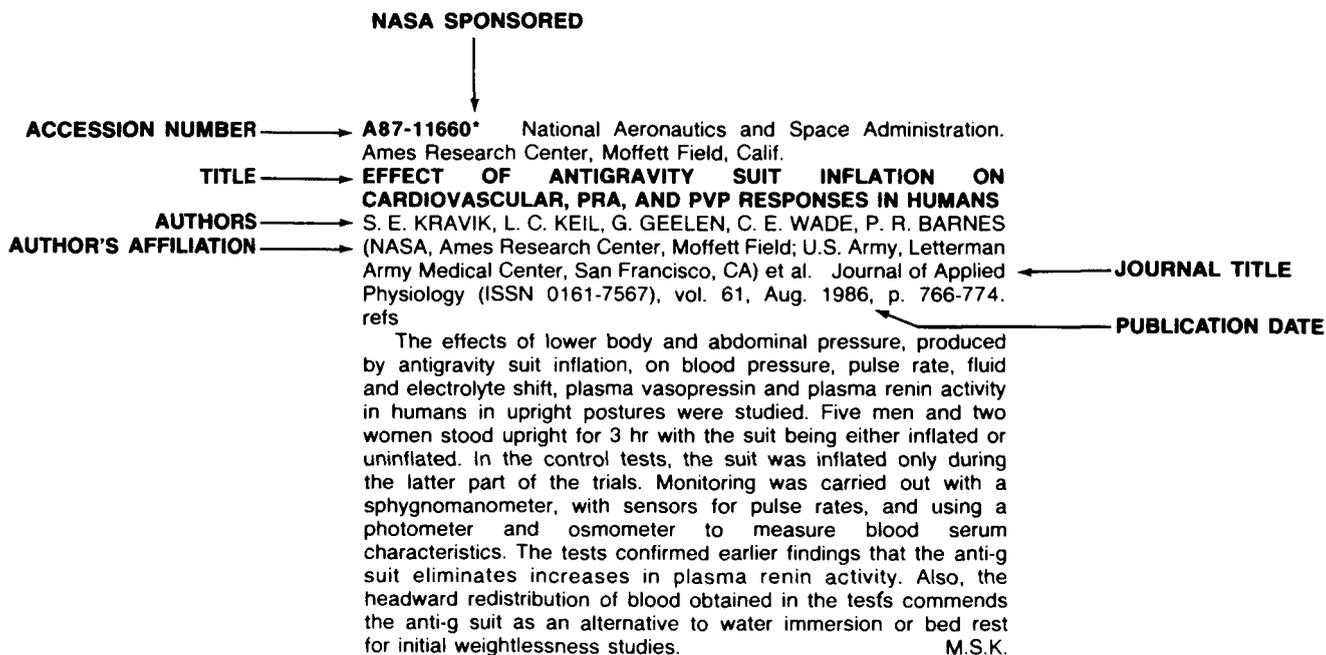
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TYPICAL REPORT CITATION AND ABSTRACT



TYPICAL JOURNAL ARTICLE CITATION AND ABSTRACT



AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 299)

JULY 1987

51

LIFE SCIENCES (GENERAL)

A87-27972

REGIONAL PULMONARY BLOOD FLOW DURING 96 HOURS OF HYPOXIA IN CONSCIOUS SHEEP

D. C. CURRAN-EVERETT, K. MCANDREWS, and J. A. KRASNEY (New York, State University, Buffalo) *Journal of Applied Physiology* (ISSN 0161-7567), vol. 61, Dec. 1986, p. 2136-2143. refs (Contract NIH-HL-36126; NIH-HL-27683; NIH-HL-28542)

The relationship between the pulmonary arterial pressor response to hypoxia and the regional pulmonary blood flow was studied in conscious standing ewes during 96 h of normobaric hypoxia (effected by N₂ dilution in an environmental chamber). Regional pulmonary blood flow was calculated by injecting 15-micron radiolabeled microspheres into the superior vena cava. Pulmonary arterial pressure was found to increase from 12 torr during normoxia to 19-22 torr throughout hypoxia. However, pulmonary blood flow did not shift among dorsal and ventral regions, nor were there interlobar shifts of blood flow. The data suggest that sheep and other species, such as dogs, that may possess a narrow perfusion gradient during normoxia, may be inappropriate as models for studying the mechanisms of alterations in regional pulmonary perfusion during hypoxia. I.S.

A87-27973

UPPER AIRWAY DILATING FORCES DURING WAKEFULNESS AND SLEEP IN DOGS

ALVIN S. F. GOH, FAIQ G. ISSA, and COLIN E. SULLIVAN (Sydney, University, Australia) *Journal of Applied Physiology* (ISSN 0161-7567), vol. 61, Dec. 1986, p. 2148-2155. Research supported by the National Health and Medical Research Council of Australia. refs

The effects of sleep and sleep state on the overall activity of the upper airway muscles were studied in dogs by measuring the pressure within an isolated segment of the upper airway (between the nares and the midtrachea) during wakefulness (W), slow-wave sleep (SWS), and REM sleep. During SWS, the mean baseline level of the upper airway pressure (P_{ua}) increased by about 2.1 cm H₂O, in comparison to the W period, while the mean inspiratory-related phasic change in P_{ua} decreased significantly. During REM sleep, both the baseline level of P_{ua} and, especially, the phasic change in P_{ua} varied widely. The data indicate that, in dogs, the sum of forces which dilate the upper airway during the W period decreases during both SWS and REM sleep. However, the consistent coupling between the inspiratory drive and the upper airway dilation during W persists in SWS but is frequently uncoupled during REM sleep. I.S.

A87-28088* Chicago Univ., Ill.

ENVIRONMENTAL TRENDS IN EXTINCTION DURING THE PALEOZOIC

J. JOHN SEPKOSKI, JR. (Chicago, University, IL) *Science* (ISSN 0036-8075), vol. 235, Jan. 2, 1987, p. 64-66. refs (Contract NSF DEB-81-08890; NAG2-282)

Extinction intensities calculated from 505 Paleozoic marine assemblages divided among six environmental zones and 40 stratigraphic intervals indicate that whole communities exhibit increasing extinction offshore but that genera within individual taxonomic classes tend to have their highest extinction onshore. The offshore trend at the community level results from a concentration of genera in classes with low characteristic extinction rates in nearshore environments. This finding is consistent with the ecologic expectation that organisms inhabiting unpredictably fluctuating environments should suffer more extinction than counterparts living under more predictably equitable conditions.

Author

A87-28331#

CHANGES OF CARDIOPULMONARY RESPONSES OF RATS DURING CENTRIFUGAL ACCELERATIONS

MASAMICHI SUDOH, SACHIO IKAWA, MIHARU KOHNO (Jikei University, Tokyo, Japan), and HISASHI SAIKI (St. Marianna University, Kawasaki, Japan) *Japanese Journal of Aerospace and Environmental Medicine* (ISSN 0387-0723), vol. 23, Sept. 1986, p. 59-67. In Japanese, with abstract in English. refs

Female rats were exposed to -G_x, +G_z, then -G_z forces from 3-6 g for 30 min to evaluate the effects of hypergravity on cardiopulmonary responses. The rats were monitored for ECG, heart rate (HR), mean arterial blood pressure (MAP) and impedance pneumogram data. HR decreased during -G_z exposure and was otherwise steady, while the MAP decreased with each type of g-exposure. An increase in the respiration rate observed during -G_x exposure was proportional to the magnitude of acceleration, and was also evident during +G_z acceleration of 6 g. M.S.K.

A87-28838

COMPARISON OF EPIDURAL PRESSURE IN LIVE ANESTHETIZED AND POST-MORTEM PRIMATES

GUY S. NUSHOLTZ (Michigan, University, Ann Arbor) and CARLEY WARD (Biodynamic Engineering, Inc., Pacific Palisades, CA) *Aviation, Space, and Environmental Medicine* (ISSN 0095-6562), vol. 58, Jan. 1987, p. 9-17. refs

A87-28839

GLUTAMIC OXALACETIC AND GLUTAMIC PYRUVIC TRANSAMINASE ACTIVITIES IN DIFFERENT TISSUES OF RATS AND GUINEA PIGS EXPOSED TO VARYING LEVELS OF ALTITUDE STRESS FOR DIFFERENT PERIODS OF TIME

KAVERI MUKHERJEE and N. C. GHOSH (University College of Science and Technology, Calcutta, India) *Aviation, Space, and Environmental Medicine* (ISSN 0095-6562), vol. 58, Jan. 1987, p. 18-23. refs

A87-28845

THE BEHAVIORAL EFFECTS OF ANTICHOLINESTERASE INSULT FOLLOWING EXPOSURE TO DIFFERENT ENVIRONMENTAL TEMPERATURES

THOMAS G. WHEELER (USAF, School of Aerospace Medicine, Brooks AFB, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, Jan. 1987, p. 54-59. refs

This study evaluates soman toxicity via a number of behavioral tasks after an 8-h exposure to one of five thermal stress conditions (-1, 7, 15, 23, or 31 C at 80 + or - 5 percent RH). Animals were removed from the environmental chamber, injected with soman (0-160 micrograms/kg) and tested 30 min postinjection. The test battery included motor activity, grip strength, core temperature, sensitivity to heat, effects on memory and learning, and a subjective rating of the animal's state of health. A significant thermal stress/soman interaction was observed for all measures. This interaction was seen as a shift of the soman dose-response functions to the right for the higher temperature groups, i.e., the lower the stress temperature, the greater the susceptibility to soman. For example, the ED50 for the activity measure was 38 micrograms/kg for the -1 C exposure group and 94 micrograms/kg for the 31 C group. The thermal stress influence on soman toxicity may be a function of previous motor activity. Author

A87-28847* Florida Univ., Gainesville.

SKELTAL RESPONSE TO SIMULATED WEIGHTLESSNESS - A COMPARISON OF SUSPENSION TECHNIQUES

T. J. WRONSKI (Florida, University, Gainesville) and E. R. MOREY-HOLTON (NASA, Ames Research Center, Moffett Field, CA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, Jan. 1987, p. 63-68. refs

Comparisons are made of the skeletal response of rats subjected to simulated weightlessness by back or tail suspension. In comparison to pair-fed control rats, back-suspended rats failed to gain weight whereas tail-suspended rats exhibited normal weight gain. Quantitative bone histomorphometry revealed marked skeletal abnormalities in the proximal tibial metaphysis of back-suspended rats. Loss of trabecular bone mass in these animals was due to a combination of depressed longitudinal bone growth, decreased bone formation, and increased bone resorption. In contrast, the proximal tibia of tail-suspended rats was relatively normal by these histologic criteria. However, a significant reduction trabecular bone volume occurred during 2 weeks of tail suspension, possibly due to a transient inhibition of bone formation. The findings indicate that tail suspension may be a more appropriate model for evaluating the effects of simulated weightlessness on skeletal homeostasis. D.H.

A87-29042

DYNAMICS OF CONDITIONED-REFLEX REGULATION OF THE FUNCTIONAL CONDITION OF THE LOCAL ZONE OF THE BRAIN CORTEX, TESTED BY A BIOFEEDBACK METHOD [DINAMIKA USLOVNOREFLEKTORNOI REGULIATSII FUNKSIONAL'NOGO SOSTOIANIIA LOKAL'NOI ZONY KORY MOZGA, TESTIRUEMAIA METODOM BIOLOGICHESKOI OBRATNOI SVIAZI]

N. S. KOSITSYN and V. B. DOROKHOV (AN SSSR, Institut Vyshei Nervnoi Deiatel'nosti i Neurofiziologii, Moscow, USSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 291, no. 3, 1986, p. 741-745. In Russian. refs

A87-29050

SEASONAL VARIATIONS OF PROLIFERATION ACTIVITY IN HIBERNATING ANIMALS [SEZONNAIA DINAMIKA PROLIFERATIVNOI AKTIVNOSTI U ZIMOSPIASHCHIKH]

I. I. KRUMAN, S. G. KOLAEVA, G. R. IVANITSKII, S. A. RUDCHENKO, and Z. S. KHURKHULU (AN SSSR, Institut Biologicheskoi Fiziki, Pushchino, SSSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 291, no. 4, 1986, p. 992-994. In Russian. refs

Studies performed on gophers (*Citellus undulatus*) show that the cell-proliferation activity in hibernating animals has a seasonal character: at different times, it can decrease in normothermic

animals and increase in hibernating ones. It is suggested that the seasonal variation of proliferation activity in hibernating animals is regulated endogenously and occurs through a decrease or increase in the number of cells entering into the mitotic cycle. B.J.

A87-29946

THE PROSPECTS OF USING ENDOGENOUS MODULATORS OF BODY FUNCTIONS AND CONDITIONS [PERSPEKTIVY ISPOL'ZOVANIIA ENDOGENNYKH MODULIATOROV FUNKTSII I SOSTOIANII]

G. A. VARTANIAN and E. A. KORNEVA (AMN SSSR, Leningrad, USSR) Fiziologiya Cheloveka (ISSN 0131-1646), vol. 12, Nov.-Dec. 1986, p. 1021-1027. In Russian. refs

The complexity of modern technology often leads to conditions that impose considerable emotional stress and make it necessary to optimize the functional state of operators. The possibilities of using specific neuropeptides for modulating the functional condition of the human brain are discussed. Experiments are described showing changes effected in the emotional state or in a conditioned reflex of an animal by introducing spinal fluid from animals with specific emotional disorders and conditioned reflexes, respectively. Special attention is given to two mechanisms for regulating the productivity of the immune system: (1) by increasing the number of newly formed immune cells through neurohumoral modulations (e.g., by hypothalamus stimulation or by injection of specific myelopeptides) and (2) by increasing the activity of existing immune cells. I.S.

A87-30421#

PLANT PHYSIOLOGY RESEARCH IN SPACE

WOLFRAM LORK and VOLKER STROBEL Dornier Post (English Edition) (ISSN 0012-5563), no. 3, 1986, p. 54, 55.

A technology demonstration project - Biosample - is described that is to be capable of performing biological experiments automatically, as may be required for unmanned missions such as EURECA (European Retrievable Carrier) or the man-tended free flyer (MTFF). Biosample provides different sophisticated manipulations of samples by dedicated mechanisms, but can also be used in a manned laboratory to save crew time for other tasks. The relationship between gravitropism and phototropism is considered in particular. For operation in space the system would have to fulfill the following conditions: different temperature compartments (0 - 30 C); humidity control; control of gas composition (especially CO₂); removal of toxic or impairing agents; total darkness; irradiation with monochromatic light (optionally polarized) from different directions; observation on IR illumination; centrifuges to allow accelerations between 0 and 3 g for application of gravistimuli and/or 1-g reference experiments (lateral and longitudinal); seeding, germination, and cultivation of the plantlets; and fixation of plant tissues to study morphological changes. A proposed ground-based experiment using gravitational 'pulses' from a centrifuge is described. D.H.

A87-30499

SPECTRAL SENSITIVITY OF HUMAN CONE PHOTORECEPTORS

J. L. SCHNAPP, T. W. KRAFT, and D. A. BAYLOR (Stanford University, CA) Nature (ISSN 0028-0836), vol. 325, Jan. 29, 1987, p. 439-441. refs
(Contract NIH-EY-05750)

The spectral sensitivities of human cones are measured by recording electrical responses to stimuli of different wavelengths, and the results are reported. The spectral sensitivities of 'green' and 'red' cones, determined over the entire visible region, show peaks near 530 and 560 nm respectively, and are remarkably similar to those of the old-world monkey *Macaca fascicularis*. They satisfactorily predict the photopic luminosity function, a measure of the sensitivity of cone-mediated human vision to light of different wavelengths. The kinetics of the light responses of human cones also appears similar to that of macaque cones; the time to peak response to a dim flash was 50-100 ms and there was a characteristic undershoot during recovery. C.D.

A87-30880* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

NASA'S LIFE SCIENCES PROGRAM

GERALD A. SOFFEN (NASA, Goddard Space Flight Center, Greenbelt, MD) IN: Space Science and Applications: Progress and Potential. New York, IEEE Press, 1986, p. 55-68.

NASA space missions from the Mercury through the Shuttle program have provided successively more data on the ability of humans to function in space for progressively longer periods of time. The Skylab program encouraged cooperation between medical and engineering personnel in the design of space suits, diet, food preparation, and cleanliness procedures and equipment, and the man-machine interface. Research is now concentrated on supporting man in space, evaluating the effects of the microgravity environment on humans, and modeling encounters with extraterrestrial life and the effects of human activities on terrestrial biota. Current levels of understanding of the physiological causes of human health problems produced by long-duration spaceflight are summarized. Experiments planned for the Shuttle, Spacelab, and the Space Station are outlined, noting the long-term goal of configuring the Space Station so that only food and hydrazine are needed to complete the life support system cycle.

M.S.K.

A87-31026

PRINCIPLES OF QUANTUM BIOLOGY AS DEMONSTRATED BY ULTRAWEAK PHOTON EMISSION FROM LIVING CELLS

FRITZ-ALBERT POPP (Kaiserslautern, Universitaet, West Germany) IN: Lasers '85; Proceedings of the Eighth International Conference, Las Vegas, NV, Dec. 2-6, 1985. McLean, VA, STS Press, 1986, p. 311-316. refs

Living tissues emit very weak quasi-continuous photoemission of a few hundred photons/sec per sq cm of surface area, over the IR-UV spectrum. The spectral distribution, transparency, temperature-dependence and relaxation dynamics after excitation of this biological luminescence indicate that these 'biophotons' exhibit a curiously high degree of coherence, the coherence times being of the order of several minutes. The phenomenon is noted to be governed by a nonequilibrium phase transition at multimode laser threshold, furnishing a novel and reliable basis for research in 'quantum biology'.

O.C.

N87-18972*# University of Southern Illinois, Carbondale. Dept. of Botany.

ORIGIN AND EVOLUTION OF OSMOREGULATORY MECHANISMS IN BLUE-GREEN ALGAE (CYANOBACTERIA) AS A FUNCTION OF METABOLIC AND STRUCTURAL COMPLEXITY: REFLECTIONS OF PRECAMBRIAN PALEOBIOLOGY Final Report, 15 Jun. 1982 - 15 May 1986

JOHN H. YOPP, DONALD R. TINDALL, and KENNETH PAVLICEK 11 Mar. 1987 59 p

(Contract NAGW-344)

(NASA-CR-180199; NAS 1.26:180199) Avail: NTIS HC A04/MF A01 CSCL 06C

Major accomplishments underlying the basic understanding of cyanobacterial resistance to salt tolerance and osmotic stress were made. The methodology proposed included: the tracing of the pathways of formation of osmoregulatory solutes by traditional methods involving C-14 labelled substrates; gas chromatography; amino acid analysis; X-ray analysis using scanning transmission electron microscopy; and most importantly, C-13 labelled substrates, followed by Nuclear Magnetic Resonance (NMR) spectroscopy. It was found that the cyanobacteria employ a diversity of organic, osmoregulatory solutes. Osmoregulatory solutes were found to serve four functions: adjustment of water activity, noninhibition of enzymes; lowering of $K_{sub m}$ of enzymes to allow functioning at normal levels when the intracellular salt accumulates, and extending the pH optimum of enzymes as intracellular pH rises due to proton-potassium ion pump action during osmoregulation. Differences in osmoregulatory solutes may, but are not always, be attributed to differences in nutritional capabilities. The mechanism of osmoregulation and concomitant salt tolerance in halophilic cyanobacteria was elucidated. The

activities of betaine and S-Adenosylhomocysteine hydrolase are discussed.

B.G.

N87-18973*# Management and Technical Services Co., Washington, D.C.

USSR SPACE LIFE SCIENCES DIGEST, ISSUE 10

LYDIA RAZRAN HOOKE, MIKE RADTKE, RONALD TEETER, VICTORIA GARSHNEK, and JOSEPH E. ROWE (Library of Congress, Washington, D. C.) Washington NASA Mar. 1987 110 p

(Contract NASW-3676)

(NASA-CR-3922(12); NAS 1.26:3922(12)) Avail: NTIS HC A06/MF A01 CSCL 06C

The USSR Space Life Sciences Digest contains abstracts of 37 papers recently published in Russian language periodicals and bound collections and of five new Soviet monographs. Selected abstracts are illustrated with figures and tables from the original. Additional features include the translation of a book chapter concerning use of biological rhythms as a basis for cosmonaut selection, excerpts from the diary of a participant in a long-term isolation experiment, and a picture and description of the Mir space station. The abstracts included in this issue were identified as relevant to 25 areas of aerospace medicine and space biology. These areas are adaptation, biological rhythms, biospherics, body fluids, botany, cardiovascular and respiratory systems, developmental biology, endocrinology, enzymology, group dynamics, habitability and environmental effects, hematology, human performance, immunology, life support systems, mathematical modeling, metabolism, microbiology, morphology and cytology, musculoskeletal system, neurophysiology, nutrition, personnel selection, psychology, and radiobiology. Author

N87-18974# Missouri Univ., Columbia. Dept. of Biological Sciences.

PHOTOSYNTHESIS, CLONING AND BIOCONVERSION OF SOLAR ENERGY IN CYANOBACTERIA Final Report, 1 May 1983 - 30 Apr. 1986

L. A. SHERMAN Jun. 1986 17 p

(Contract DE-AC02-81ER-10899)

(DE86-015846; DOE/ER-10899/T1) Avail: NTIS HC A02/MF A01

This project is concerned with an analysis of the photosynthetic membrane in the cyanobacterium, *Aphanocapsa* sp. The first stage of the project concerned an analysis of the membrane proteins, including pigment-binding proteins, and analysis of the composition of PSII, PSI, cyt b sub 6/f complex, and phycobilisomes. These complexes were analyzed by biochemical separation of the complexes, gel electrophoresis, and western blotting using heterologous antibodies. Some novel membrane proteins were detected and were isolated from acrylamide gels. Antibodies against these proteins were produced and utilized to clone the genes from a lambda gtl1 library. The genes for two of the proteins, a 36 kDa chlorophyll-binding proteins and a 42 kDa carotenid-binding protein have been cloned and sequenced. This system is being utilized because of the ability to exchange genetic information in cyanobacteria. In addition to transformation, we developed a conjugation system that allows introduction of large plasmids from bacteria into *Aphanocapsa*. We are using this and other genetic exchange methods to produce specific mutations in cyanobacteria to determine the function of protein and protein domains. DOE

N87-19888# Stanford Univ., Calif. Dept. of Chemistry.

ENERGY TRANSFER AND PHOTOCHEMISTRY IN BIOMIMETIC SOLAR CONVERSION Annual Report, Oct. 1985 - Sep. 1986

S. G. BOXER Aug. 1986 15 p

(Contract GRI-5083-260-0824)

(PB87-134060; GRI-86/0238) Avail: NTIS HC A02/MF A01 CSCL 06C

Electron transfer is being studied in several well-defined molecular systems, and new techniques for studying electron transfer are being developed. Photo-induced electron transfer lies at the heart of photosynthesis and forms the basis for our approach to biomimetic solar conversion. Electron donors and acceptors

are covalently connected to molecular frameworks which permit variation of the distance between sites and the nature of the intervening medium. Myoglobin produced by recombinant DNA methods has a free sulfhydryl for attachment of various electron acceptors. The feasibility of attachment has been demonstrated, and the free sulfhydryl group has been moved in the sequence by site-specific mutagenesis. The effects of electric fields on electron transfer kinetics have been treated theoretically. From the analysis, it is evident that the effects of electric fields on recombination kinetics in well-chosen systems offer a very useful approach to understanding important features of electron transfer. GRA

N87-19889*# Virginia Univ., Charlottesville. Dept. of Computer Science.

VISUAL MONITORING OF AUTONOMOUS LIFE SCIENCES EXPERIMENTATION Final Technical Report, 1 Aug. 1985 - 31 Oct. 1986

G. E. BLANK and W. N. MARTIN Apr. 1987 19 p
(Contract NAG5-597)

(NASA-CR-177072; NAS 1.26:177072; UVA/528244-CS87/101)
Avail: NTIS HC A02/MF A01 CSCL 06C

The design and implementation of a computerized visual monitoring system to aid in the monitoring and control of life sciences experiments on board a space station was investigated. A likely multiprocessor design was chosen, a plausible life science experiment with which to work was defined, the theoretical issues involved in the programming of a visual monitoring system for the experiment was considered on the multiprocessor, a system for monitoring the experiment was designed, and simulations of such a system was implemented on a network of Apollo workstations.

Author

N87-19890# Smithsonian Institution, Rockville, Md. Environmental Research Center.

PRIMARY LIGHT HARVESTING SYSTEM: THE RELATIONSHIP OF PHYCOBILISOMES TO PHOTOSYSTEM 1 AND 2 Progress Report, May 1985 - Sep. 1986

E. GANTT 1986 6 p
(Contract DE-AS05-76ER-04310)

(DE87-000644; DOE/ER-04310/T5) Avail: NTIS HC A02/MF A01

The energy transfer pathway from the phycobilisome to the photosystems in the photosynthetic membrane is being studied in cyanobacteria and red algae. Two independent terminal fluorescence emitters were resolved for the first time in isolated phycobilisomes. One of them was isolated and identified as the high molecular weight anchor polypeptide linking the phycobilisomes and the thylakoid. The other is assumed to be allophycocyanin-B. Location of the anchor polypeptide in both the phycobilisome and the thylakoid was verified by immunoprecipitation analysis. Within the phycobilisome core, energy flow from allophycocyanin seems to occur independently to the two terminal emitters. Since nearly parallel orientation of the dipole moment occurs only between allophycocyanin and the anchor polypeptide, the preferred energy transfer pathway is assumed to occur through the anchor polypeptide to the thylakoids. Regulation by light of the development of the photosynthetic apparatus is continuing. In the red algae *Porphyridium cruentum*, an obligate shade plant, the phycobilisome number changes while photosystem I remains relatively invariant with changes in light intensity. It appears that this organism will serve as a model system for studying intensity effects. DOE

AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

A87-28154

BEYOND NIGHT AND DAY

ISABEL S. ABRAMS Space World (ISSN 0038-6332), vol. W-12-276, Dec. 1986, p. 12, 13.

Research being carried out at NASA-Ames to evaluate potential effects of circadian rhythm interruptions on astronauts is discussed. The current practice is to keep astronauts on Houston time, although events in space easily disrupt the sleep schedules. Bedrest tests up to 56 days have been performed to simulate weightlessness. Nearly every bodily function has been found to have a circadian rhythm, e.g., blood pressure, heartbeat, respiration, etc. Most functions peak between 1-4 p.m., with the magnitudes of peaks and lows being different for males and females. The rhythms of certain persons have been found to entrain those of others. The effects of light has also been examined and it has been determined that the spectrum of light, either from broad spectrum bulbs or sunlight, controls the secretion of melatonin by the pineal gland and the regular functioning of persons in an 8 hr dark and 16 hr light circadian rhythm. M.S.K.

A87-28242

CLASSIFIER-DIRECTED SIGNAL PROCESSING IN BRAIN RESEARCH

ALAN S. GEVINS and NELSON H. MORGAN (EEG Systems Laboratory, San Francisco, CA) IEEE Transactions on Biomedical Engineering (ISSN 0018-9294), vol. BME-33, Dec. 1986, p. 1054-1068. Research supported by the National Institute of Neurological and Communicative Diseases and Strokes, Schering Corp., USAF, and NASA. refs

Because of the difficulty of extracting useful information from brain electrical or magnetic field measurements, sensitive analytic methods are often required. 'Open-loop' techniques for the choice of signal features and the testing of statistical hypotheses are often not sufficient for such problems. The sensitivity of analyses can be increased by 'closed-loop' analyses which use feedback from the hypothesis testing to optimize the feature extraction and/or primary analysis to achieve maximal classification accuracy for a pattern recognition analysis which attempts to separate experimental or clinical conditions. Signal processing algorithms whose parameters are set to maximize the strength of consequent inferences as measured by classifier performance could be called classifier-directed methods. This paper reviews the application of classifier-directed methodologies to waveform detection and categorical classification problems in brain research. Pattern recognition methods are shown to be a convenient way of incorporating expert knowledge in a statistical framework with minimal assumptions about the statistics of the desired or undesired components. Author

A87-28243

CLASSIFICATION AND DETECTION OF SINGLE EVOKED BRAIN POTENTIALS USING TIME-FREQUENCY AMPLITUDE FEATURES

JEFFREY M. MOSER and JORGE I. AUNON (Purdue University, West Lafayette, IN) IEEE Transactions on Biomedical Engineering (ISSN 0018-9294), vol. BME-33, Dec. 1986, p. 1096-1106. refs (Contract F49620-83-K-0031)

The classification and detection of event-related brain potentials was investigated using signal processing and statistical pattern recognition techniques. Amplitudes at sampled time points and frequency quantities have previously been used as features. Improvements to these procedures were obtained by using features from the time-frequency plane to utilize the geometric relationship between time and frequency, capitalizing on the nonstationarity of

the evoked potential signals. These features were transformed from the original data sets based upon a two-step classification/feature selection procedure which uses selected frequencies from step 1 as parameters for data filtering in step 2. Features were selected from the filtered data, classifiers were designed, and the estimated classification accuracies were computed. This system was used for classification of single evoked potentials from two classes and for the detection of a particular single evoked potential in the electroencephalogram. Actual EEG data from human subjects participating in visual stimulation Sternberg paradigm experiments were used for testing the ability of the methods to distinguish the various signals. The results of the new method were compared to those of previous methods using one-step techniques, and significant improvements in classification and detection accuracies were obtained. Author

A87-28245*

Jet Propulsion Lab., California Inst. of Tech., Pasadena.

SHORT TIME FOURIER ANALYSIS OF THE ELECTROMYOGRAM-FAST MOVEMENTS AND CONSTANT CONTRACTION

BLAKE HANNAFORD (California Institute of Technology, Jet Propulsion Laboratory, Pasadena) and STEVEN LEHMAN (California, University, Berkeley) IEEE Transactions on Biomedical Engineering (ISSN 0018-9294), vol. BME-33, Dec. 1986, p. 1173-1181. refs

Short-time Fourier analysis was applied to surface electromyograms (EMG) recorded during rapid movements, and during isometric contractions at constant forces. A portion of the data to be transformed by multiplying the signal by a Hamming window was selected, and then the discrete Fourier transform was computed. Shifting the window along the data record, a new spectrum was computed each 10 ms. The transformed data were displayed in spectrograms or 'voiceprints'. This short-time technique made it possible to see time-dependencies in the EMG that are normally averaged in the Fourier analysis of these signals. Spectra of EMGs during isometric contractions at constant force vary in the short (10-20 ms) term. Short-time spectra from EMGs recorded during rapid movements were much less variable. The windowing technique picked out the typical 'three-burst pattern' in EMG's from both wrist and head movements. Spectra during the bursts were more consistent than those during isometric contractions. Furthermore, there was a consistent shift in spectral statistics in the course of the three bursts. Both the center frequency and the variance of the spectral energy distribution grew from the first burst to the second burst in the same muscle. The analogy between EMGs and speech signals is extended to argue for future applicability of short-time spectral analysis of EMG. Author

A87-28330#

CARDIAC FUNCTION AT REST UNDER ACUTE EXPOSURE TO HYPOBARIC HYPOXIA

KAZUO KIKUCHI, KATSUMI ASANO, and HIROMI TAKAHASHI (Tsukuba, University, Sakura, Japan) Japanese Journal of Aerospace and Environmental Medicine (ISSN 0387-0723), vol. 23, Sept. 1986, p. 51-58. refs

The effects of acute exposure to hypobaric hypoxia on the cardiac pump function (CPF) and myocardial contractility were examined. Four human male adults in a supine position at simulated altitudes from 4000-6500 m ASL were monitored in terms of M-mode echocardiographs and systolic time intervals. Increasing altitudes increased the ejection fraction, heart rate, cardiac output and mean velocity of the circumferential fiber shortening, and decreased the left ventricular end-systolic volume and the total electromechanical systole left ventricular ejection time (LVET). It was concluded that the pre-ejection phase and LVET are good indicators of the CPF at rest in acute hypobaric hypoxic conditions. M.S.K.

A87-28499

BIORHYTHMOLOGICAL ASPECTS OF THE DIAGNOSIS AND TREATMENT OF HYPERTENSION [BIORITMOLOGICHESKIE ASPEKTY DIAGNOSTIKI I LECHENIIA GIPERTONICHESKOI BOLEZNI]

F. I. KOMAROV, A. G. BRIUKHOVETSKII, and V. E. BUVALTSEV Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), Sept. 1986, p. 24-29. In Russian. refs

The circadian rhythm in the arterial pressure of hypertonic patients was studied using automated 24-h measurements of the systolic, diastolic, and median dynamic pressure, as well as the cardiac output parameters. Three types of circadian rhythm in the arterial hypertension were established: (1) the morning-day, (2) the evening-night, and (3) a nondifferentiated type; among these, the morning-day type is the most benign in terms of prognosis. In the morning-day patients, an increase of the arterial pressure in the morning is correlated with an increase in the cardiac output, while in the evening-night patients, an increase of the cardiac minute volume and the output volume coincided with the development of a vasoconstrictive component. The patients of the first type exhibited higher daytime elevations of angiotensin and aldosterone activities, correlated with lowering of plasma progesterone; the tolerance to physical loads in these patients was the highest. I.S.

A87-28500

PSYCHOPHYSIOLOGICAL AND NEUROLOGICAL ASPECTS OF FLIGHT-PERSONNEL FATIGUE [PSIKHOFIZIOLOGICHESKIE I NEVROLOGICHESKIE ASPEKTY PROBLEMY UTOMLENNIA LETNOGO SOSTAVA]

V. A. EGOROV and N. I. KOMANDENKO Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), Sept. 1986, p. 44, 45. In Russian. refs

Subjective and objective fatigue symptoms caused by polymorphic functional disturbances in the nervous system, the analyzers, and other organs and systems is discussed, together with the sequence of appearance of these symptoms. Emphasis is placed on the diagnosis of early symptoms of the fatigue syndrome, such as the asthenia syndrome (characterized by headaches, increased irritability, sleep disturbances, low tolerance to physical and mental loads, and increased perspiration), oral automatism, elevated thresholds of tactile sensitivity, and elevated or lowered ligamental and periosteal reflexes. Poor coordination, equilibrium disturbance, and vegetative polyneuritis (especially in helicopter pilots) also appear early. Early recognition of these symptoms is important in prophylaxis and treatment of fatigued personnel and, in the long run, in increasing their life expectancy. I.S.

A87-28837* National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.

CARDIOVASCULAR DYNAMICS DURING THE INITIAL PERIOD OF HEAD-DOWN TILT

CLARE MARIE TOMASELLI, RICHARD A. KENNEY, MARY ANNE BASSETT FREY, and G. WYCKLIFFE HOFFLER (NASA, Kennedy Space Center; Bionetics Corp., Cocoa Beach, FL; George Washington University, Washington, DC) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, Jan. 1987, p. 3-8. refs

The cardiovascular response to 1 h of 60-deg head-down tilt was studied in 12 male subjects, ages 30-39 years, to simulate the early effects of weightlessness. Fluid shifts, hemodynamic variables, and indices of myocardial contractility were evaluated by utilizing electrocardiography, systolic time intervals, impedance cardiography, sphygmomanometry, and measurement of calf circumference. Most cardiovascular variables remained stable throughout the initial 30 min of the protocol, even though translocation of fluid from the legs to the thorax commenced immediately with the onset of head-down tilt. In contrast, minutes 30-60 were characterized by reduced stroke volume, cardiac output, mean stroke ejection rate, and Heather index concomitant with an elevation in mean arterial pressure. Intrathoracic fluid volume continued to increase, while leg volume continued to decrease.

This latter physiological response suggests intrathoracic sequestration of fluid volume; blood was apparently redistributed to the pulmonary circulation rather than being retained in the great veins. Author

A87-28840
HORMONE AND ENERGY SUBSTRATE CHANGES DURING PROLONGED EXERCISE IN THE HEAT

G. HARLEY HARTUNG, LOREN G. MYHRE, DONALD M. TUCKER, and JOHN W. BURNS (USAF, School of Aerospace Medicine, Brooks AFB; Baylor University, Houston, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, Jan. 1987, p. 24-28. refs

A study is described to determine the responses of serum hormones, glycerol, and glucose sampled during prolonged, intense exercise under heat-stress conditions without fluid replacement. Eleven trained men were studied during a 16.1 km run. Fasting blood samples were taken prior to the run at 6.4, 12.9, and 16.1 km, and 3 h recovery. Serum or plasma glucose, insulin, glucagon, glycerol, and catecholamines were measured. Glucose increased then decreased significantly. Glycerol increased and continued to increase throughout the run. Epinephrine increased progressively during the run, but norepinephrine increased at 6.4 km, and did not change further. Insulin increased slightly then decreased significantly. Glucagon increased and remained elevated at 3 h recovery. It is concluded that in trained men who are fasting and exercising strenuously, substrate-hormone relationships may differ from those found in other exercise-dietary states. D.H.

A87-28841
CARDIOVASCULAR RESPONSES TO MODERATE FACIAL COOLING IN MEN AND WOMEN

JOSEPH A. MANNINO and RICHARD A. WASHBURN (Wisconsin, University, Green Bay) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, Jan. 1987, p. 29-33. refs

The pattern and range of cardiovascular responses were examined for a group of 20 healthy men and women whose faces were exposed to a stream of moderately cold air at a constant wind speed for 10 min. During the course of exposure, both heart rate and forearm blood flow decreased significantly, while mean arterial blood pressure increased significantly from pre-exposure values. There were no significant differences found in cardiovascular responses between men and women. The results indicate that moderate facial cooling precipitates significant cardiovascular responses in healthy subjects and the range of response may depend, in part, on individual factors. D.H.

A87-28842
EMOTIONAL AND PHYSIOLOGICAL EFFECTS OF NITROUS OXIDE AND HYPERBARIC AIR NARCOSIS

ROBERT J. BIRSNER (U.S. Navy, Naval Submarine Medical Research Laboratory, Groton, CT) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, Jan. 1987, p. 34-38. refs

(Contract NAVY TASK M0099, PN03, 9017)

Measurements of seven self-reported emotional states (happiness, activity, fear, anger, depression, fatigue, and anxiety) and three physiological variables (heart rate, systolic blood pressure, and diastolic blood pressure) were made among 16 subjects under four conditions: (1) all subjects breathing normobaric air; (2) several days later, immediately after half the subjects had breathed 30 percent nitrous oxide and the other half had breathed normobaric air; (3) the following day, subsequent to exposure of all subjects to a simulated depth of 57 m on air in a hyperbaric chamber; and (4) several weeks after the hyperbaric chamber exposure, with all subjects breathing normobaric air. The results showed that the physiological responses of the group that breathed nitrous oxide did not differ significantly from the control group following the hyperbaric chamber exposure, while self-reported happiness was lower among the nitrous oxide group than among the control group following hyperbaric chamber exposure. Nitrous oxide does not appear to benefit emotional or physiological adaptation to nitrogen narcosis associated with breathing

hyperbaric air, and may even impair emotional adaptation, at least under these experimental conditions. Author

A87-28843
RESPIRATORY RESPONSE AND MUSCLE FUNCTION DURING ISOMETRIC HANDGRIP EXERCISE AT HIGH ALTITUDE

RICHARD L. BURSE, ALLEN CYMERMAN, and ANDREW J. YOUNG (U.S. Army, Research Institute of Environmental Medicine, Natick, MA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, Jan. 1987, p. 39-46. refs

An investigation was conducted to determine if the hyperventilatory response to fatiguing isometric exercise at sea level could predict resting ventilation and acute mountain sickness (AMS) at 5300 m altitude. There was no relationship between the magnitude or pattern of exercise-induced hyperventilation at sea level and the severity of AMS later at altitude. Sea level hyperventilatory response was not predictive of resting ventilation at altitude. Altitude exposure progressively increased both the incidence and magnitude of the hyperventilatory response to exercise and prolonged it for 60-90 s into the recovery period, providing support for the 'central command' theory of ventilatory control during isometric exercise. Neither AMS nor changes in body weight or circulating norepinephrine levels can account for the temporal pattern of increased grip strength, but the respiratory alkalosis occurring at altitude appears to be a likely mechanism. D.H.

A87-28844
EFFECTS OF ATROPINE AND 2-PAM CHLORIDE ON VISION AND PERFORMANCE IN HUMANS

GUNILLA HAEGERSTROM-PORTNOY, REESE JONES, ANTHONY J. ADAMS, and ARTHUR JAMPOLSKY (Smith-Kettlewell Institute of Visual Sciences, San Francisco, CA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, Jan. 1987, p. 47-53. refs
(Contract DAMD17-83-C-3198)

Experiments are described that were conducted to assess the time course and severity of effects of atropine and 2-PAM chloride on selected visual functions, physiological measures, and a tracking performance task. Atropine and 2-PAM chloride are currently used as antidotes for organophosphate poisoning produced in pilots engaged in aerial application of pesticides. Atropine and 2-PAM Cl were administered intramuscularly, noting a long lasting and dose-related increase in pupillary diameter and a decrease in accommodative amplitude with loss of near visual acuity. These functions returned to baseline 2 days after injection. Tracking performance was significantly decreased by 4 mg of atropine. The changes in vision function cannot readily explain the tracking performance loss, since the tracking involved a distant visual target while the atropine produced degradation of near vision. Most of the physiological tests, tracking performance and all visual functions were unaffected by 2-PAM Cl. D.H.

A87-28846
EFFICACY OF TRANSDERMAL SCOPOLAMINE AGAINST SEASICKNESS - A THREE-DAY STUDY AT SEA

JOSEPH ATTIAS, CARLOS GORDON, JOSEPH RIBAK, OFER BINAH, and ARNON ROLNICK (Israel Navy, Motion Sickness Research Center, Technion Israel Institute of Technology, Haifa) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, Jan. 1987, p. 60-62. refs

Transdermal scopolamine has been reported to provide protection against motion sickness, both while sailing at sea (7-8 h) and under experimental conditions. In this study, the efficacy of transdermal scopolamine was studied, and its side effects during a 72-h cruise at sea were evaluated. Male volunteers, 20-25 years old, who were located on a 3000-ton vessel were evaluated. The presence of seasickness, defined by the Graybiel et al. (1968) diagnostic criteria, was used to calculate percent protection. When sickness was considered as malaise II or more, the drug provided 74, 73, and 39 percent protection during the three sailing days, respectively. There were no significant differences in the magnitude of the side effects, reported by experimental and placebo groups.

It is concluded that transdermal scopolamine's efficacy against seasickness during a three-day cruise was not associated with significant side effects and, therefore, the drug is suitable for long-term use by sailing crews. Author

A87-28848**INDUCTION AND PREVENTION OF ACCELERATION ATELECTASIS**

W. A. TACKER (Purdue University, West Lafayette, IN), U. I. BALLDIN (Forsvarets Forskningsanstalt; Karolinska Institutet, Stockholm, Sweden), R. R. BURTON, D. H. GLAISTER, K. K. GILLINGHAM (USAF, School of Aerospace Medicine, Brooks, AFB, TX) et al. *Aviation, Space, and Environmental Medicine* (ISSN 0095-6562), vol. 58, Jan. 1987, p. 69-75. Research supported by the National Research Council and USAF. refs

Methods for preventing or correcting acceleration atelectasis are described. Aircrew readily develop acceleration atelectasis when exposed to +Gz forces while breathing 100 percent O₂ and wearing an anti-G suit, with symptoms of chest pain, coughing, and shortness of breath. Experiments were conducted on 12 subjects using simulated aerial combat maneuvers (SACM). Decreases in vital capacity (VC) measurements were used as quantification of atelectasis, two types of reduction being identified and described. Labile reductions in VC were readily restored by a deep breath or cough. Acceleration atelectasis was reduced by dilution of the inspired oxygen concentration by argon and nitrogen, the addition of unassisted positive pressure at 30 mm Hg to the breathing mask, or the performance of the anti-G straining maneuver (AGSM). D.H.

A87-28849**CONJUNCTIVAL OXYGEN TENSION AT HIGH ALTITUDE**

THOMAS H. MADER, KARL E. FRIEDL, LAWRENCE C. MOHR, and WILLIAM N. BERNHARD (U.S. Army, Madigan Army Medical Center, Tacoma, WA; U.S. Army, Walter Reed Army Medical Center, Washington, DC; New York University Medical Center, NY) *Aviation, Space, and Environmental Medicine* (ISSN 0095-6562), vol. 58, Jan. 1987, p. 76-79. Army-supported research. refs

A transconjunctival oxygen monitor was tested in high altitude environments, real and simulated, in order to establish normal values for transconjunctival oxygen tension (P_{cjO₂}) at altitudes above sea level. The ratio of P_{cjO₂} to arterial blood oxygen tension (PaO₂) did not change in a consistent manner between sea level and 4267 m (14,000 ft) simulated altitude; P_{cjO₂} was 74 percent of PaO₂. The 16 subjects participating in the mountaineering phase of the study revealed similar means at sea level and 1829 m, but a smaller decrement was observed at 3048 m. The difference between mountain and chamber values may be accounted for by a partial acclimatization to altitude brought about by longer exposure on the mountain excursions. A comparison between P_{cjO₂} and transcutaneous oxygen tension during the chamber study suggests that a greater precision and sensitivity is obtained with measurement of oxygen tension at the conjunctival site. D.H.

A87-28850**PREDICTIVE VALUE OF PREMATURE VENTRICULAR CONTRACTIONS ON THE RESTING ELECTROCARDIOGRAM FOR VENTRICULAR ARRHYTHMIAS ON 24 HOUR MONITORING IN ASYMPTOMATIC YOUNG ADULTS**

JOSHUA BARZILAY, PAUL FROOM, JOSEPH RIBAK, MOSHE GROSS, and JOCHANAN BENBASSAT (Israel Air Force, Aeromedical Center, Ramat Gan; Hadassah University Hospital, Jerusalem) *Aviation, Space, and Environmental Medicine* (ISSN 0095-6562), vol. 58, Jan. 1987, p. 80-82. refs

A87-29648**OPTIMUM MULTIELECTRODE A POSTERIORI ESTIMATES OF SINGLE-RESPONSE EVOKED POTENTIALS**

JOHN J. WESTERKAMP (Dayton, University, OH) and JORGE I. AUNON (Purdue University, West Lafayette, IN) *IEEE Transactions on Biomedical Engineering* (ISSN 0018-9294), vol. BME-34, Jan. 1987, p. 13-22. USAF-supported research. refs

This paper discusses the design and performance of an optimum linear multielectrode filter for estimating the evoked potential contained in a single scalp-recorded brain response to a visual stimulus. The filter is derived under the criterion of minimum mean-square error and is time varying to allow for the nonstationarity of the brain response. Single and two-channel filters are designed for simulated and human visual evoked potential data. Cross-correlation matrices required to design the filters are estimated 'a posteriori' from multielectrode recordings of the prestimulus electroencephalogram and are derived from a multielectrode model of the evoked potential. Filter performance is evaluated using the criteria of mean-square-error, signal bias, noise reduction, and output signal-to-noise ratio. The filter is shown to be very effective at suppressing the ongoing electroencephalogram and emphasizing the underlying evoked potential. Author

A87-29649* Institut National de Recherche et de Securite pour la Prevention des Accidents du Travail et des Maladies Professionnelles, Vandoeuvre (France).

A NEW QUANTITATIVE INDICATOR OF VISUAL FATIGUE

YVES GOUSSARD (CNRS, Laboratoire des Signaux et Systemes, Gif-sur-Yvette, France), BERNARD MARTIN (Institut National de Recherche et de Securite, Vandoeuvre, France), and LAWRENCE STARK (California, University, Berkeley) *IEEE Transactions on Biomedical Engineering* (ISSN 0018-9294), vol. BME-34, Jan. 1987, p. 23-29. refs

(Contract NCC2-86)

Ocular-motor correlates of visual fatigue have remained elusive. Performance of ocular-motor tracking with a wide-band white noise input and the response of the dual-mode, smooth pursuit-saccadic eye movement system as output was used to test visual fatigue. A new visual fatigue indicator, VFI, was defined as the nonlinear remnant after subtracting an identified impulse response contribution to the output. Subjects were required to perform very fatiguing CRT screen reading tasks, and the VFI correlated well with the subjective reports of visual fatigue. Author

A87-29650**TIME-OPTIMAL CONTROL OF SACCADIC EYE MOVEMENTS**

JOHN D. ENDERLE (North Dakota State University, Fargo) and JAMES W. WOLFE (USAF, School of Aerospace Medicine, Brooks AFB, TX) *IEEE Transactions on Biomedical Engineering* (ISSN 0018-9294), vol. BME-34, Jan. 1987, p. 43-55. refs

(Contract F33615-83-D-0603)

A new theory describing the time-optimal control of saccadic eye movements is proposed based on Pontryagin's minimum principle and physiological considerations. The lateral and medial rectus muscle of each eye is assumed to be a parallel combination of an active state tension generator with a viscosity and elastic element, connected to a series elastic element. The eyeball is modeled as a sphere connected to a viscosity and elastic element. Each of these elements is assumed to be ideal and linear. The neuronal control strategy is shown to be a first-order time-optimal control signal. Under this condition, the active state tension for each muscle is a low-pass filtered pulse-step waveform. The magnitude of the agonist pulse is a maximum for saccades of all sizes and only the duration of the agonist pulse affects the size of the saccade. The antagonist muscle is completely inhibited during the period of maximum stimulation for the agonist muscle. Horizontal saccadic eye movements were recorded from infrared signals reflected from the anterior surface of the cornea and then digitized. Parameter estimates for the model were calculated by using a conjugate gradient search program which minimizes the integral of the absolute value of the squared error between the model and the data. The predictions of the model under a

time-optimal controller are in good agreement with the data.

Author

A87-29937

THE SIGNIFICANCE OF THE SPECTRAL-CORRELATION PARAMETERS OF HUMAN NEOCORTICAL POTENTIALS FOR THE CHARACTERIZATION OF SHORT-TERM MEMORY. II [ZNACHENIE SPEKTRAL'NO-KORRELIATSIONNYKH PARAMETROV POTENTIALOV NEOKORTEKSA CHELOVEKA DLIA KHARAKTERISTIKI KRATKOVREMENNOI PAMIATI. II]

IA. A. VASILEV, T. A. KOROLKOVA, and E. E. OSTROVSKAIA (AN SSSR, Institut Vysshei Nervnoi Deiatel'nosti i Neurofiziologii, Moscow, USSR) Fiziologiya Cheloveka (ISSN 0131-1646), vol. 12, Sept.-Oct. 1986, p. 803-809. In Russian. refs

A87-29938

THE CENTRAL VENOUS PRESSURE AND HORMONAL REGULATION OF WATER EXCHANGE UNDER ANTIORTHOSTASIS [TSENTRAL'NOE VENOZNOE DAVLENIE I GORMONAL'NAIA REGULIATSIIA VODNOGO OBMENA PRI EGO IZMENENII V USLOVIYAKH ANTIORTOSTAZA]

V. B. NOSKOV, V. E. KAMKOV, B. V. AFONIN, V. V. CHESTUKHIN, and IU. V. SUKHANOV Fiziologiya Cheloveka (ISSN 0131-1646), vol. 12, Sept.-Oct. 1986, p. 810-816. In Russian. refs

The effects of hydration status on the hormonal regulation of water-electrolyte exchange and on its interrelation with the central venous pressure (CVP) were studied in humans subjected to antiorthostasis (5 h at a -15 deg head-down tilt). It was found that hypohydration (caused by an intake of furosemide) led to sharper increases in diuresis and electrolyte excretion, a greater decrease of the circulating plasma (by 16 percent), and a fall of CVP (by 56 percent), compared to nonhypohydrated controls. The antiorthostasis-induced increases in concentrations of angiotensin-I, antidiuretic hormone, plasma renin, and adrenocorticotropin were higher in hypohydrated subjects. While antiorthostasis caused a decrease in plasma aldosterone, the levels of this hormone in hypohydrated subjects were also elevated. I.S.

A87-29939

THE DYNAMICS OF CORRELATION INDICES OF ULTRASLOW PHYSIOLOGICAL PROCESSES IN HUMAN BRAIN STRUCTURES DURING THE PROCESS OF SOLVING VISUAL-RECOGNITION PROBLEMS [DINAMIKA POKAZATELEI KORRELIATSII SVERKHMEDLENNYKH FIZIOLOGICHESKIKH PROTSESSOV STRUKTUR MOZGA CHELOVEKA V PROTSESSE RESHENIIA ZADACH ZRITEL'NOGO OPOZNIANIA]

E. A. KOGAN (Rostovskii Gosudarstvennyi Universitet, Rostov-on-Don, USSR) Fiziologiya Cheloveka (ISSN 0131-1646), vol. 12, Nov.-Dec. 1986, p. 883-890. In Russian. refs

A87-29940

THE ELECTROENCEPHALOGRAM OF HUMANS UNDER CHRONIC HYPOXIA [ELEKTROENTSEFALOGRAMMA CHELOVEKA PRI KHONICHESKOI GIPOKSII]

L. IU. KAIUMOV (Dushanbinskii Gosudarstvennyi Pedagogicheskii Institut, Dushanbe, Tadzhik SSR) Fiziologiya Cheloveka (ISSN 0131-1646), vol. 12, Nov.-Dec. 1986, p. 900-906. In Russian. refs

Changes in EEG parameters and their correlations with the symptoms of chronic hypoxia manifested in the first days of high-altitude stay were studied in mountain climbers who were flown from an altitude of 1785 m above sea level to 4100 m and, after 6 days at this altitude, climbed to an altitude of 5100-5800 m. The observed effects included a decrease in the frequency of the alpha rhythm, the formation of theta waves, and the appearance of interhemispheric frequency and amplitude asymmetries. Subjects with the most serious symptoms of hypoxia exhibited spatial synchronization of the alpha rhythm. I.S.

A87-29941

THE CONDITIONING FUNCTION OF THE RESPIRATORY SYSTEM UNDER VARYING CONDITIONS AND STATES OF THE ORGANISM [KONDICTIONIRUIUSHCHAIYA FUNKTSIIA DYKHATEL'NOGO APPARATA PRI RAZLICHNYKH USLOVIYAKH I SOSTOIANIIYAKH ORGANIZMA]

F. T. AGARKOV (Donetskii Meditsinskii Institut, Donetsk, Ukrainian SSR) Fiziologiya Cheloveka (ISSN 0131-1646), vol. 12, Nov.-Dec. 1986, p. 907-913. In Russian. refs

The effects of cardiopulmonary diseases and such exogenous conditions as physical exercise, inhalation of hot or cold air, and suppression of inhalation, on the conditioning function of the respiratory system (CFRS) were investigated using the temperature of exhaled alveolar air (TEAA) as a measure of the CFRS. Pathological conditions such as pneumoconiosis, pneumonia, and bronchial asthma were found to be characterized by hypopneumothermia, whereas myocardial infarction, focal pulmonary tuberculosis, and fevers were found to cause hyperpneumothermia. Physical exercise and breathing of cold (-4 to 0 C) air caused temporary decreases in TEAA, while suppression of inhalation by 25-35 s and the action of hot-air inhalation led to increases in the TEAA values in both healthy subjects and those suffering from cardiopulmonary diseases. The changes in TEAA were greater in sick than in normal subjects. The potential usefulness of TEAA as a diagnostic criterion is pointed out. I.S.

A87-29942

DYNAMICS OF SOME INDICES OF LIPID METABOLISM IN YOUNG PEOPLE DURING ADAPTATION TO PROLONGED PHYSICAL AND PSYCHOEMOTIONAL LOADS [DINAMIKA NEKOTORYKH POKAZATELEI LIPIDNOGO OBMENA U MOLODYKH LIUDEI V PROTSESSE ADAPTATSII IKH K DLITEL'NYM FIZICHESKIM I PSIKHOEMOTSIONAL'NYM NAGRUZKAM]

S. D. POLOSHENTSEV and D. A. RUDNEV (Voenno-Meditsinskaia Akademiia, Leningrad, USSR) Fiziologiya Cheloveka (ISSN 0131-1646), vol. 12, Nov.-Dec. 1986, p. 956-960. In Russian. refs

A87-29943

VARIABILITY OF THE CARDIAC RHYTHM UNDER MENTAL WORK OF DIFFERENT INTENSITY [VARIABEL'NOST' SERDECHNOGO RITMA PRI UMSTVENNOI RABOTE RAZNOI NAPRIAZHENNOSTI]

D. M. DEMINA, M. N. EVLAMPPIEVA, I. S. KANDROR, A. B. KIRPICHNIKOV, E. M. RATNER (Vsesoiuznyi Nauchno-Issledovatel'skii Institut Zheleznodorozhnoi Gigieny, Moscow, USSR) et al. Fiziologiya Cheloveka (ISSN 0131-1646), vol. 12, Nov.-Dec. 1986, p. 971-975. In Russian. refs

The effect of mental work of varying intensity on the electrocardiogram characteristics (the mode, modal amplitude, and cardiac interval dispersion) was studied in train dispatchers fitted with electrodes on the left side of the thorax, with hourly EKG readings taken during 12-h work shifts. It was found that minimal and moderate emotional stress leads to a decrease in the cardiac rhythm dispersion, while fatigue and elevated emotional stress cause increases in the R-R cardiogram intervals. I.S.

A87-29944

THE DEGREE OF CONCORDANCE OF ADAPTIVE REACTIONS IN TWINS UNDER MOUNTAIN-CLIMATE CONDITIONS AND THEIR CONNECTION WITH THE REACTIVITY OF THE CONNECTIVE TISSUE PHYSIOLOGICAL SYSTEM [STEPEN' KONKORDANTNOSTI ADAPTIVNYKH REAKTSII U BLIZNETSOV V USLOVIYAKH GORNOGO KLIMATA I IKH SVIAZ' S REAKTIVNOST'IU FIZIOLOGICHESKOI SISTEMY SOEDINITEL'NOI TKANI]

V. A. BEREZOVSKII, T. M. ZELENKAIA, T. V. SEREBROVSKAIA, A. S. ZVERKOVA, and N. V. ILCHEVICH (AN USSR, Institut Fiziologii; Ministerstvo Zdravookhraneniia, Institut Gematologii i Perelivaniia Krovi, Kiev, Ukrainian SSR) Fiziologiya Cheloveka (ISSN 0131-1646), vol. 12, Nov.-Dec. 1986, p. 992-998. In Russian. refs

A87-29945

BODY TEMPERATURE, AND CONVECTIVE AND RADIATIVE HEAT TRANSFER IN HUMANS DURING WORK UNDER THE HIGH-TEMPERATURE CONDITIONS OF AN ARID ZONE [TEMPERATURA TELA, KONVEKTSIONNYI I RADIATIONNYI TEPLOBMEN CHELOVEKA PRI RABOTE V USLOVIAKH VYSOKOI TEMPERATURY ARIDNOI ZONY]

M. D. KHUDAIBERDIEV, A. G. GRIGORIAN, and F. F. SULTANOV (AN TSSR, Institut Fiziologii i Eksperimental'noi Patologii Aridnoi Zony, Ashkhabad, Turkmen SSR) Fiziologiya Cheloveka (ISSN 0131-1646), vol. 12, Nov.-Dec. 1986, p. 999-1004. In Russian. refs

A87-29947

EEG CHANGES IN CONDITIONS OF ONE-TIME SLEEP DEPRIVATION AND IN THE RESTORATION PERIOD [IZMENENIE EEG V USLOVIAKH ODNOKRATNOI DEPRIVATSII SNA I V PERIOD VOSSTANOVLEENIIA]

IA. I. LEVIN, I. G. DALLAKIAN, and R. G. BINIURISHVILI (I Moskovskii Meditsinskii Institut, Moscow, USSR) Fiziologiya Cheloveka (ISSN 0131-1646), vol. 12, Nov.-Dec. 1986, p. 1028-1030. In Russian. refs

The effect of one-time sleep deprivation (for 24 h) on EEG activity was studied by spectral analysis in 22 healthy men during waking hours and after the first night of restoration sleep. Sleep deprivation caused an increase in the percentage of slow rhythms and a depression of the alpha-spectrum power. Sleep in the first restoration night did not fully compensate for the effects of sleep deprivation, this fact reflected by the greater than normal percentage of the theta rhythm in the EEG after the first night of sleep. I.S.

A87-29948

THE EFFECTS OF ATMOSPHERIC FRONTS ON PHYSICAL WORK CAPACITY AND ON THE ADAPTIVE REACTIONS OF THE CARDIOVASCULAR SYSTEM [VLIANIE ATMOSFERNYKH FRONTOV NA FIZICHESKUII RABOTOSPOSOBNOST' I ADAPTIVNYE REAKTSII SERDECHNO-SOSUDISTOI SISTEMY]

A. M. ARINGAZINA and K. U. KASENOV (Aktiubinskii Gosudarstvennyi Meditsinskii Institut, Aktiubinsk, Kazakh SSR) Fiziologiya Cheloveka (ISSN 0131-1646), vol. 12, Nov.-Dec. 1986, p. 1034-1036. In Russian. refs

A87-30873

HUMAN NEUROELECTRIC PATTERNS PREDICT PERFORMANCE ACCURACY

ALAN S. GEVINS, NELSON H. MORGAN, STEVEN L. BRESSLER, BRIAN A. CUTILLO, ROSEANN M. WHITE (EEG Systems Laboratory, San Francisco, CA) et al. Science (ISSN 0036-8075), vol. 235, Jan. 30, 1987, p. 580-585. USAF-NSF-NIH-supported research. refs

In seven right-handed adults, the brain electrical patterns before accurate performance differed from the patterns before inaccurate performance. Activity overlying the left frontal cortex and the motor and parietal cortices contralateral to the performing hand preceded accurate left- or right-hand performance. Additional strong activity overlying midline motor and premotor cortices preceded left-hand performance. These measurements suggest that brief, spatially distributed neural activity patterns, or 'preparatory sets,' in distinct cognitive, somesthetic-motor, and integrative motor areas of the human brain may be essential precursors of accurate visuomotor performance. Author

A87-18975* National Aeronautics and Space Administration, Washington, D.C.

AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 295)

Mar. 1987 71 p (NASA-SP-7011(295); NAS 1.21:7011(295)) Avail: NTIS HC A04 CSCL 06E

This bibliography lists 206 reports, articles and other documents introduced into the NASA scientific and technical information system in February, 1987. Author

N87-18976* National Aeronautics and Space Administration, Washington, D.C.

AEROSPACE MEDICINE AND BIOLOGY: A CUMULATIVE INDEX TO THE 1986 ISSUES (SUPPLEMENT 293)

Jan. 1987 251 p (NASA-SP-7011(293); NAS 1.21:7011(293)) Avail: NTIS HC A12 CSCL 06E

This publication is a cumulative index to the abstracts contained in the Supplements 281 through 292 of Aerospace Medicine and Biology: A Continuing Bibliography. It includes seven indexes - subject, personal author, corporate source, foreign technology, contract number, report number, and accession number. Author

N87-18977*# Brown Univ., Providence, R. I. Dept. of Pathology.

GROWTH FACTOR INVOLVEMENT IN TENSION-INDUCED SKELETAL MUSCLE GROWTH Semiannual Status Report, Sep. 1986 - Mar. 1987

HERMAN W. VANDENBURGH 1987 8 p Prepared in cooperation with Miriam Hospital, Providence, R.I.

(Contract NAG2-414)

(NASA-CR-180201; NAS 1.26:180201) Avail: NTIS HC A02/MF A01 CSCL 06P

New muscle tissue culture techniques were developed to grow embryonic skeletal myofibers which are able to differentiate into more adultlike myofibers. Studies on mechanical stimulation of cultured muscle cell growth will now be more directly applicable to mechanically-induced growth in adult muscle, and lead to better models for understanding muscle tissue atrophy caused by disuse in the microgravity of space. Author

N87-18978*# California Univ., San Francisco. Dept. of Physiology.

NEURAL MECHANISMS BY WHICH GRAVITATIONAL STIMULI AND STRESS AFFECT THE SECRETION OF RENIN AND OTHER HORMONES Final Technical Report

WILLIAM F. GANONG 26 Mar. 1987 4 p

(Contract NAGW-490)

(NASA-CR-180246; NAS 1.26:180246) Avail: NTIS HC A02/MF A01 CSCL 06S

The present goal is to determine by the production of discrete lesions the parts of the hypothalamus and brainstem that are involved in serotonin-mediated increases in renin secretion. A variety of stimuli which act in different ways to increase renin stimuli were developed and standardized. The experiments with p-chloroamphetamine (PCA) demonstrated that there is a serotonergic pathway which projects from the dorsal raphe nuclei to the paraventricular nuclei and the ventromedial nuclei of the hypothalamus; that projection from paraventricular nuclei to the brainstem and spinal cord may be oxytocinergic; and that the pathway from the spinal cord to the renin secreting cells is sympathetic. The demonstration that paraventricular lesions lower circulating renin substrate is important because it raises the possibility that substrate secretion is under neural control, either via the pituitary or by direct neural pathways. The discovery that lesions of the ventromedial nuclei appear to abolish the increase in renin secretion produced by many different stimuli without affecting the concentration of renin substrate in the plasma makes the position of the hypothalamus in the regulation of fluid and electrolyte balance more prominent than previously suspected. B.G.

N87-18979*# California Univ., San Diego, La Jolla. Dept. of Chemistry.

THIOL BIOCHEMISTRY OF PROKARYOTES Final Technical Report, 7 Jun. 1982 - 31 Dec. 1986

ROBERT C. FAHEY 31 Dec. 1986 5 p

(Contract NAGW-342)

(NASA-CR-180257; NAS 1.26:180257) Avail: NTIS HC A02/MF A01 CSCL 06P

The present studies have shown that GSH metabolism arose in the purple bacteria and cyanobacteria where it functions to protect against oxygen toxicity. Evidence was obtained indicating

that GSH metabolism was incorporated into eucaryotes via the endosymbiosis giving rise to mitochondria and chloroplasts. Aerobic bacteria lacking GSH utilize other thiols for apparently similar functions, the thiol being coenzyme A in Gram positive bacteria and chi-glutamylcysteine in the halobacteria. The thiol biochemistry of prokaryotes is thus seen to be much more highly diversified than that of eucaryotes and much remains to be learned about this subject. B.G.

N87-18980# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

APPARENT MOTION AND PRIOR CORRESPONDENCE EFFECTS IN VISUAL PERCEPTION

ROBERT G. EGGLESTON Jun. 1986 164 p
(AD-A174424; AD-E900637; AAMRL-TR-86-027) Avail: NTIS HC A08/MF A01 CSCL 05J

The process by which two visual stimuli presented at one time (t1) are paired with two different stimuli presented at a later time (t2) was investigated. Since there was more than one way for the stimuli to mate across frames, the task involved a problem in correspondence. It was proposed that the solution to a correspondence problem would be influenced (1) by the solution to the immediately preceding, or prior, one, and (2) by variations in the spatio-temporal characteristics of the sequentially presented apparent movement displays. When the prior and current correspondence problems were identical in structure, the influence of the former problem on the latter one was called a hysteresis effect; when the two problems were not identical in structure, the interaction between problems was called a priming effect. The results of eight experiments showed that (1) the hysteresis effect and priming effects were significant, and (2) the magnitude of both effects was related to the spatio-temporal parameters of the display sequence. In addition, both effects can operate in a telegraphic mode, can tolerate a difference in the type of solution between the prior and current problems, and more recent correspondence problems have a larger prior correspondence effect than more frequent but less recent correspondence problems. GRA

N87-18981# Oak Ridge National Lab., Tenn.

MODELLING EARLY STAGES OF HUMAN VISION

C. C. JORGENSEN, R. GAWRONSKI, and F. HOLLY Aug. 1986 133 p Prepared in cooperation with Army Human Engineering Labs., Aberdeen Proving Ground, Md.
(Contract DE-AC05-84OR-21400)
(DE86-015996; ORNL/TM-10031) Avail: NTIS HC A07/MF A01

This report presents the first results of an effort to model vision processes operating in the early layers of the human retina. The ultimate goal of this research is to develop a robot vision system based on computational principles of human vision. These include massive parallelism, dynamic feedback, and multilayer pattern recognition. Two neural models were developed. The first represented early vision in terms of static two-dimensional linear equations using a linear matrix and limited feedback. The second considered dynamic two-dimensional nonlinear processes and used matrices of nonlinear differential equations. The first set of equations was parameterized using psychophysical data from subjective intensity judgements for visual illusions. Illusions were quantified by creating a digitized image representing the subjective effect of human perception when exposed to input patterns. A Fourier transform was made of the input and output patterns and used to solve for the coefficients of the retinal operator equations. The equations were then applied to new illusions and compared with human subjective results through three dimensional plots of output pixel intensities. The second model with dynamic equations was studied using a computer simulation developed to operate on varying input wave forms and variable neural connection topologies. DOE

N87-18982# Oak Ridge National Lab., Tenn.

DOSE-RATE MODELS FOR HUMAN SURVIVAL AFTER EXPOSURE TO IONIZING RADIATION

T. D. JONES, M. D. MORRIS, and R. W. YOUNG (Defense Nuclear Agency, Washington, D.C.) 1986 9 p Presented at the American Nuclear Society Annual Meeting, Bethesda, Md., 15 Sep. 1986 Prepared in cooperation with Defense Nuclear Agency, Washington, D.C.

(Contract DE-AC05-84OR-21400)

(DE86-015645; CONF-8609147-1) Avail: NTIS HC A02/MF A01

This paper reviews new estimates of the LD sub 50 in man by Mole and by Rotblat, the biological processes contributing to hematologic death, the collection of animal experiments dealing with hematologic death, and the use of regression analysis to make new estimates of human mortality based on all relevant animal studies. Regression analysis of animal mortality data has shown that mortality is dependent strongly on dose rate, species, body weight, and time interval over which the exposure is delivered. The model has predicted human LD sub 50s of 194, 250, 310, and 360 rad to marrow when the exposure time is a minute, an hour, a day, and a week, respectively. DOE

N87-19891* National Aeronautics and Space Administration, Washington, D.C.

AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 296)

Apr. 1987 67 p

(NASA-SP-7011(296); NAS 1.21:7011(296)) Avail: NTIS HC A04 CSCL 06E

This bibliography lists 171 reports, articles and other documents introduced into the NASA scientific and technical information system in March, 1987. Author

N87-19892# School of Aerospace Medicine, Brooks AFB, Tex.
CONTACT LENS WEAR FOR VISUAL DISORDERS IN USAF AVIATORS Progress Report, Jan. 1968 - Mar. 1986

THOMAS J. TREDICI and WILLIAM J. FLYNN Sep. 1986 16 p
(AD-A174681; USAFSAM-86-23) Avail: NTIS HC A02/MF A01 CSCL 17E

Contact lenses are an alternative method to spectacles for correcting refractive errors, but the U.S. Air Force prohibits the wearing of contact lenses by all aircrew members unless medically or optically indicated (AFR 167-3). The USAF School of Aerospace Medicine has a clinical contact lens study consisting of 55 individuals wearing contact lenses for eye defects such as keratoconus, aphakia, anisometropia, and other special indications. Of these 55 subjects, 33 had medical conditions affecting their vision and were unconditionally grounded. Thirty-one of these individuals (18 of 19 pilots, 8 of 9 navigators, 5 of 5 other categories) were visually rehabilitated and returned to full flight status by the use of contact lenses. Hard lenses were used in 70% of the cases, and soft lenses were used in 30%. The large number of USAF aviators required to wear spectacles and new head-borne equipment has created compatibility problems with the standard USAF aviators' spectacle. For this spectacle compatibility problem, contact lenses appear as a viable alternative. However, concerns remain about the potential aviation hazards, such as +G2 effects, bubble formation and corneal hypoxia. GRA

N87-19893# Army Research Inst. of Environmental Medicine, Natick, Mass.

PLASMA OPIOID PEPTIDE RESPONSES DURING HEAT ACCLIMATION IN HUMANS

WILLIAM J. KRAEMER, LAWRENCE E. ARMSTRONG, LOUIS J. MARCHITELLI, ROGER W. HUBBARD, and NATALIE LEVA 27 Oct. 1986 22 p
(AD-A174771; USARIEM-M-7-87) Avail: NTIS HC A02/MF A01 CSCL 06O

Peptides, i.e., Plasma Beta-endorphin, Met-enkephalin and Peptide F immunoreactivity (ir) were measured at rest and following exercise on three days of an eight-day heat acclimation regime. Fourteen male subjects demonstrated physiological heat acclimation adaptations. The data demonstrated a differential

reponse of peripheral plasma levels of endogenous opioid peptides (EOP) to exercise in the heat. In addition, EOP did not follow the same time-course of other physiological adaptations as no differences resting or exercise levels were observed over the eight-day heat acclimation regime. Significant increases in Beta-endorphin ir (pre- to post exercise) appear to reflect concomitant exercise-heat related changes. Furthermore, the increased peripheral levels of Beta-endorphin may be related to increased glucocorticoid activity. Heat and exercise stress may result in a reduction of Met-enkephalin ir observed in peripheral plasma and might be due to degradation or a decrease in processing from the larger precursors. The differential responses of EOP suggest the possibility of separate physiological roles for these peptides during exercise in the heat but peripheral plasma levels of EOP do not appear to reflect heat acclimation changes. GRA

N87-19894# Army Research Inst. of Environmental Medicine, Natick, Mass.

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

L. E. BANDERET, D. M. MACDOUGALL, D. E. ROBERTS, D. TAPPAN, and M. JACEY Jun. 1986 28 p
(AD-A174855; USARIEM-T15/86) Avail: NTIS HC A03/MF A01 CSCL 05J

The effects of initial hydration state upon cognitive performance during cold exposure are examined. Five tests (Coding, Number Comparison, Computer Interaction, Pattern Comparison, and Grammatical Reasoning) were used to assess the cognitive performance of 36 male Marine volunteers. All subjects practiced the tests extensively the 3 days before the cold exposure. Each test was usually given 5 times per day for 4 minutes per administration. Computer Interaction was practiced 5 times per day for 7 minutes. Two groups of 18 subjects each were studied, 21 days apart, for 10 consecutive days. The second group of subjects was dehydrated by 2.5% of their body weight by severe fluid restriction and exercise-induced sweating the day before the cold exposure; the first group was normally-hydrated. All subjects spent 5 days in an environmental chamber where temperatures during the day were -23 to -25 C with 4 km/h winds and night conditions ranged from -4 to -10 C without wind. In the cold the subjects wore protective arctic uniforms; afterwards, recovery was evaluated for 27 hours. All cognitive assessment was interspersed with extensive physical work. Subjects exercised vigorously each day by walking, running, and pulling simulated loads on a treadmill. Hardware was worn during precold, cold, and recovery testing. The subjects' fluid intake was controlled and limited throughout the study. GRA

N87-19895# Army Research Inst. of Environmental Medicine, Natick, Mass.

SIGNS AND SYMPTOMS OF HEAT EXHAUSTION DURING STRENUOUS HEAT ACCLIMATION EXERCISE

LAWRENCE E. ARMSTRONG, ROGER W. HUBBARD, WILLIAM J. KRAEMER, JANE P. DELUCA, and ELAINE L. CHRISTENSEN Oct. 1986 26 p
(AD-A174862; USARIEM-M-4-87) Avail: NTIS HC A03/MF A01 CSCL 06S

This investigation reports the heat exhaustion signs and symptoms (SAS) which fourteen healthy, unacclimatized males experienced during 8 days of heat acclimation (HA) in an environmental chamber (41.2 + or - 0.5 C db, 39.0 + or - 1.7 % RH). Daily HA trials consisted of intensities of 63.0 + or - 2.8 to 71.8 + or - 2.9 (range: 51 - 95) %VO₂max. Typical physiological adaptations to heat occurred. Mean day 1 vs day 8 values were: final HR = 169 + or - 3 vs 144 + or - 5 beats/min, final Tre = 39.19 + or - 0.10 vs 38.55 + or - 0.17 C, final Tsk = 37.56 + or - 0.21 vs 36.52 + or - 0.26 C, %PV = 7.33 + or - 0.89 vs 5.85 + or - 1.31. Mean entering body weight was stable from day 1 to day 8, except that subject N lost 5.44 kg from day 5 to day 8. Subject N was one of four subjects who exhibited a lack of physiological adaptations in HR, Tre, Tsk and % delta PV. 12 out of 14 subjects (85.7%) experienced one or more SAS (e.g.,

dizziness, chills, abdominal cramps, vomiting). SAS occurred in 20 out of 112 trials (17.8%). SAS were not more prevalent at high exercise intensities; the greatest number of SAS occurred at 50-69% VO₂ max. of SAS occurred at 50 - 69% VO₂ max.

GRA

N87-19896# Army Research Inst. of Environmental Medicine, Natick, Mass.

APPEARANCE OF INGESTED H₂O IN PLASMA AND SWEAT DURING EXERCISE-HEAT EXPOSURE

LAWRENCE E. ARMSTRONG, ROGER W. HUBBARD, STEVEN H. ZEISEL, and MORTEZA JANGHORBANI 24 Nov. 1986 17 p
(AD-A174871; USARIEM-M-11-87) Avail: NTIS HC A02/MF A01 CSCL 06S

A study of human water transport and eccrine sweat gland function measured the rate of appearance of H₂O-18 in plasma and sweat. Four healthy males were exposed for 6 h to a hot, wet environment (37.1 C db, 31.3 C wb) and to intermittent cycle ergometer protocols. Baseline plasma (antecubital vein) and scraped sweat samples were collected (-30 to 0 min) prior to administration of 100 g of labelled water (84.7% O-16, 15.3% O-18) via nasogastric tube at 0 min. Samples were analyzed using isotopic ratio mass spectrometry. The isotopic enrichment of baseline sweat samples were slightly greater than that of plasma samples. Peak enrichment (O-18/O-16 Ratio) in plasma (range: 2.4908 - 2.7206 x .001) occurred at 21 - 28 min postdose and at 21 - 45 min postdose in sweat (range: 2.3089 - 2.6666 x .001). The O-18/O-16 Ratio in plasma and sweat declined rapidly, then declined slowly for the remaining heat exposure. The appearance of H₂O-18 in sweat reflected that of plasma; neither curve was significantly altered by exercise intensity, duration, or frequency. This is the first known stable isotope data to verify that ingested fluid is rapidly assimilated and becomes available for evaporative cooling during work in the heat. GRA

N87-19897# McMaster Univ., Hamilton (Ontario). Dept. of Medicine.

OXYGEN TRANSPORT DURING EXERCISE AT EXTREME SIMULATED ALTITUDE: OPERATION EVEREST 2

JOHN R. SUTTON, JOHN T. REEVES, PETER D. WAGNER, BERTRON M. GROVES, and ALLEN CYMERMAN Oct. 1986 54 p
(Contract DAMD17-85-C-5206; DA PROJ. 3E1-62777-A-879)
(AD-A175280) Avail: NTIS HC A04/MF A01 CSCL 06S

A decrease in maximal oxygen uptake has been demonstrated with increasing altitude. In this study 8 healthy males, aged 21 to 31 yrs, were examined at rest and during steady state exercise at sea level, and the following barometric pressures: 428, 347, 282, and 240 torr during a 40-day simulated ascent of Mt. Everest. The subjects exercised on a cycle ergometer and electrocardiograph, ventilation and expired gas samples were measured for heart rate, ventilation, VO₂ and VCO₂. Arterial and mixed venous blood was collected from indwelling radial or brachial and pulmonary artery catheters for analysis of blood gases, oxygen saturation and content and lactate. As barometric pressure decreased there was a reduced exercise capacity with VO₂ max decreasing from 3.9 l/m at sea level to 1.1 l/m at PB 240 torr. This was associated with profound hypoxemia and hypocapnia, at 60 Watts exercise PaO₂ = 28 + or - 1 torr and PCO₂ 11 + or - 1 Torr, with marked reduction in PVO₂ = 14.8 + or - 1 Torr (x + or - 1 SEM). Considering the major factors responsible for transfer of oxygen from the atmosphere to the tissues the most important adaptations occurred in ventilation where a four-fold increase in alveolar ventilation was observed. Diffusion from the capillary to the tissue mitochondria reflected by PVO₂ was also increased with altitude. Blood lactate was reduced at maximal exercise at increasing altitudes which suggested a reduced contribution from anaerobic metabolism to energy supply. GRA

N87-19898# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.

PERFORMANCE AND PHYSIOLOGICAL EFFECTS OF ACCELERATION-INDUCED (+GZ) LOSS OF CONSCIOUSNESS Final Report

JAMES O. HOUGHTON, DENNIS K. MCBRIDE, and KEN HANNAH Oct. 1986 17 p Prepared in cooperation with Naval Aerospace Medical Research Lab., Pensacola, Fla. (AD-A175328; NADC-86130-60) Avail: NTIS HC A02/MF A01 CSDL 06S

Flight profiles flown in today's aircraft routinely introduce the pilot to G levels above individual tolerances, especially with the acceleration stresses imposed by air combat maneuvering. This place the pilot in a situation where loss of consciousness (LOC) could occur with little or no warning and of which he may not be aware did occur, even after he regains consciousness and recovers the aircraft. The objective of this study is to determine how well and soon a pilot can regain control of an aircraft if he accidentally loses consciousness while in a high-G maneuver. A secondary objective is to determine how much warning time a pilot has from peripheral light loss (PLL) until he experiences LOC. Eight volunteers were repeatedly taken to deliberate LOC on the NAVAIRDEVCON human centrifuge under these different G-onset conditions simulating a TACAIR environment. Twenty LOC episodes occurred during the study. The period of complete incapacitation for all LOCs was a mean 12.6 seconds which, when combined with the period of confusion and disorientation immediately following recovery, results in a total mean time of 25 seconds during which the pilot is unable to adequately perform. This is more than enough time for a disaster to occur, especially in an unstable aircraft.

GRA

N87-19899# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.

PULSE WAVE DELAY FOR +GZ TOLERANCE ASSESSMENT Interim Report

LEONID HREBIEN Apr. 1986 11 p (AD-A175859; NADC-86140-60) Avail: NTIS HC A02/MF A01 CSDL 06S

We have found that pulse wave delay increases linearly with +Gz experienced by conscious subjects and that G-tolerance limits as measured using conventional light bars occur repeatedly at the same pulse wave delays or delta delay. When protective modalities such as anti-G suits or supinating seats are used, the delta delays increase at a slower rate as a function of +Gz. G-tolerance thresholds occur at higher +Gz levels with protection but the delta pulse wave delays reach the same value for all tolerance levels. This parameter can be used to warn expert systems of the approach of GLOC during actual flight and/or provides an objective measure of G-protection provided by new or modified anti-G equipment. Therefore, this tool can be used in the research setting to evaluate the efficacy of G-protective equipment in an objective manner.

GRA

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BEHAVIORAL SCIENCES

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

A87-28211* Stanford Univ., Calif.

THE SYNTHESIS AND ANALYSIS OF COLOR IMAGES

BRIAN A. WANDELL (Stanford University, CA) IEEE Transactions on Pattern Analysis and Machine Intelligence (ISSN 0162-8828), vol. PAMI-9, Jan. 1987, p. 2-13. Previously announced in STAR as N86-10777. refs

(Contract NIH-2-R01-EY-03164; NCC2-307; NCC2-332)

A method is described for performing the synthesis and analysis of digital color images. The method is based on two principles.

First, image data are represented with respect to the separate physical factors, surface reflectance and the spectral power distribution of the ambient light, that give rise to the perceived color of an object. Second, the encoding is made efficiently by using a basis expansion for the surface spectral reflectance and spectral power distribution of the ambient light that takes advantage of the high degree of correlation across the visible wavelengths normally found in such functions. Within this framework, the same basic methods can be used to synthesize image data for color display monitors and printed materials, and to analyze image data into estimates of the spectral power distribution and surface spectral reflectances. The method can be applied to a variety of tasks. Examples of applications include the color balancing of color images, and the identification of material surface spectral reflectance when the lighting cannot be completely controlled.

Author

A87-31210#

HELPING THE PILOT HANDLE THE SUPERCOCKPIT

ERIC J. LERNER Aerospace America (ISSN 0740-722X), vol. 25, Feb. 1987, p. 28-31.

Human factors are a focus in design studies for advanced cockpits, where pilots will have instantaneous access to sensor data. Workload control methods are being examined by monitoring physiological responses to piloting tasks. Heart rate, blinking and EEG frequencies increase with workload. An EEG wave pattern (p-300) has been correlated with the moment of decision. Its decrease in amplitude with the duration of high workload signals impaired decision-making. Microencephalographic sensors are being developed for in-flight p-300 wave monitoring of military pilots. Other research includes the development of blackout sensors, an electronic 'pilot's associate' to aid pilots after blackouts, and a Virtual Panorama Display which would analyze the pilot workload for a given image. Sound stimuli and their mode of presentation are being examined to replace some visual data displays. In the most farseeing studies, consideration is being given to tuning supercockpits directly to pilot brainwaves.

M.S.K.

N87-19900# Engineering Research Associates, Inc., Vienna, Va.

SCHEMA-BASED MODEL OF INFORMATION PROCESSING FOR SITUATION ASSESSMENT Interim Report

DAVID F. NOBLE and DEBORAH BOEHM-DAVIS Oct. 1986 81 p

(Contract N00014-84-C-0484)

(AD-A174757; R-622-86) Avail: NTIS HC A05/MF A01 CSDL 05J

A model of human information processing that links the properties of presented information to situation assessments based on this information is described, and data from experiments testing the major model attributes are presented. The model is based on the assumption that humans assess situations by determining the extent to which features in an observed situation match features of previously encountered reference situations that have been encoded as schema within semantic memory. The model involves seven processing steps. The first six are: schema activation at task initiation, object classification, substitution of objects not usually processed by the schema with functional equivalents that can be processed, scaling of features using schema criteria curves, weighting of features, and combining features using a weighted geometric mean of scaled features. The seventh step is an iteration of the last three. The experimental data strongly support the proposed model as a descriptive model of human information processing. The model has value, as well, for the design of information presentation aids.

GRA

N87-19901# Materials Research Labs., Ascot Vale (Australia).
VISUAL SEARCH PERFORMANCE AND OBSERVER EXPECTATIONS

C. J. WOODRUFF Sep. 1986 34 p
 (AD-A174807; MRL-R-1019) Avail: NTIS HC A03/MF A01
 CSCL 05J

A field experiment is reported in which subject's expectations regarding cues to detection of selected target types, and the effect such expectations might have on time to detection, were investigated. A scenario procedure for measurement of expectations is described, and the reliability and validity of this procedure documented. A measure of the mismatch between the availability of certain features on individual targets and the subject's expectations is introduced. The variation of search time with mismatch is examined, and it is found that there is no evidence of its dependence on the extent of mismatch. GRA

N87-19902# Naval Postgraduate School, Monterey, Calif.
HUMAN ADAPTATION TO THE COMPUTER M.S. Thesis
 FREDERICK A. SYCURO Sep. 1986 65 p
 (AD-A176052) Avail: NTIS HC A04/MF A01 CSCL 05H

This thesis is a study of the conceptions and fears that man, as both a user and manager, has regarding the computer. A survey of current literature on the subject of man's adaptation and perceptions to the computer has been reviewed in an attempt to identify specific problem areas. This study outlines the more common of these problem areas and provides recommendations for both the user and manager to assist in the adaptation, implementation and usage of the computer. Author (GRA)

N87-19903# Technische Hogeschool, Delft (Netherlands).
A DESCRIPTION OF VISUAL STRUCTURE Ph.D. Thesis
 BERNARDUS JOHANNES A KROESE 1986 139 p
 (ETN-87-99314) Avail: NTIS HC A07/MF A01

Relations between parameters of perceptual processes and characteristics of a model for the description of visual structure were studied. The structure description is based on relations (chords) between image points of similar visual quality (i.e., color, gray level). The number of chords in a certain region as a function of length r and orientation θ is represented in the chord space. The nonuniformity of the human image sampling array causes nonuniform quantization errors. This leads to a $\log r$, θ representation of the chord space rather than an r , θ representation. Clusters in the chord space represent strong partial correlations and are considered as structure features. The configuration of these structure features, indicating image structure, is invariant for position, size, and orientation. The particular representation of the structure domain permits a description of image structure at variable level of detail. ESA

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

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

A87-28567
EFFECTS OF HELMET WEIGHT AND CENTER-OF-GRAVITY ON THE VIBRATORY DYNAMICS OF THE HEAD-NECK SYSTEM - A MODELING APPROACH

CHRISTOPHER D. HAYES, JACK F. WASSERMAN (Tennessee, University, Knoxville), and BARCLAY P. BUTLER (U.S. Army, Aeromedical Research Laboratory, Fort Rucker, AL) IN: International Modal Analysis Conference, 4th, Los Angeles, CA, Feb. 3-6, 1986, Proceedings. Volume 2. Schenectady, NY, Union College, 1986, p. 1201-1207. refs
 (Contract DABT01-85-P-3828)

A four degree of freedom mathematical model was developed to describe the effects of varying helmet weight and center-of-gravity (CG) on the vibration characteristics of the head-neck-helmet system. The model consists of two pivot points connected by a system of rotational springs. Experimental data, collected from six subjects exposed to single- and multiple-axis vibration while wearing a variable weight/variable CG helmet, was used to determine rotational spring coefficients. Data from a simplified model was compared to experimental head-neck motion data to illustrate the change in head-neck-helmet motion due to the change in helmet weight and CG. Eventual optimization of the mathematical model will produce a useful tool to predict changes in pilot head-neck motion due to changes in helmet design. Author

A87-29074
ATTENUATION OF THE DOSE OF SOLAR COSMIC RAYS BY THE GEOMAGNETIC FIELD [OSLABLENIE DOZY SOLNECHNYKH KOSMICHESEKIKH LUCHEI GEOMAGNITNYM POLEM]

M. V. ZIL, A. V. KOLOMENSKII, and V. M. PETROV Kosmicheskie Issledovaniia (ISSN 0023-4206), vol. 24, Nov.-Dec. 1986, p. 944-947. In Russian. refs

The possible radiation-shielding effect of the geomagnetic field is investigated in connection with the protection of manned spacecraft against solar cosmic rays. Calculations were carried out via numerical integration for circular satellite orbits at heights from 300 to 1000 km and for orbital-plane inclination angles from 50 to 90 deg. The calculations indicate that the geomagnetic field effectively reduces the radiation hazard of solar cosmic rays at heights of 300-400 km. B.J.

A87-30272
ENGINEERING THE MAN-MACHINE INTERFACE FOR AIR TRAFFIC CONTROL

GREGORY KLOSTER (Knowlex Technology Corp., Denver, CO) and ANDRES ZELLWEGER (FAA, Washington, DC) Computer (ISSN 0018-9162), vol. 20, Feb. 1987, p. 47-55, 60-62. refs

The man-machine interface (MMI) is the cornerstone on which system architectures proposed for the ATC Advanced Automation System (AAS) must be built. Emphasis is laid on the workstation (sector suite console) and software controlling the MMI and the design methodology used by the FAA before initiating the design competition phase (DCP) of the AAS program. The AAS is to increase safety, efficiency and fuel savings, while accommodating evolutionary changes over the 20-30 yr life of the system. The design specifications were drawn from recommendations of a user team consisting of computer experts, active ATC personnel, human factors experts and engineers. The results of the 10,000 manhours devoted to the specifications definition are summarized in terms of the operational requirements, operations concept formulation,

MMI functional and performance and console requirements.
M.S.K.

A87-30273

THE QUANTIFICATION OF OPERATIONAL SUITABILITY

MARK D. PHILLIPS (Computer Technology Associates, Inc., Denver, CO) Computer (ISSN 0018-9162), vol. 20, Feb. 1987, p. 63-71. refs

The development of the requirements and operational suitability assessments of emerging designs developed by engineers, human factors scientists and active ATC personnel for the FAA Advanced Automation System is described. Emphasis is laid on the man-machine interface (MMI) design specifications which were defined for the two prime contractors for design proposals. Efforts were directed at obtaining a detailed operations concept for the MMI in terms of a validated set of system events, i.e., a complete characterization of the controller's job. Analysis of controller tasks permitted exploration of the ergonomic aspects of the MMI. Several examples are provided of specific tasks the proposed designs must perform, and milestone demonstrations being required of the contractors during the design competition phase are outlined.

M.S.K.

A87-30849

AN APPROACH TO SCENE DESIGN FOR REAL-TIME COMPUTER-GENERATED IMAGERY

GAVAN LINTERN (Illinois, University, Savoy) IN: Simulators III; Proceedings of the Conference, Norfolk, VA, Mar. 10-12, 1986. San Diego, CA, Society for Computer Simulation, 1986, p. 127-131. Research supported by the University of Illinois. refs (Contract N61339-84-D-0001)

Three theoretical approaches to defining the factors governing perception of space and surfaces are explored, with emphasis on the relevance for eliciting distance judgments with computer-generated imagery (CGI) for training simulators. The discussion covers depth-cue theory, ecological theory and a computational approach to vision used for AI systems. The specific hypotheses, and empirical data supporting each approach, are described. The effects of the size, shape, continuity, texture, motions, detail and geometric properties of objects in CGI scenery are discussed.

M.S.K.

A87-31120#

NEW CONCEPTS IN TELE-AUTONOMOUS SYSTEMS

LYNN CONWAY, RICHARD VOLZ, and MICHAEL WALKER (Michigan, University, Ann Arbor) AIAA, NASA, and USAF, Symposium on Automation, Robotics and Advanced Computing for the National Space Program, 2nd, Arlington, VA, Mar. 9-11, 1987. 17 p. Research supported by the University of Michigan. refs

(AIAA PAPER 87-1686)

Generic design concepts for semi-autonomous robotic systems amenable to facile human intervention when situations arise that cannot be handled by on-board AI programming are explored. Attention is focused on systems where an operator has a televised view of a robot manipulator controllable with a joystick. Problems inherent in the time delays between command and feedback in long-distance tele-operations can be ameliorated with a local simulation of the robot superimposed over the actual situation. The forward simulation can be used even when no time delays are present, i.e., a time clutch, to disengage the operator actions from the robot actions. A position clutch can disconnect path generation commands from robot actions, allowing the operator to test close maneuvers before translating the simulation into robot motions. A time brake would allow avoidance of robot crashes into obstacles that appear along a generated path. Finally, protocols are described for permitting smooth tradeoffs among human operators or back to the machine AI system.

M.S.K.

N87-18983*# Texas A&M Univ., College Station. Regenerative Concepts Group.

CONCEPTUAL DESIGN FOR A FOOD PRODUCTION, WATER AND WASTE PROCESSING, AND GAS REGENERATION MODULE Semiannual Progress Report

O. W. NICKS 15 Nov. 1986 97 p

(Contract NAG9-161)

(NASA-CR-180208; NAS 1.26:180208; SRC-5494-1) Avail: NTIS HC A05/MF A01 CSCL 06K

During the first six month period, the RECON (Regenerative Concepts Group) team collected reference material, made visits to consult with other researchers, and invited distinguished visitors to speak on the status of closed life support activities. A decision was made to develop the data base and modeling such that artificial intelligence (AI) methods could be used to manipulate data and examine concept alternatives. Six discrete tasks and a project schedule were outlined for the first year. The first two tasks have been essentially completed and have resulted in a sample set of assumptions for general use in defining candidate systems and for the specification of closed system characteristics. To model a closed environment, decisions were necessary to establish the amounts of food, air, water and waste products. Although recognized that data would eventually be normalized on the basis of a single human, the amount of data in existence for four person crews led to the decision to use this as a baseline. Information on existing concepts was collected from NASA sources, from industry, and libraries. Concept modeling was begun, hardware and software obtained, technical tasks identified and experimental work initiated.

Author

N87-18984*# Grumman Aerospace Corp., Bethpage, N.Y. Space Systems Div.

TELEROBOTIC ASSEMBLY OF SPACE STATION TRUSS STRUCTURE

GRAHME FISCHER 1986 10 p Presented at the 1986 Space Telerobotics Workshop, Pasadena, Calif., 20-22 Jan. 1987 (Contract NAS9-17229)

(NASA-CR-180239; NAS 1.26:180239) Avail: NTIS HC A02/MF A01 CSCL 05H

Discussed are methods of assembling the space station's structure utilizing only telerobotic devices, i.e.: (1) an approximately anthropomorphic telerobot with two dextrous arms; (2) the Shuttle Remote Manipulator System (SRMS); (3) various material handling machines. Timelines and task recommendations for autonomous operations are also included. Also described are some experimental results comparing two manipulator control devices.

Author

N87-18985*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

STEREO DEPTH DISTORTIONS IN TELEOPERATION

DANIEL B. DINER and MARIKA VONSYDOW 1 Feb. 1987 54 p

(Contract NAS7-918)

(NASA-CR-180242; JPL-PUB-87-1; NAS 1.26:180242) Avail: NTIS HC A04/MF A01 CSCL 05H

In teleoperation, a typical application of stereo vision is to view a work space located short distances (1 to 3 meters) in front of the cameras. Discussed are converged camera placement and the effects of intercamera distance, camera-to-object viewing distance, and focal length of the camera lenses on both stereo depth resolution and stereo depth distortion. While viewing the fronto-parallel plane 1.3 meters in front of the cameras, depth errors on the order of 2 centimeters are measured. A geometric analysis was made of the distortion of the fronto-parallel plane of convergence for stereo TV viewing. Results were then verified experimentally. The objective was to determine the optimal camera configuration which gave high stereo depth resolution while minimizing stereo depth distortion. It was found that for converged cameras at a fixed camera-to-object viewing distance, larger intercamera distances allow higher depth resolutions, but cause greater depth distortions. Thus with larger intercamera distances, operators will make greater depth errors (because of the greater distortions), but will be more certain that they are not errors

(because of the higher resolution). The analysis predicts camera configurations and a camera motion strategy that minimize stereo depth distortion without sacrificing stereo depth resolution.

Author

N87-18986# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.

ALTERNATING-FIELD STEREOSCOPIC DISPLAYS USING LIGHT-SCATTERING LIQUID CRYSTAL SPECTACLES

P. MILGRAM and R. VANDERHORST 4 Dec. 1985 20 p
Submitted for publication

(NLR-MP-85083-U; ETN-87-99297) Avail: NTIS HC A02/MF A01

Field-sequential stereoscopy means of displaying three dimensional visual images are reviewed. The conventional electro-optic shutter devices used for viewing such displays employ either twisted nematic liquid crystals or PLTZ ceramics. Both of these methods suffer the drawback of severe reduction in the brightness of the display image being observed. A field sequential stereoscopic viewing apparatus employing light-scattering cholesteric liquid crystals is proposed. Advantages of this device include minimal reduction in image brightness, full color, and reduced visual fatigue. ESA

N87-18987# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).

IMPROVED GUIDANCE AND CONTROL AUTOMATION AT THE MAN-MACHINE INTERFACE

WALTER M. HOLLISTER, ed. Dec. 1986 123 p
(AGARD-AR-228; ISBN-92-835-1537-4) Avail: NTIS HC A06/MF A01

Modern control and display technology has already reduced significantly the workload associated with piloting all forms of airborne vehicles. However, increased demands on the pilot make it desirable to establish how automation may further reduce both the cognitive and decision-making workload of the pilot. There is evidence that under high workload, in poor visibility, or for maximum combat capability, the pilot could perform better with control inputs more directly related to the outputs over which he needs control. There are also basic questions as to what information the pilot really needs, what control and management functions can be automated, and what functions must the pilot retain to perform his task satisfactorily in relation to different mission aspects. The AGARD GCP/WG.07 members were asked to identify the most promising options for improved automation at the man-machine interface of flight vehicles and present their findings. Author

N87-19904*# Georgia Inst. of Tech., Atlanta. Center for Man-Machine Systems Research.

PILOT INTERACTION WITH AUTOMATED AIRBORNE DECISION MAKING SYSTEMS Semiannual Progress Report, Mar. 1986 - Feb. 1987

JOHN M. HAMMER, C. YOON WAN, and VIJAY VASANDANI
Feb. 1987 86 p

(Contract NAG2-123)
(NASA-CR-180258; NAS 1.26:180258) Avail: NTIS HC A05/MF A01 CSCL 05H

The current research is focused on detection of human error and protection from its consequences. A program for monitoring pilot error by comparing pilot actions to a script was described. It dealt primarily with routine errors (slips) that occurred during checklist activity. The model to which operator actions were compared was a script. Current research is an extension along these two dimensions. The ORS fault detection aid uses a sophisticated device model rather than a script. The newer initiative, the model-based and constraint-based warning system, uses an even more sophisticated device model and is to prevent all types of error, not just slips or bad decision. B.G.

N87-19905# Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.

SUPERVISORY CONTROL, MENTAL MODELS AND DECISION AIDS, PART 1 Final Report, Mar. 1983 - Jul. 1986

THOMAS B. SHERIDAN, LEONID CHARNY, MAX B. MENDEL, and JAMES B. ROSEBOROUGH 31 Jul. 1986 20 p

(Contract N00014-83-K-0193)
(AD-A174727) Avail: NTIS HC A02/MF A01 CSCL 05H

This paper poses a framework for considering human supervisory control of semi-automatic systems. It analyzes supervisory control into specific human functions and gives examples of research that have been done and/or are needed with respect to each of these functions. For each such function it is argued that the human supervisory operator necessarily has a corresponding mental model, and potentially can have a computer-based decision aid. The relation of the proposed framework to the canonical modern control paradigm is also discussed, as are the reasonable limitations of our ability to model such a complex human machine interaction which itself exercises a high degree of free choice. Three accompanying papers offer detailed contributions to three of the supervisory functions (and corresponding decision aids) which heretofore have been neglected, namely: (1) formation of objectives by satisficing; (2) acquisition, calibration and combination of measures of process state; and (3) estimation of process state from current measure and past control actions. GRA

N87-19906# Air Force Human Resources Lab., Brooks AFB, Tex.

HUMAN FACTORS TECHNOLOGIES: PAST PROMISES, FUTURE ISSUES Final Technical Paper

EARL A. ALLUISI Dec. 1986 12 p
(AD-A174761; AFHRL-TP-86-40) Avail: NTIS HC A02/MF A01 CSCL 05E

Discussed are what are viewed as major issues confronting the human factors profession. The small size of the human factors work force, relative to the hardware/software engineering work force, is fundamental to the several issues discussed: How can leverage be generated? How can computer technologies be used to make a leveraged impact on design? How can applicable data and databases be constructed or generated for the computer-based leverage needed? The paper addresses the resolution of these issues with some specific examples. GRA

N87-19907# Rockefeller Univ., New York.

VISUAL TEMPORAL FILTERING AND INTERMITTENT VISUAL DISPLAYS Final Progress Report, 1 Sep. 1984 - 30 Jun. 1986

ROBERT SHAPLEY 8 Aug. 1986 8 p
(Contract AF-AFOSR-0278-84)

(AD-A174773; AFOSR-86-2026TR) Avail: NTIS HC A02/MF A01 CSCL 05J

The initial objective of this project was to investigate the relation between the temporal filtering properties of visual neurons and the performance of human observers when they view intermittent visual displays, e.g., video screens. The scope of the project was reduced by the support level set by AFOSR to focus just on human observers and to omit any experiments on neurons in experimental animals. Specific aims of the project initially included the design and fabrication of a variable-raster-rate electro-optic display, and the use of this novel device to measure the contrast sensitivity function at different raster rates. These two specific aims have been reached and are described in the full report. GRA

N87-19908# Coast Guard, Washington, D.C. Office of Research and Development.

SURVIVAL AT SEA: THE EFFECTS OF PROTECTIVE CLOTHING AND SURVIVOR LOCATION ON CORE AND SKIN TEMPERATURES Final Report

ALAN M. STEINMAN and PAUL S. KUBILIS Nov. 1986 119 p
(AD-A175316; USCG-D-26-86) Avail: NTIS HC A06/MF A01 CSCL 06Q

Different types of protective clothing for maritime personnel were compared in 3 simulated, survival environments: immersion

in cold, rough seas; exposure to cold wind, spray and waves atop an overturned boat; and exposure to cold air and waves in an open, one-man liferaft. The test garments were: flight suit (FS); two-piece wet suit (WS); insulated, loose-fitting aviation (AC) and boatcrew (BC) coveralls; uninsulated dry suit (NI); NI with a 5 cm tear in the shoulder seam (NX). All garments were worn over cotton thermal underwear; an additional layer of insulated, short-sleeve underwear was worn with NI and NX. 8 Coast Guard crewmen were the test subjects; mean age = 23 yrs; mean ht. = 175 cm; mean wt. = 72 kg; mean body fat = 11%. Significant differences between cooling rates in water and those on the boat or in the raft were found for all garments except NI and WS (boat). The results demonstrate that survivors maintain higher skin temps. and slower cooling rates out of the water, even when exposed to continuous wind, spray and waves than when they remain immersed in rough seas. Insulated, intact-dry-suits provide better immersion protection than do either tight-fitting wet suits or loose-fitting coveralls; leaky dry suits provide no better protection than do loose-fitting coveralls. The best survival environment is provided by the one-man liferaft. Linear cooling rates were used to estimate survival times in 6.1 C rough seas for personnel wearing each of the test garments. GRA

N87-19909# Anacapa Sciences, Inc., Fort Rucker, Ala.
HUMAN FACTORS RESEARCH IN AIRCREW PERFORMANCE AND TRAINING Final Summary Report, 1 Sep. 1981 - 31 Dec. 1985

KENNETH D. CROSS and SANDRA M. SZABO Nov. 1986 224 p
 (Contract MDA903-81-C-0504; DA PROJ. 2Q2-63731-A-792)
 (AD-A175348; ASI-479-080-86; ARI-RN-86-94) Avail: NTIS HC A10/MF A01 CSCL 05I

Each summary description contains a background section that describes the rationale for the research and the research objectives, a research rationale for the research and the research objectives, a research approach section that describes the tasks and activities required to fulfill the project objectives, a results section that describes the research findings, and a project status section that describes the work completed and projections for future research, if any. Subjects covered include: retention of helicopter flying skills; relearning helicopter flying skills; Army aviator training; Army aviator selection test; Army aviator performance measurement/evaluation; Army helicopter workstation design; helicopter flight simulators; flight simulators for training simulator sickness; aviator peer evaluation; aviator safety; and aviator training media. GRA

N87-19910# Naval Weapons Center, China Lake, Calif.
MEASURES OF EFFECTIVENESS IN SYSTEMS ANALYSIS AND HUMAN FACTORS Final Report, Jan. - Jul. 1984
 RONALD A. ERICKSON Sep. 1986 63 p
 (AD-A175353; AD-E900639; NWC-TP-6740) Avail: NTIS HC A04/MF A01 CSCL 12B

This report presents information from a number of sources on the development of measures of effectiveness (MOEs) for use in human factors and systems analysis. GRA

N87-19911# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
AN ASSESSMENT OF ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS TECHNOLOGY FOR APPLICATION TO MANAGEMENT OF COCKPIT SYSTEMS
 WAYNE L. MARTIN Sep. 1986 125 p
 (AD-A175456; AAMRL-TR-86-040) Avail: NTIS HC A06/MF A01 CSCL 06D

A review of the literature in the field of artificial intelligence was performed to identify research and development efforts in industry, academia, and government laboratories that may be related (or relatable) to the cockpit management function in tomorrow's aircraft. Individual chapters address the following topics: Chapter 1 - An Introduction to Artificial Intelligence and Expert Systems; Chapter 2 - Artificial Intelligence Development Applications in DARPA, DOD, and NASA; Chapter 3 - State-of-the-Art Review and Projection of Future Expert System

Developments; Chapter 4 - Human Factors Research in Artificial Intelligence and Expert Systems; Chapter 5 - Image Understanding; Chapter 6 - Natural Language Processing/Understanding; and Chapter 7 - Summary Comments on the Development and Application of Artificial Intelligence and Expert Systems. Separate bibliographies are provided at the end of each chapter to assist the reader in identifying specific literature of interest. A glossary of abbreviations, acronyms, and special terms used in the context of this report is also provided. GRA

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SPACE BIOLOGY

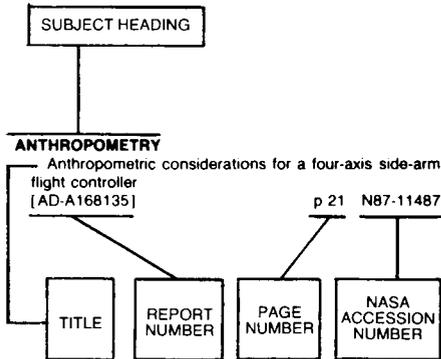
Includes exobiology; planetary biology; and extraterrestrial life.

A87-30492* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PERENNIAL N2 SUPERSATURATION IN AN ANTARCTIC LAKE

ROBERT A. WHARTON, JR., CHRISTOPHER P. MCKAY, ROCCO L. MANCINELLI (NASA, Ames Research Center, Moffett Field, CA), and GEORGE M. SIMMONS, JR. (Virginia Polytechnic Institute and State University, Blacksburg) Nature (ISSN 0028-0836), vol. 325, Jan. 22, 1987, p. 343-345. refs
 (Contract NSF DPP-84-16340; NCA2-2)

The results of a study are reported which, for the first time, documents the supersaturation of N2 in a lake. Dissolved N2 levels of 145 percent and 163 percent were determined for Antarctica's Lake Hoare from samples taken just below the ice cover and at a depth of 12 m, respectively. The relative importance of biological and abiological sources is reflected in the ratio of N2 concentration to O2 concentration. In Lake Hoare this ratio was 1.20 at the ice/water interface and 1.05 at 12 m, considerably different from the ratio in equilibrium with air (about 1.8). Based on these results, it is determined that about half of the net O2 production in the lake is the result of biological processes. The significance of these results for the putative ice-covered paleolakes in the canyon regions of Mars is discussed. C.D.

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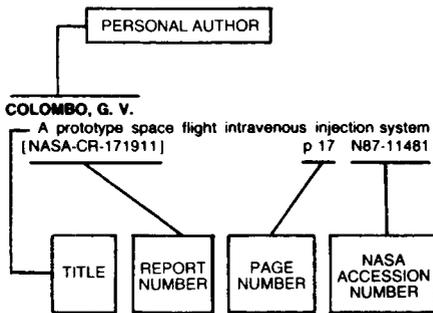
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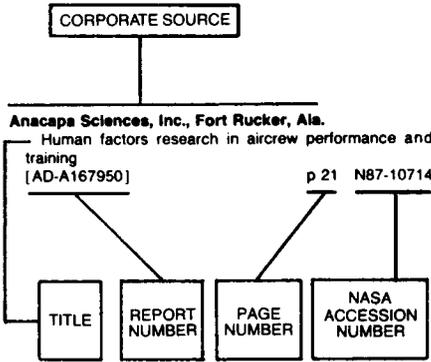
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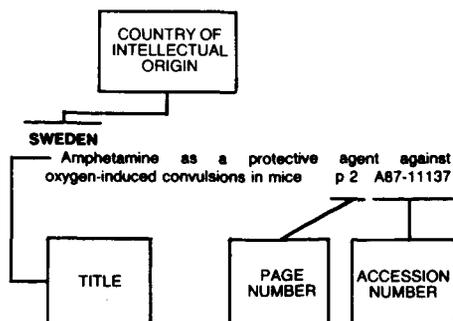
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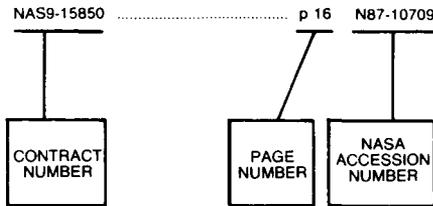
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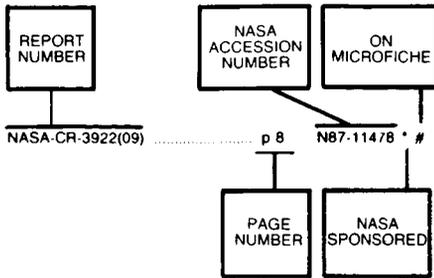


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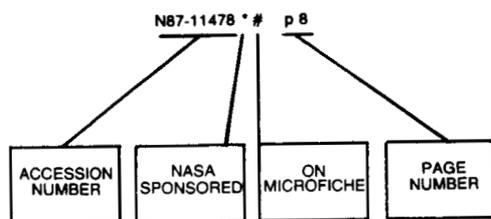


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