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Aerospace Medicine and Biology

A Continuing Bibliography with Indexes

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Aerospace Medicine and Biology

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NASA SP-7011(287)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 287)

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 July 1986 in

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

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INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* lists 346 reports, articles and other documents announced during July 1986 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA).* The first issue of the bibliography was published in July 1964.

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

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

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

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

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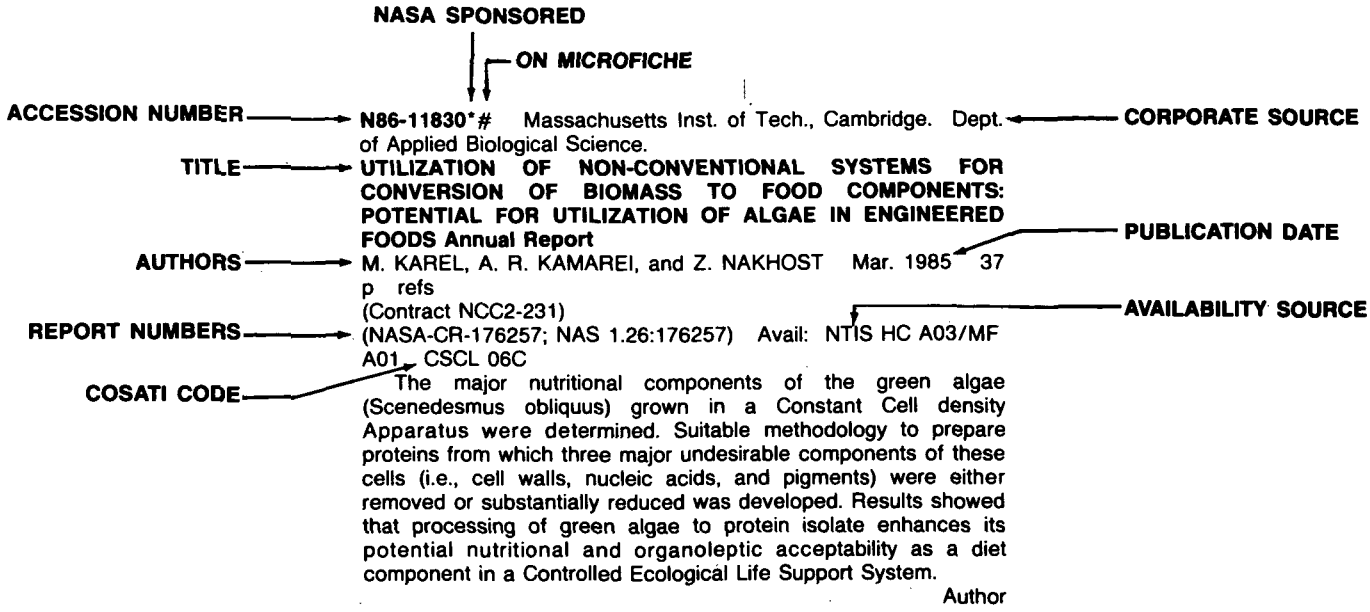
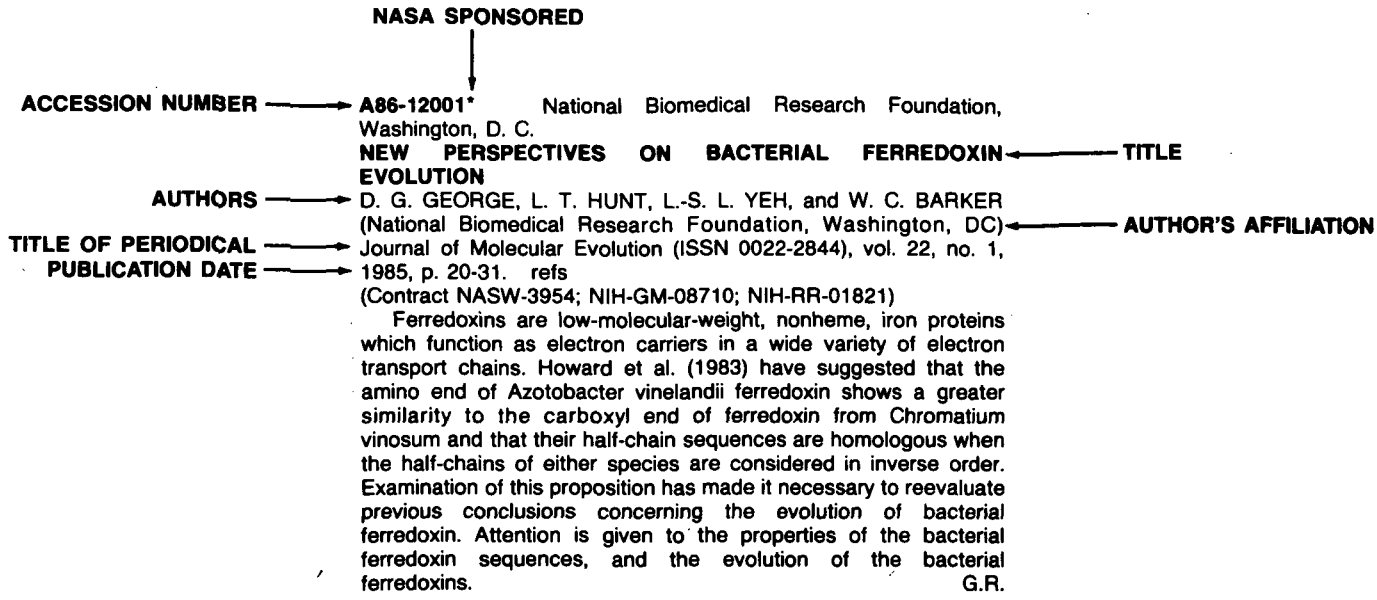
TYPICAL REPORT CITATION AND ABSTRACT



TYPICAL JOURNAL ARTICLE CITATION AND ABSTRACT



AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 287)

AUGUST 1986

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LIFE SCIENCES (GENERAL)

Includes genetics.

A86-30165
WHEAT FARMING IN A LUNAR BASE
F. B. SALISBURY and B. G. BUGBEE (Utah State University of Agriculture and Applied Science, Logan) IN: Lunar bases and space activities of the 21st century . Houston, TX, Lunar and Planetary Institute, 1985, p. 635-645. refs

An analysis of the parameters involved in the efficient operation of a lunar based wheat farm is presented along with recommendations on this operation. Wheat, with its vertical leaf orientation and excellent growth under continuous light, has been studied in the context of a bioregenerative life support system. Theoretical photosynthetic efficiencies suggest a maximum dry matter yield of 195 g/sq m/day when plants are irradiated with 1000 micromol photons/s/sq m, an irradiance high-pressure sodium lamps can readily achieve. In practice, yields may be affected by the harvest index, biomass digestibility, and lamp efficiency. Based on these factors, each person requires a minimum of 6 sq m of growing area and 3.55 kW of electrical energy. However, based on currently achieved yields, these minimum figures are 24 sq m and 13.4 kW/person. If these numbers are then doubled to provide a safety margin, a lunar farm could theoretically support 100 people in a 5000 sq m area. In addition, yields may be increased by manipulating temperature, humidity, nutrients, carbon dioxide and radiation; and by breeding suitable cultivars K.K.

A86-30166* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
METABOLIC SUPPORT FOR A LUNAR BASE
R. L. SAUER (NASA, Johnson Space Center, Houston, TX) IN: Lunar bases and space activities of the 21st century . Houston, TX, Lunar and Planetary Institute, 1985, p. 647-651. refs

A review of the metabolic support systems used and the metabolic support requirements provided on past and current spaceflight programs is presented. This review will provide familiarization with unique constraints of space flight and technology as it relates to inflight metabolic support of astronauts. This information, along with a general review of the NASA effort to develop a Controlled Ecological Life Support System (CELSS) will define the general scenario of metabolic support for a lunar base. A phased program of metabolic support for a lunar base will be elucidated. Included will be discussion of the CELSS water reclamation and food recycling technology as it now exists and how it could be expected to be progressively incorporated into the lunar base. This transition would be from a relatively open system in the initial development period, when mechanical phase change water reclamation and minimal plant growth are incorporated, to the final period when practically total closure of the life support system will be proved through physicochemical and biological processes. Finally, a review of the estimated metabolic intake requirements for the occupants of a lunar base will be presented. Author

A86-30168
RADIATION TRANSPORT OF COSMIC RAY NUCLEI IN LUNAR MATERIAL AND RADIATION DOSES
R. SILBERBERG, C. H. TSAO, J. H. ADAMS, JR. (U.S. Navy, E. O. Hulburt Center for Space Research, Washington, DC), and J. R. LETAW (Severn Communications Corp., Severna Park, MD) IN: Lunar bases and space activities of the 21st century . Houston, TX, Lunar and Planetary Institute, 1985, p. 663-669. refs

The radiation environment on the lunar surface is inhospitable. The permanent settlers may work ten hours per 24-hour interval for the two-week-long lunar day on the lunar surface, or 20 percent of the total time. At moderate depths below the lunar surface (less than 200 g/sq cm) the flux of secondary neutrons exceeds considerably that in the upper atmosphere of the earth, due to cosmic-ray interactions with lunar material. The annual dose equivalent due to neutrons is about 20 or 25 rem within the upper meter of the lunar surface. The dose equivalent due to gamma rays generated by nuclear interactions near the lunar surface is only on the order of 1 percent of that due to neutrons. However, gamma-ray line emission from excited nuclei and nuclear spallation products generated by cosmic rays near the lunar surface is of considerable interest: these lines permit the partial determination of lunar composition by gamma spectroscopy. Author

A86-30376
INTERNATIONAL UNION OF PHYSIOLOGICAL SCIENCES, COMMISSION ON GRAVITATIONAL, PHYSIOLOGY, ANNUAL MEETING, 7TH, NIAGARA FALLS, NY, OCTOBER 13-18, 1985, PROCEEDINGS
O. E. REYNOLDS, ED. Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, 257 p. For individual items see A86-30377 to A86-30480.

Among the topics discussed are: fluid/electrolyte balance and cardiovascular function in response to weightlessness; gravireception in plants and animals; and gravity sensitive systems in animals. Consideration is also given to: gravitational effects on animal development; chronobiology; the effect of gravity on cardiovascular fluid dynamics; and scientific payload concepts for the Space Station. Additional topics discussed include Spacelab bioscience mission results on homeostasis and biological rhythms in rats during spaceflight; the distribution of Ca, S, Mg, and P in rat incisors in space; and hematologic parameters of astrorats flown on Spacelab-3. I.H.

A86-30377#
COMPARATIVE ANALYSIS OF HYPO - AND HYPER-GRAVITY EFFECTS ON PRENATAL DEVELOPMENT OF MAMMALS
L. V. SEROVA, L. A. DENISOVA, and A. M. PUSTYNNIKOVA (Institut Mediro-Biologicheskikh Problem, Moscow, USSR) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-5 to S-8. refs

The effects of hypergravity and microgravity on prenatal development in rats and mice is considered. Data from soviet space missions are compared to the results of ground based centrifugation experiments in order to study two types of physiological change associated with gravity effects: (1) nonspecific changes which develop as stress reactions; and specific changes which are related to alterations in the locations and function of

organs and tissues. The role of nonspecific and specific gravity effects in the process of copulation fertilization, and birth rate are considered detail. It is shown that the effects of microgravity and hypergravity (an adaptation period) appear to be almost the same. I.H.

A86-30378*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SPACEFLIGHT AND CALCIUM METABOLISM
E. R. MOREY-HOLTON and S. B. ARNAUD (NASA, Ames Research Center, Moffett Field, CA) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-9 to S-12. refs

Calcium metabolism data from spaceflight have been obtained primarily from Skylab astronauts, from Soviet Salyut-6 cosmonauts, and from growing rats flown either on the Soviet Cosmos series or Spacelab 3. In this report, the results from Skylab astronauts will be compared to data from bed rested subjects, and the results from Cosmos rats will be compared to data from a ground-based rat model, to help explain (1) how spaceflight or gravitational unloading alters calcium metabolism in adult humans and growing rats, (2) the relevance of the observations of bone dynamics in growing rats to the changes in adult man, and (3) the sequence of events leading to changes in calcium metabolism during spaceflight. A hypothetical scheme of the mechanisms causing altered bone mass during spaceflight will be proposed. Author

A86-30379*# Arizona Univ., Tucson.
RESPONSES OF SKELETAL MUSCLE TO UNLOADING - A REVIEW
M. E. TISCHLER, S. R. JASPERS, E. J. HENRIKSEN, and S. JACOB (Arizona, University, Tucson) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-13 to S-16. Previously announced in STAR as N85-35594. refs
(Contract NAGW-227; NIH-AM-28647)

Suspension models were used to study muscle response to reduced activity. During 6 days of tail casting, the soleus (SOL) atrophies while the extensor digitorum longus grows relatively normally. After discounting those changes in both muscles due primarily to increased secretion of adrenal hormones, the following conclusions regarding the specific responses of the SOL could be drawn: (1) Atrophy is probably due primarily to increased protein degradation; (2) Decreased synthesis of glutamine may result from reduced availability of ammonia due to diminished use of ATP; (3) Greater muscle glycogen seems to reflect an increased response to insulin of glucose uptake which leads to greater glucose metabolism; and (4) Faster catabolism of branched-chain amino acids can be attributed to enhanced flux through ketoacid dehydrogenase. Studies by others using tail casted suspended rats showed in the SOL: (1) a gradual switch from type 1 to type 2 fibers; (2) increased acid protease activity; and (3) altered muscle function and contractile duration. Using harness suspended rats, others showed in the SOL: (1) significant atrophy; (2) increased numbers of glucocorticoid receptors; and (3) no change in muscle fatigability. Author

A86-30380*# California Univ., Berkeley.
SKELETAL MASS CHANGE AS A FUNCTION OF GRAVITATIONAL LOADING
N. PACE, A. H. SMITH, and D. F. RAHLMANN (California, University, Berkeley) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-17 to S-20. refs
(Contract NSG-7336)

The hypothesis that increased loading on an animal by chronic centrifugation results in an increase in skeletal mass was tested, using metabolically mature hamsters, rats, guinea pigs, Dutch rabbits and New Zealand rabbits representing a body mass range from 0.15 to 3.8 kg. Groups of 12 male animals of each species were subjeted to 2.0 g for 6 weeks on a 2.74 radius centrifuge with one degree of freedom. Subsequently, six of the animals were killed to measure whole body composition, while the rest comprised the control group, recovering for four weeks at 1.0 g prior to composition analysis. Results show a significant increase in bone mineral mass at 2.0 g. These centrifuge experiment results were then compared with the results of the USSR Cosmos Biosatellite experiment, whereby five rats experienced osteoporosis after 18.5 days of weightlessness. The opposing nature of effects that occurred at 0 g and 2.0 g is indicated schematically of particular interest is the fact that the bone mineral mass of the Cosmos 1129 flight rats was 17 pct less than that of the 1.0 g controls; whereas the bone mineral mass of the centrifuge rats was 18 pct greater than that of their 1.0 g controls. It is concluded that the bone mineral mass of the rat is directly proportional to gravitational loading over the range of 0 g to 2.0 g. K.K.

A86-30388#
INVESTIGATIONS OF HIGHER PLANTS UNDER WEIGHTLESSNESS
A. J. MERKYS, R. S. LAURINAVICIUS, D. V. SVEGZDIENE, and A. V. JAROSIUS (AN LSSR, Institut Botaniki, Vilnius, Lithuanian SSR) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-43 to S-46.

During the last three decades a number of experiments on higher plants have been performed under spaceflight conditions in the USSR. They include radiobiological and genetical investigations of dormant seeds and microspores, physiological investigations of seed germination, and experiments on the prolonged growth of plants in space undergoing a full cycle of development with the formation of biologically valuable seeds. They also include experiments on the spatial orientation of plants under microgravity conditions and in the field of centrifugal forces that have made it possible to determine the threshold of geotropic sensitiveness of plants. On the basis of the level of knowledge obtained, key tasks for the longterm investigations of gravitational plant physiology in space are outlined. Author

A86-30389#
GRAVITY SENSING IN ANIMAL CELLS
A. COGOLI (Zuerich, Eidgenoessische Technische Hochschule, Zurich, Switzerland) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-47 to S-50. Research supported by the Swiss Federal Institutes of Technology. refs
(Contract SNSF-3,382,0,82)

Experimental results are reviewed concerning the sensitivity of animal cells to microgravity in space, low-gravity in a clinostat, and hypergravity in a centrifuge. Attention is given to the effects of low-g or micro-g environments on all phases of cell development and a variety of cell parameters including cell proliferation, motility, nuclear density, chromosome patterns, and morphology. Certain findings on the adaptation of human lymphocytes to microgravity may have practical applications to biotechnology. For example, the fact that lymphocytes increase their interferon production by reducing their proliferation rate may be common to other animals and could be exploited for in-vitro biosynthesis of pharmaceutical products. I.H.

A86-30390#
THE EFFECTS OF REAL AND SIMULATED MICROGRAVITY ON VESTIBULO-OCULOMOTOR INTERACTION
I. B. KOZLOVSKAIA, V. A. BARMIN, IU. V. KREIDICH, and A. A. REPIN (Institut Mediko-Biologicheskikh Problem, Moscow, USSR) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-51 to S-56. refs

The effects of microgravity on the characteristics of the vestibulo-oculomotor interaction were studied on the basis of pre-flight and post-flight tests of rapid gaze fixation in 22 cosmonauts from the Salyut-6 and Salyut-7 spacecraft. The subjects performed a motor task involving rapid catching of a 1 deg luminous target which was presented on a white screen 30 cm from the eye. The amplitude and velocity of eye and head movements in the horizontal direction were monitored, and the timing of the task performance was analyzed. In general, the data are consistent with those of model simulations which predicted an increase in the 'invasiveness' of optokinetic stimuli and a decrease in eye-head coordination in microgravity. I.H.

A86-30391*# Michigan Univ., Ann Arbor.
VERTEBRATE GRAVITY SENSORS AS DYNAMIC SYSTEMS
M. D. ROSS (Michigan, University, Ann Arbor) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-57, S-58. refs
(Contract NAG2-325; NAS2-10535)

This paper considers verterbrate gravity receptors as dynamic sensors. That is, it is hypothesized that gravity is a constant force to which an acceleration-sensing system would readily adapt. Premises are considered in light of the presence of kinocilia on hair cells of vertebrate gravity sensors; differences in loading of the sensors among species; and of possible reduction in loading by inclusion of much organic material in otoconia. Moreover, organic-inorganic interfaces may confer a piezoelectric property upon otoconia, which increase the sensitivity of the sensory system to small accelerations. Comparisons with man-made accelerometers are briefly taken up. Author

A86-30392*# California Univ., Davis.
CHRONIC ACCELERATION AND EGG PRODUCTION IN DOMESTIC FOWL
A. H. SMITH, E. L. BESCH, and R. R. BURTON (California, University, Davis) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-59, S-60. refs
(Contract NR PROJECT 102-448; NSG-7493)

A study of the influence of chronic acceleration on egg production of commercially raised hens placed on a large animal centrifuge at 90 days of age, was performed. S8 generation hens were stepped up from 1.25 G to 2 G, which was maintained for 30 days. Fifty percent ceased to be in the laying condition at 1.5 G, and 10.8 percent suffered oviduct prolapse above 1.8 G. S21 generation hens had no incidents of oviduct prolapse despite 170-day retention at 2 G, and, assuming a 30 percent population not in the laying condition, approximated the commercial production rate. Chronic acceleration did not appear to affect the relative sizes of albumen or yolk, but it did appear to reduce the relative shell size, consistent with a decrease in plasma calcium. Dry matter content was not affected. R.R.

A86-30393#
ANIMAL MODELS OF MOTION SICKNESS - ARE NONEMETIC SPECIES AN APPROPRIATE CHOICE?
K.-P. OSSENKOPP and M. D. OSSENKOPP (Western Ontario, University, London, Canada) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-61, S-62. refs
(Contract NSERC-U-0151)

Indices of motion sickness (MS) in nonemetic species, with emphasis on the rat, are examined to determine whether these animals are appropriate choices for the study of MS. A body rotation-induced conditioned taste aversion experiment using guinea pigs supports the generality of this phenomenon across a wide range of animal species, and demonstrates the utility of the conditioned taste aversion measure as an index of MS in nonemetic species. It is concluded that a multiindex approach, using several different indices, would provide a more phenomenally realistic method of describing and assessing MS. Easily quantifiable indices such as defecation levels during rotation, make the rata ideal for the study of the pharmacological treatment, and the neural mechanisms, of MS. R.R.

A86-30394#
EFFECTS OF NON WEIGHT BEARING ON CALLUS FORMATION
J. R. SWEENEY, H. E. GRUBER, M. E. KIRCHEN, and G. J. MARSHALL (Los Angeles Orthopaedic Hospital, CA) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-63, S-64.

The inverted suspension cage of Morey (1981) is used to investigate the stages of callus formation and associated tissue repair in suspended rats. 9-11-month-old suspended and weight-bearing rats with fibular osteotomies were sacrificed at 9, 18, and 36 days, and fibulae were then processed for nondecalcified stained sections. A callus forms, but the size and progressive tissue formation are delayed, with dense irregular connective tissue remaining a prominent component until the 36th day. Chondrogenesis, osteogenesis, and the periosteal reaction and its accompanying neoangiogenesis are also delayed. Though the course of events in fracture healing of nonweight bearing rats is markedly delayed, may not be totally inhibited. R.R.

A86-30395#
CORRELATED LIGHT AND ELECTRON MICROSCOPY OF THE VASCULATURE OF CORTICAL BONE IN RAT FEMORA AND TIBIAE
R. M. DILLAMAN and R. D. ROER (North Carolina, University, Wilmington) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-65, S-66. refs

An approach is developed permitting an overall and focused evaluation of the relevant features of bone vasculature as they may apply to spaceflight osteoporosis. Tibiae and femora from rats, some of which had been injected with markers, are frozen and fractured, and bone pieces are then fixed and prepared for examination. Scanning and transmission electron microscopy revealed excellent preservation of ultrastructural features such as the osteocytic processes, and permitted vascular classification, and measurement of vessel diameter. Using brightfield and epifluorescence microscopy it was possible to describe the distribution of markers. Overall features were best revealed in stereoscopic examination. The overlap of analyses permits verification of measurement and relationships. R.R.

A86-30396#
EFFECTS OF GRAVITATIONAL AND MUSCULAR LOADING ON BONE FORMATION IN GROWING RATS
R. T. TURNER, B. W. SZUKALSKI (J. L. Pettis Memorial Veteran's Administration Hospital, Loma Linda, CA), and G. K. WAKLEY (Loma Linda University, CA) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-67, S-68. Research supported by Loma Linda University and USVA. refs
(Contract NIH-AM-35651)

To determine the relative importance of muscular versus gravitational loading on bone structure, bone formation was measured in tibial cross-sections from rats subjected to orbital space flight. This was compared with bone formation in rats whose muscular loading of the tibia was reduced by sciatic nerve section and with rats whose dynamic gravitational loading of the tibia was reduced by pelvic suspension. Our results show that (a) all three treatments inhibit bone formation; (b) inhibition of bone formation is site-specific in the tibia and, (c) inhibition of bone formation is characteristic of the treatment applied. Author

A86-30397#
ARE THERE CONDITIONS IN WHICH ADRENALECTOMY IMPEDES THE ATROPHYING EFFECTS OF DENERVATION?
R. R. ALMON and D. C. DUBOIS (New York, State University, Buffalo) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-69, S-70.

The results of previous work from this and other laboratories suggest the possibility that the atrophy of skeletal muscle may involve the muscle becoming hypersensitive to glucocorticoids. If this hypothesis is correct, then a possible test would be to remove the source of the hormone and such atrophy should not occur. The objective of this study was to evaluate the effects of diet on denervation atrophy in normal and adrenalectomized animals. The variations in diet ranged from a high-calorie liquid diet to starvation. The results clearly show that when the demand for amino acid carbon from the musculature is increased due to starvation, adrenalectomy protects the musculature from both starvation atrophy and denervation atrophy. In addition, we found that adrenalectomy does not entirely remove corticosterone from the animals. Stress will induce the presence of corticosterone in the serum of adrenalectomized animals. Author

A86-30398#
MODIFICATION OF THE RESTING OXYGEN CONSUMPTION LEVEL OF BIOLOGICAL BODY AND ITS TISSUES, DURING PROLONGED HYPODYNAMICS EXPOSURE
H. SAIKI (St. Marianna University, Japan), Y. SAIKI (Saiki Institute, Japan), M. SUDOH, M. NAKAYA, K. SHIODA (Jikei University, Tokyo, Japan) et al. (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-73, S-74.

Human and animal experiments were performed to clarify whether it is possible to decrease the basal metabolic rate of the whole body and of the tissue cells by hypodynamic orthostatic conditioning. The daytime resting metabolic rates (RMR) of human subjects during six days of water immersion conditioning were analyzed to estimate the circadian rhythm. Similar analysis with rats undergoing 3-10 weeks of orthostatic suspension conditioning was performed, with some groups killed at days eight and 20 to measure tissue oxygen consumption. Daily average RMR values did not deviate over the testing periods, and though a gradual deformation of RMR curves was seen, they returned to baseline by the end of the periods. It is concluded that it is difficult to produce basal metabolic rate reduction during such conditioning durations. R.R.

A86-30399*# Columbia Univ., New York.
EARLY MAMMALIAN DEVELOPMENT UNDER CONDITIONS OF REORIENTATION RELATIVE TO THE GRAVITY VECTOR
D. J. WOLGEMUTH and G. S. GRILLS (Columbia University, New York) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-75, S-76.
(Contract NAG2-324)

A clinostat was used to assess the effects of reorientation relative to the gravity vector on mammalian germ cells cultured in vitro. Previous studies using this system revealed an inhibition of meiotic maturation of mouse oocytes. In the present study, the effects of clinostat rotation on in vitro fertilization were examined. The frequency of fertilization of experimental cultures did not vary from that of the clinostat vertical control cultures at either of the rotation rates examined. Importantly, no abnormalities of fertilization, such as parthenogenetic activation, fragmentation, or polyspermy were seen. It is concluded that the initial events of fertilization were unaffected by this treatment, although the developmental potential of these embryos remains to be assessed. Author

A86-30400*# Texas Univ., Houston.
GROWTH AND DIFFERENTIATION OF MAMMALIAN EMBRYONIC TISSUES EXPOSED TO HYPERGRAVITY IN VIVO AND IN VITRO
J. DUKE, L. JANER, and J. MOORE (Texas, University, Houston) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-77, S-78. refs
(Contract NAG2-332)

Decreased cartilage areas in embryonic limbs developing under excess g in vitro, is reported, as well as delayed skeletal development in embryos and fetuses exposed to excess g in utero. 12.5-day mouse limb buds were cultured at 2.6 g, and fixed at two days and six days of culture. In vivo experiments used alizarin-stained 18-day fetuses exposed to 2.3 g. In all studies, cartilage areas were determined using a digitized tablet. Form factor analysis determined that the main effect of in vitro centrifugation was a reduction in length of the limb elements, probably due to the precocious chondrogenesis seen in the upper regions of centrifuged limbs. Similar reductions in length of ossified areas was seen in the in utero studies. R.R.

A86-30401*# Arizona Univ., Tucson.
SIMULATED HYPOGRAVITY AND SYNAPTOGENESIS IN CULTURE
R. GRUENER (Arizona, University, Tucson; Maryland, University, Baltimore) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-79, S-80. refs
(Contract NAG2-326; NIH-NS-07702)

A study on the effects of simulated microgravity on spinal neurons and myocytes cultured from X. laevis, is performed. Horizontal clinorotation at 1-10 rpm lasted from 16-36 hours, a sufficient time for cells to proceed through ontogenetic maturation. Late appearance of striations, retarded consumpton of yolk platelets and fewer and thinner neurites indicate subnormal expression of cell functions. Furthermore, these cells do not respond normally to environmental cues like trophic substances or surface contact. The observed delay in cell maturation is consistent with a hypothesis that cellular graviperception may effect the centriole and cytoskeleton. R.R.

A86-30402#
EARLY POSTNATAL DEVELOPMENT OF RATS GESTATED DURING FLIGHT OF COSMOS 1514
J. R. ALBERTS (Indiana University, Bloomington), L. V. SEROVA, Z. APANASENKO (Institut Mediko-Biologicheskikh Problem, Moscow, USSR), and J. R. KEEFE (Case Western Reserve University, Cleveland, OH) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-81, S-82. refs

The role of gravity in mammalian ontogenesis is examined. The delivery and development of pups in rats exposed to 5 days of zero gravity on Cosmos 1514, in control rats exposed to identical conditions as the flight group except under gravity, and in viviarium control rats are studied. The data reveal that all the rats delivered their litters at the standard gestation age, the flight rats had a mortality of 19 percent, the control rats morbidity was insignificant, and all the rats displayed typical maternal care cycles and nest attendance patterns. The mean body weights for the pups one day after birth are measured as 6.25 gm for the flight pups, 6.02 gm in the synchronous control group, and 7.06 gm in the vivarium rats. It is observed that fur development and eye opening in all three groups is equivalent. The vestibular and factory functions, and tactile, auditory, and visual sensitivity are evaluated and similar responses are detected in all pups. I.F.

A86-30403*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
GROWTH AND DEVELOPMENT OF MICE AND RATS CONCEIVED AND REARED AT DIFFERENT G-INTENSITIES DURING CHRONIC CENTRIFUGATION
J. OYAMA, L. SOLGAARD, J. CORRALES, and C. B. MONSON (NASA, Ames Research Center, Moffett Field, CA) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-83, S-84. refs

Prenatal and postnatal growth of rats conceived and reared at different G-intensities from 1.0G (earth gravity) to a maximum of 2.03G were compared. Prenatal growth was not generally impaired but the lung/body mass ratio of 22-day old fetuses at 2.03G was decreased significantly compared to 1.06 controls. Survival of neonatal rats was substantially reduced at 1.71G and 2.03G. Postnatal growth was decreased at the higher G-intensities and showed smaller or no effects at the lower G-intensities. Comparisons of organ/body mass ratios of hyper-G and 1.0G rats at 9 wks of age showed relatively few differences at the lower G-intensities. Postnatal growth of mice at 2.03G was suppressed during the neonatal period but recovered later so that after 9 wks the body mass of females reached and of males approached controls. Results of this preliminary study clearly show the influence of body mass in scaling the effects of hyper-G on the growth and development of and between different animal species. Author

A86-30404*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A MARSUPIAL MODEL FOR THE INVESTIGATION OF GRAVITATIONAL EFFECTS ON EARLY DEVELOPMENT
W. JURGELSKI and K. A. SOUZA (NASA, Ames Research Center, Moffett Field, CA) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-85, S-86. refs

The application of the marsupial mouse to the study of gravitational effects on early development is discussed. The benefits provided to microgravity experiments by the unique development of the species are described. The uterogestation and exterogestation, and the formation of the vestibular and musculoskeletal systems in the marsupial mouse are examined. I.F.

A86-30405*# Baylor Coll. of Medicine, Houston, Tex.
MORPHOGENESIS AND CALCIFICATION OF THE STATOCONIA IN THE CHICK (GALLUS DOMESTICUS) EMBRYO - IMPLICATIONS FOR FUTURE STUDIES
C. D. FERMIN and M. IGARASHI (Baylor College of Medicine, Houston, TX) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-87, S-88. refs
(Contract NAG2-342; PHS-RR-05425; NIH-NS-10940; NIH-NS-22604)

The morphogenesis of the statoconia in the chick, Gallus domesticus, injected with a carbon anhydrase inhibitor is studied. The preparation of the embryo specimens for analysis is described. The early, middle, and late stages of embryonic development are examined. The data reveal that acetozolamide inhibits statoconia formation in the middle stage of development and the calcification process follows statoconia formation. The spatial relationship between the development of type 1 and type 2 hair cells and the appearance and maturation of the statoconia is investigated. I.F.

A86-30406*# Florida State Univ., Tallahassee.
FERTILIZATION, DEVELOPMENT AND SPICULE FORMATION IN SEA URCHINS UNDER CONDITIONS OF CONSTANT REORIENTATION RELATIVE TO THE GRAVITATION AXIS
G. SCHATTEN, C. STROUD, C. SIMERLY, and H. SCHATTEN (Florida State University, Tallahassee) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-89, S-90. refs
(Contract NAG2-340)

A86-30407*# Indiana Univ., Bloomington.
RESPONSE OF AMPHIBIAN EGG NON-YOLK CYTOPLASM TO GRAVITY ORIENTATION
R. C. SMITH, A. W. NEFF, and G. M. MALACINSKI (Indiana University, Bloomington) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-91, S-92. refs
(Contract NAG2-323)

In order to study amphibian egg cytoplasmic organization and egg symmetrization at the molecular level, a library of seventeen monoclonal antibodies (MoAbs) against Xenopus laevis non-yolk egg proteins was produced. Several of these MoAbs react with non-yolk cytoplasmic antigens which are unevenly distributed in the fertile Xenopus egg. Author

A86-30408*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AMPHIBIAN FERTILIZATION AND DEVELOPMENT IN MICROGRAVITY
K. A. SOUZA (NASA, Ames Research Center, Moffett Field, CA) and S. D. BLACK (California, University, Berkeley) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-93, S-94. refs

An experiment investigating the effects of gravity on embryonic development in amphibians is proposed. The planned procedures for the preparation of the frog eggs for launching in the Space Shuttle, for the injection of the eggs with gonadotropin, for the insertion of the eggs into egg chambers, for the storage of one of the chambers in a microgravity area and the second into a centrifuge, and for the fertilization of the eggs are described. The later organogenesis, swimming behavior, cytoplasmic components, cellular formation, neural plate and archenteron expansion, and allometry and expansion of the organ systems will be examined. Normal morphology for embryos and tadpoles developing at microgravity and the formation of the neural plate opposite the sperm entry point meridian are predicted. I.F.

A86-30409#
EVIDENCES FOR CHANGES IN SENSITIVITY TO AUXIN AND IN CELL-WALL PROPERTIES DURING GRAVITROPIC BENDING OF DICOT STEMS
F. B. SALISBURY, P. A. RORABAUGH, and R. WHITE (Utah State University of Agriculture and Applied Science, Logan) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-95, S-96. refs

A86-30410#
EFFECTS OF SIMULATED GRAVITY NULLIFICATION ON SHOOT-INVERSION RELEASE OF APICAL DOMINANCE IN PHARBITIS NIL
M. G. CLINE and T. K. PRASAD (Ohio State University, Columbus) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-97, S-98.

Inversion of upper shoot of Pharbitis nil induces outgrowth of the highest lateral bud adjacent to bend in stem. The objectives of this study are to determine whether simulated gravity nullification will (1) decrease ethylene production and 1-aminocyclopropane-1-carboxylic acid (ACC) synthase activity in inverted shoot, (2) restrict growth in inverted shoot and (3) affect outgrowth of highest lateral bud. Gravity nullification is simulated by rotating the plant (with its upper shoot inverted) in a vertical plane perpendicular to axis of a horizontal clinostat. Results indicate that clinostating does: (1) prevent release of apical dominance, (2) significantly decrease ACC synthase activity and ethylene production in inverted shoot and (3) reduce growth restriction of inverted shoot. These data are consistent with hypothesis that shoot inversion release of apical dominance is caused by ethylene-induced restriction of growth in inverted shoot. Author

A86-30411*# Cornell Univ., Ithaca, N.Y.
GRAVISTIMULATION-INDUCED CHANGES IN CURRENT PATTERNS AROUND ROOT CAPS
T. BJORKMAN and A. C. LEOPOLD (Cornell University, Ithaca, NY) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-99, S-100. refs
(Contract NIH-P41-RR-01395-SSS; NAGW-3)

Changes in the electric current patterns around the root cap of corn following gravistimulation were determined using a vibrating probe. A transient increase in upward current in the cap was found following stimulation. The response began with a time lag similar to the presentation time, and was limited to the area of the root cap lateral to the statocytes. A pysiological response as rapid as that reported by Behrens et al. (1985) was not observed. C.D.

A86-30412*# Kenyon Coll., Gambier, Ohio.
EFFECT OF CALMODULIN AND AUXIN TRANSPORT INHIBITORS ON CALCIUM NET UPTAKE ALONG APICAL CORN ROOTS
K. L. EDWARDS (Kenyon College, Gambier, OH) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-101, S-102. refs
(Contract NAGW-368)

A86-30413*# Washington Univ., St. Louis, Mo.
RED LIGHT SHIFTS THE LOCUS AND RATE OF GRAVITROPIC CURVATURE IN ETIOLATE PEA EPICOTYLS
M. A. HARRISON and B. G. PICKARD (Washington University, St. Louis, MO) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-103, S-104.
(Contract NAGW-70; NAGW-420)

A86-30414*# Ohio State Univ., Columbus.
THE STRUCTURE AND DEVELOPMENT OF THE STARCH SHEATH IN PEA EPICOTYLS
D. F. SACK (Ohio State University, Columbus) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-105, S-106. refs
(Contract NAGW-780)

Graviperception in plant stems is thought to occur in endodermal cells differentiated as a starch sheath, but little is known about the ultrastructure of these cells in dicots. The structure of the pea starch sheath was studied with respect to gravity and to development in order to determine whether symplastic or apoplastic blockages exist and to describe any intracellular polarity. Amyloplasts increase in size towards the base of the epicotyl hook but are not consistently sedimented until the cells enter the zone exhibiting gravicurvature below the hook. The starch sheath cells are connected to each other and to cells of the cortex and the stele by plasmodesmata. A casparian strip exists in older endodermal cells but not at the stage that the endodermis is differentiated as a starch sheath. Amyloplasts were frequently observed in apparent contact with endoplasmic reticulum. Author

A86-30415#
PLANT GROWTH RESPONSES TO ATMOSPHERE AND OTHER ENVIRONMENTAL VARIABLES IN THE SPACE SHUTTLE PLANT GROWTH UNIT
M. D. CUELLAR and C. A. MITCHELL (Purdue University, West Lafayette, IN) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-107, S-108.

Studies using a ground-based version of the Plant Growth Unit (PGU) are being conducted with mungbean (Phaseolus aureus Rosb. cv. Berken). Composition and turnover rate of atmosphere within four Plant Growth Chambers (PGCs) mounted in the PGU were investigated. Addition of Hoagland's No. 1 nutrient solution to the medium resulted in superior seedling growth over that using only water. Flowing atmosphere at 1 liter/h through the PGCs for 7 days had no significant effect on shoot dry weight relative to that in a static atmosphere, but did result in greater stem length. In a static atmosphere, ethylene accumulated to levels which retarded plant growth, as demonstrated using a technique designed to trap C2H4 over 7-day growth periods. Elevated levels of CO2 also accumulated in sealed PGCs lacking C2H4 traps, but a depletion of CO2 occurred when using such traps, while plants exhibited increased growth. Author

A86-30416#
EFFECTS OF MECHANICAL STRESSES, ABSCISIC ACID, AND OUTDOOR EXPOSURE ON GROWTH AND WATER RELATIONS OF EGGPLANT
J. G. LATIMER and C. A. MITCHELL (Purdue University, West Lafayette, IN) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-109, S-110. refs

A86-30417*# Michigan State Univ., East Lansing.
AN ATTEMPT TO LOCALIZE AND IDENTIFY THE GRAVITY SENSING MECHANISM OF PLANTS
R. S. BANDURSKI, A. SCHULZE, and D. REINECKE (Michigan State University, East Lansing) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-111, S-112. refs
(Contract NAGW-97; NSF PCM-82-04017)

The oxidation and transport of indole-3-acetic acid (IAA) in Zea mays is examined towards an understanding of the gravity-influenced promotion of growth in plants. An enzyme that oxidizes IAA to a nongrowth-promoting species has been partially purified, and determined to be stimulated by a lipoidal factor. Data suggest that the upward transport of IAA in the stele and outward movement from the stele into the mesophyll cortex is metabolically mediated, and possibly affected by the gravitational stimulus. It is postulated that hormone assymmetries can arise by 'potential-gating' of the transport channels between the various plant tissues. R.R.

A86-30418*# Baylor Univ., Waco, Tex.
CYTOCHEMICAL LOCALIZATION OF CALCIUM IN CAP CELLS OF PRIMARY ROOTS OF ZEA MAYS L
R. MOORE (Baylor University, Waco, TX) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-113, S-114. NASA-supported research.

The cellular distribution of Ca in caps of primary roots of Zea mays was examined during the onset and early stages of gravicurvature to determine its possible role in root gravitropism. Staining becomes associated with the portion of the cell wall adjacent to the distal end of the cell after five minutes, and persists throughout the onset of gravicurvature. The outermost peripheral cells of roots oriented horizontally and vertically secrete Ca through plasmodesmata-like channels in their cell walls. Data suggest that Ca is not transported laterally through the columella tissue,but rather that the movement of Ca to the lower side of caps of horizontally-oriented roots is at least partially through and/or on the mucilage of the cap, and via an electrochemical gradient. An important role in root gravitropism is indicated for Ca secretion by peripheral cells. R.R.

A86-30419*# Texas Univ., Austin.
IMMUNOCYTOCHEMICAL LOCALIZATION OF CALMODULIN IN PEA ROOT CAPS AND PLUMULES AND ITS RELEVANCE TO HYPOTHESIS ON GRAVITROPISM
S. J. ROUX and M. DAUWALDER (Texas, University, Austin) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-115, S-116.
(Contract NSG-7480)

A86-30420*# California Univ., Berkeley.
EFFECTS OF NORFLURAZON ON THE LEVELS OF ABSCISIC ACID AND XANTHOXIN IN CAPS OF GRAVISTIMULATED ROOTS OF MAIZE
L. J. FELDMAN (California, University, Berkeley) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-117, S-118. refs
(Contract NAGW-238)

A86-30421#
THE CALCIUM DEPENDENCE OF AUXIN ACTION IN ROOTS
M. L. EVANS and K.-H. HASENSTEIN (Ohio State University, Columbus) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-119, S-120. refs

The inhibitory action of auxin on growth in roots of maize seedlings raised to contain variable levels of calcium is studied to investigate the interaction of calcium and auxin in the control of root elongation. Inhibition of root elongation by 10 micro-M of Indole-3-acetic acid (IAA) does not occur in roots of seedlings raised by inhibition and growth in distilled water to minimize their calcium content. The inhibition of root growth by 0.01 micro-M IAA resembles that of 0.5 mM CaCl2. These results are consistent with the suggestion that IAA action is coupled to IAA-induced calcium release from storage pools. The calcium-control hypothesis has application to microgravity studies, where gravity-induced calcium redistribution could establish a gradient in auxin activity without a gradient in auxin concentration. R.R.

A86-30422#
CORRELATED CHANGES IN CALMODULIN ACTIVITY AND GRAVITROPIC SENSITIVITY IN ROOTS OF MAIZE
C. L. STINEMETZ and M. L. EVANS (Ohio State University, Columbus) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-121, S-122. refs

A86-30423*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
BONE LOSS DURING SIMULATED WEIGHTLESSNESS - IS IT GLUCOCORTICOID MEDIATED?
D. D. BIKLE, B. P. HALLORAN, C. M. CONE, and E. MOREY-HOLTON (NASA, Ames Research Center, Moffett Field; USVA, Medical Center, San Francisco, CA) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-123, S-124.

Elevating the hindquarters of a rat by the tail unweights the hind limbs but maintains normal weight-bearing by the forelimbs. This maneuver leads to a decrease in bone mass and calcium content in the unweighted bones (e.g., tibia and L1 vertebra), but not in the normally weighted bones (e.g., humerus and mandible). Potentially, the stress of the maneuver, mediated by increased glucocorticoid production and secretion, could explain the decreased bone formation, rather than the skeletal unweighting per se. To test this possibility, the effects of adrenalectomy on the response of bone to the unweighting of the hind limbs of normal rats were evaluated. Author

A86-30424*# Columbia Univ., New York.
LOCALIZATION OF CALCIUM STIMULATED ADENOSINE TRIPHOSPHATASE ACTIVITY IN BLOOD VESSELS OF THE SKELETON
S. B. DOTY (Columbia University, New York) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-125, S-126. refs
(Contract NCC2-325)

Alkaline phosphatase is an enzyme found in bone forming cells which decreases in certain bones as a result of hypogravity or non-weight bearing. This enzyme can also hydrolyze adenosine triphosphate. Therefore, an effort was made to localize calcium-stimulated ATPase by cytochemistry to determine whether altered bone cell activity might be related to changing calcium levels which occur during hypogravity. The results indicate that Ca(++)-ATPase is largely found along the endothelium and basal lamina of blood vessels, and not found in bone forming cells. This suggests that calcium regulation in the vicinity of bone

formation may be modulated by the vasculature of the area. Author

A86-30425*# California Univ., San Francisco.
EFFECT OF SIMULATED WEIGHTLESSNESS AND CHRONIC 1,25-DIHYDROXYVITAMIN D ADMINISTRATION ON BONE METABOLISM
B. P. HALLORAN, D. D. BIKLE, R. K. GLOBUS, M. J. LEVENS (California, University, San Francisco), T. J. WRONSKI (Florida, University, Gainesville), E. MOREY-HOLTON (NASA, Ames Research Center, Moffett Field, CA) et al. (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-127, S-128.

Weightlessness, as experienced during space flight, and simulated weightlessness induce osteopenia. Using the suspended rat model to simulate weightlessness, a reduction in total tibia Ca and bone formation rate at the tibiofibular junction as well as an inhibition of Ca-45 and H-3-proline uptake by bone within 5-7 days of skeletal unloading was observed. Between days 7 and 15 of unloading, uptake of Ca-45 and H-3-proline, and bone formation rate return to normal, although total bone Ca remains abnormally low. To examine the relationship between these characteristic changes in bone metabolism induced by skeletal unloading and vitamin D metabolism, the serum concentrations of 25-hydroxyvitamin D (25-OH-D), 24, 25-dihydroxyvitamin D (24,25(OH)2D) and 1,25-dihydroxyvitamin D (1,25(OH)2D) at various times after skeletal unloading were measured. The effect of chronic infusion of 1,25(OH)2D3 on the bone changes associated with unloading was also determined. Author

A86-30426*# Arizona Univ., Tucson.
RESPONSE OF RAT HINDLIMB MUSCLES TO 12 HOURS RECOVERY FROM TAIL-CAST SUSPENSION
M. E. TISCHLER, E. J. HENRIKSEN, S. JACOB, P. COOK, and S. JASPERS (Arizona, University, Tucson) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-129, S-130. Previously announced in STAR as N85-35590. refs
(Contract NAGW-227)

Previous work has shown a number of biochemical changes which accompany atrophy or reduced muscle growth in hindlimb of tail-casted, suspended rats. These results clearly show that altered muscle growth was due to changes in protein turnover. Accordingly, the rise in soleus tyrosine following unloading reflects the more negative protein balance. Other major changes we found included slower synthesis of glutamine as indicated by lower ratios of glutamine/glutamate and reduced levels of aspartate which coincide with slower aspartate and ammonia metabolism in vitro. In conjunction with the study of SL-3 rats, which were subjected to 12 h of post-flight gravity, a study of the effects of 12 h eight bearing on metabolism of 6-day unloaded hindlimb muscles was carried out. G.L.C.

A86-30427*# Arizona Univ., Tucson.
POSSIBLE MECHANISM FOR CHANGES IN GLYCOGEN METABOLISM IN UNLOADED SOLEUS MUSCLE
E. J. HENRIKSEN and M. E. TISCHLER (Arizona, University, Tucson) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-131, S-132. Previously announced in STAR as N85-35588. refs
(Contract NAGW-227)

Carbohydrate metabolism has been shown to be affected in a number of ways by different models of hypokinesia. In vivo glycogen levels in the soleus muscle are known to be increased by short-term denervation and harness suspension. In addition, exposure to 7 days of hypogravity also caused a dramatic increase in glycogen concentration in this muscle. The biochemical alterations caused by unloading that may bring about these increases in glycogen storage in the soleus were sought. G.L.C.

A86-30428*# Vanderbilt Univ., Nashville, Tenn.
CHANGES IN SKELETAL MUSCLE PROPERTIES FOLLOWING HINDLIMB SUSPENSION
G. T. PATTERSON and W.-D. DETTBARN (Vanderbilt University, Nashville, TN) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-133, S-134.
(Contract NAG2-301)

Changes in AChE regulation, the functions of the sarcoplasmic reticulum (SR), and muscle fiber-type population in the extensor digitorium longus (EDL) and soleus of male rats suspended in a nonweight-bearing position are studied. Muscle weight, AChE activity, protein content, SR calcium loading rates, and muscle types in the suspended and control rats are evaluated and compared. It is observed that following 1-4 weeks of suspension the EDL is unaffected; however, the soleus muscle weight, and protein content decrease and the AChE activity increases. The SR calcium loading rates of EDL decrease 10 percent and the soleus increase 50 percent in the suspended rats. The data reveal that the population of muscle type 1 (slow fibers) decreases and type 2 (fast fibers) increases for the soleus, and the distribution is unchanged for the EDL of the suspended rats. It is detected that a nonweight-bearing position affects the soleus (a fast-twitch muscle), but not the EDL (a slow-twitch muscle). I.F.

A86-30429*# Texas Univ., Dallas.
CONTROL OF ARACHIDONIC ACID RELEASE IN CHICK MUSCLE CULTURES
G. H. TEMPLETON, M. PADALINO, and W. WRIGHT (Texas, University, Dallas) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-135, S-136. refs
(Contract NAGW-140)

Cultures from thigh muscles of 12 day old embryonic chicks are utilized to examine arachidonic release, prostaglandin (PG) biosynthesis, and protein synthesis. The preparation of the cultures is described. It is observed that exogenous arachidonic acid is formed into photsphatidylethanolamine and phosphatidylcholine, is released by a calcium ionosphere or phospholiphase simulator, and is the substrate for the biosynthesis of PG; the epidermal growth factor and PGF do not stimulate protein synthesis over the basal levels. The relationship between arachidonate release and melittin is studied. The data reveal that a change in intracellular calcium stimulates phospholiphase activity, arachidonate release, and PG synthesis in chick muscle culture. I.F.

A86-30430#
CAGE-SIZE AND GENDER EFFECTS ON FATIGUE IN RATS
R. M. ENOKA, L. L. RANKIN, and D. G. STUART (Arizona, University, Tucson) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-137, S-138. refs

The effects of cage size during rearing and of gender on the physiological properties of adult rat muscles are investigated. Male and female rats were housed in cages 47 x 25 x 20 cm and 320 x 183 x 99 cm and separated by gender. The size, and contractile and electromyographic (EMG) characteristics of the soleus and extensor digitorin longus (EDL) of the caged rats are evaluated. It is observed that the soleus and EDL of the males are 0.23 g and 0.25 g respectively, and both muscles are 0.17 g in the females; the force exerted by the EDL in response to stimuli is 2.13 N in the males and 1.29 N in the females. It is noted that cage size and gender have minimal effects on changes in the EMG characteristics, gender influences whole body mass, and absolute force, and cage size and gender affect normalized force and fatigability. I.F.

A86-30431#
ALTERED CARBOHYDRATE METABOLISM IN THE WHOLE BODY SUSPENDED RAT
J. M. STEFFEN, R. D. FELL, and X. J. MUSACCHIA (Louisville, University, KY) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-139, S-140. refs

Adjustments to seven days of hypokinesia/hypodynamia (H/H) in suspended rats include increased muscle fatigability and decreased oxidative capacity. The present studies investigated changes in carbohydrate metabolism which may regulate energy supply for contractile activity. Rats suspended for seven days and controls were used to determine: serum insulin, response to glucose loading, muscle sensitivity to insulin, and muscle glycogen at rest and following contractile activity. Serum insulin was comparable in control and H/H rats. Elevated plasma glucose and a greater hyperglycemia in response to oral glucose suggested loss of insulin sensitivity. This was confirmed by perfusion studies of hindlimb muscle glucose uptake. While atrophied muscles from H/H rats exhibited increased glycogen concentrations, glycogen was depleted to a greater extent during moderate intensity stimulation. These results suggest alterations in carbohydrate metabolism with whole body suspension. Author

A86-30432*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
OXYGEN CONSUMPTION DURING COLD EXPOSURE AT 2.1 G IN RATS ADAPTED TO HYPERGRAVIC FIELDS
J. HOROWITZ, S. PATTERSON, and C. MONSON (NASA, Ames Research Center, Moffett Field, CA; California, University, Davis) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) *Physiologist, Supplement (ISSN 0031-9376), vol.* 28, Dec. 1985, p. S-141, S-142. refs
(Contract NSG-2234)

The thermoregulation ability of rats exposed to various gravitational fields is examined. Male Sprague-Dawley rats were exposed to 22 C and 1 G, and 9 C and 2.1 G in experiment one, 1 G, 2.4 G, 5.8 G and 22 + or - 1.5 C in experiment two, and 1 G, 19-22 C, and 5 C in experiment three. It is observed that the core temperature in the control rats was 36.8 + or 0.4 C at 22C and 30.8 + or - 0.6 C at 9 C, and oxygen consumption dropped from 37 + or - 0.3 C core temperature at 22 C, 36.4 + or - 0.3 C at 9 C, 0.4 oxygen consumption was 8.18 + or - 0.9 ml/min at 22 C, and 14.2 + or - 0.4 ml/min at 9 C. The data from experiment two reveal that tail temperature in the control rats peaked at 2.4 G and at 5.8 G for the acclimated rats, and in experiment three a greater decrease in core temperature is detected in the 2.1-G rats. It is noted that prior acclimation to 2.1 G enhances the thermoregulation ability when exposed to the cold. I.F.

A86-30433*# California Univ., Davis.
CHANGES IN FUNCTIONAL METABOLISM IN THE RAT CENTRAL NERVOUS SYSTEM FOLLOWING SPACEFLIGHT
D. M. MURAKAMI, J. D. MILLER, and C. A. FULLER (California, University, Davis) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-143, S-144. refs
(Contract NAG2-349; NAS2-10536)

The neuronal metabolism and soma size of neurons within the paraventricular nucleus (PVN) and the supraoptic nucleus of rats are analyzed. Five male Sprague-Dawley rats were flown on Spacelab 3 for 7 days under a 12:12 light/dark cycle and unlimited food and water, and a control group was kept on the ground under similar conditions. The preparation of the hypothalamus of the rats for microscopic examination using thionin or the cytochrome oxidase (CYOX) technique is described. CYOX activity and soma size within the PVN are evaluated. The effects of water drinking pattern and space flight on CYOX activity and soma size are investigated. The data reveal that the flight rats with normal drinking patterns display a decrease in neuronal metabolism within the vasopressin-containing neurons of the hypothalamus and this metabolic change may reflect fluid shifts caused by microgravity. I.F.

A86-30435*# Millsaps Coll., Jackson, Miss.
MORPHOLOGICAL EVIDENCE OF MECHANORECEPTIVE GRAVITY PERCEPTION IN A WATER FLEA - DAPHNIA MAGNA
D. G. MEYERS (Millsaps College, Jackson, MS) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-149, S-150. refs
(Contract NAGW-70; NAGW-643)

Hair-like structures or setae located in the basal membrane of the swimming antennae of the water flea, D. magna, were observed by scanning electron microscopy and compared to mechanoreceptors in the Higher Order Crustacea. Similarities in anatomy, size, attachment, number, length, and orientation support the hypothesis that the setae are rheoceptive mechanoreceptors which mediate gravity perception through deflection by water currents during the sink phase of hop-and-sink swimming behavior. Author

A86-30436*# Eastern Virginia Medical School, Norfolk.
EFFECTS OF CLINOSTAT ROTATION ON AURELIA STATOLITH SYNTHESIS
D. SPANGENBERG, S. DAVIS, and H. ROSS-CLUNIS, III (Eastern Virginia Medical School, Norfolk) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-151, S-152. refs
(Contract NAG2-343)

Aurelia ephyrae develop eight graviceptors (rhopalia) during their metamorphosis from polyps, which are used for positional orientation with respect to gravity. In three experiments for each speed of 1/15, 1/8, 1/4, 1/2, 1, and 24 rpm, groups of six polyps were rotated in the horizontal or vertical plane (control) using clinostats. Other controls were kept stationary in the two planes. Ten ephyrae from each group were collected after 5-6 days at 27 C in iodine and the number of statoliths per rhopalium were counted. Statistical analyses of statolith numbers revealed that horizontal clinostat rotation at 1/4 and 1/2 rpm caused the formation of significantly fewer statoliths per rhopalium than were found in controls. The finding that these slow rates of rotation reduces statolith numbers suggests that the developing ephyrae were disoriented with respect to gravity at these speeds, causing fewer statocytes to differentiate or to mineralize. Author

A86-30437#
PROTEIN CONCENTRATION ELEVATIONS IN LUNGS OF MICE FOLLOWING SUDDEN, TRANSIENT CEPHALAD (+GZ) ACCELERATION
C. J. GUTIERREZ, D. J. CRITTENDEN, J. S. LYTLE, D. R. DUKESHERER, and C. DELMORAL (Central Florida, University, Orlando) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-153, S-154. refs

In order to examine effects of headward acceleration (+Gz) on pulmonary vasculature, mice were subjected to +Gz for 1.8 sec aboard a solid fuel rocket. Protein in bronchoalveolar lavage was measured for evidence of altered microvasculature. Experimental mice were launched and recovered from a parachute descent. Sham control mice were placed in the rocket but not launched. Protein content in control mice (N = 8) was 1.53 + or - 8 (SD) mg/gm wet lung tissue and in experimental mice (n = 11) was elevated to 13.09 + or - 8.31 (SD) mg/gm wet lung (p less than .001). Lung wet weight/body weight ratios were not changed. Sudden transient imposition of +6.22 Gz at liftoff may have induced hypervolemia of basilar microvessels subsequent to increased hydrostatic pressure. Possible stretching of endothelial

junctions may have permitted a small amount of fluid and protein transudation. Fluid may have entered bronchiolar airways subsequently gravitating toward alveoli. Lavage protein may have been recovered from alveolar and bronchiolar regions. Author

A86-30438*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
TRANSIENT DEHYDRATION OF LUNGS IN TAIL-SUSPENDED RATS
A. R. HARGENS, J. STESKAL, and E. R. MOREY-HOLTON (NASA, Ames Research Center, Moffett Field, CA; California, University; USVA, Medical Center, San Diego) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-155, S-156. NASA-USVA-supported research. refs

The fluid balance in the lungs of rats exposed to head-down tilt is examined. Six Munich-Wister rats were suspended for 7 days and 10 Sprague-Dawley rats for 14 days using the technique of Morey (1979). The water contents of the lungs of the suspended and a control group are calculated and compared. The data reveal that the two-days suspended rats had dehydrated lungs; however, the lungs of the 14-day suspended and control group rats were similar. It is noted that the dehydration in the 2-day suspended rats is caused by general dehydration not the head-tilt position. I.F.

A86-30439*# California Univ., Davis.
INFLUENCE OF EXPOSURE TO A PROLONGED HYPERDYNAMIC FIELD ON BODY TEMPERATURE IN THE SQUIRREL MONKEY
C. A. FULLER (California, University, Davis) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-157, S-158. refs
(Contract NAG2-349; NAS2-10536)

The effect of gravitational loading on the regulation of body temperature is examined. Five adult male squirrel monkeys were exposed to a 2-G environment twice for 48 hours, once beginning in the middle of their light cycle and the second time in the middle of their dark cycle. It is observed that a reduction in body temperature occurs during the light cycle phase and at night there is an insignificant change in body temperature. The rhythmic characteristics of the light and dark cycles are analyzed. The data reveal that the body temperature in animals at 2 G is influenced more during the active phase of the animals 24-hour cycle. I.F.

A86-30440*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CHANGES IN MUSCLE PROTEIN COMPOSITION INDUCED BY DISUSE ATROPHY - ANALYSIS BY TWO-DIMENSIONAL ELECTROPHORESIS
S. ELLIS (NASA, Ames Research Center, Moffett Field, CA), C. S. GIOMETTI (Argonne National Laboratory, IL), and D. A. RILEY (Wisconsin, Medical College, Milwaukee) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-159, S-160. refs

Using 320 g rats, a two-dimensional electrophoretic analysis of muscle proteins in the soleus and EDL muscles from hindlimbs maintained load-free for 10 days is performed. Statistical analysis of the two-dimensional patterns of control and suspended groups reveals more protein alteration in the soleus muscle, with 25 protein differences, than the EDL muscle, with 9 protein differences, as a result of atrophy. Most of the soleus differences reside in minor components. It is suggested that the EDL may also show alteration in its two-dimensional protein map, even though no significant atrophy occurred in muscle wet weight. It is cautioned that strict interpretation of data must take into account possible endocrine perturbations. R.R.

A86-30441*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
CONSIDERATIONS IN THE DESIGN OF LIFE SCIENCES RESEARCH FACILITIES FOR THE SPACE STATION
M. HEINRICH and C. E. RUDIGER (Lockheed Missiles and Space Co., Inc., Bioastronautics Div., Sunnyvale, CA) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-161, S-162.
(Contract NAS5-20400)

The facilities required for life science research on a permanent Space Station are examined. Specifications important to the designing of facilities and planning of activities on the Space Shuttle are: (1) the species to be tested, (2) the number and procedure for testing, (3) the number of specimens at each sampling time, (4) the analyses required, (5) the methods of preserving samples, instruments, and supplies, and (6) the amount of crew time required. Experiments which are relevant to understanding the effects of microgravity on living systems are to be performed on the Space Station. The design and instruments of a Space Station laboratory and specimen centrifuge are described. I.F.

A86-30442#
HYPOKINEZIA AND SPACE FLIGHT REFLECTED ON RATS STOMACH
P. GROZA, I. LAZAR, E. DRAGOMIRESCU, S. IONESCU, V. ZAMFIR (Academia de Stiinte Medicale, Institutul de Fiziologie Normala si Patologica, Bucharest, Rumania) et al. (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-163, S-164. refs

The effects of 5 days of space flight and 7 days of hypokenezia (HK) on the gastric acid secretion, blood pH level, and lactic dehydrogenase (LDH) izoenzymes of the gastric mucosa in nonpregnant, pregnant, and adrenalectomized rats are investigated. It is observed that there is a decrease in glicoprotein content and an increase in the LDH izoenzymes for all the rats after HK. The data reveal that despite the increase in gastric acid output (GAO) due to pregnancy the GAO and blood pH level decrease after HK; however, the GAO in nonpregnant rats is increased. The removal of the adrenal glands after HK does not affect GAO. I.F.

A86-30443#
VIVARIA REQUIREMENTS FOR ANIMAL LIFE CYCLE STUDIES ON SPACE STATION
R. C. MAINS (Mains Associates, Berkeley, CA) and J. R. ALBERTS (Star Enterprises, Bloomington, IN) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-165, S-166.

The application of animal vivaria to life cycle research is discussed. The requirements for the reproduction/growth, maintenance, and measurement of amphibians and rodents in space are described. The development of systems capable of reproduction and growth, and life support of animals is examined. I.F.

A86-30444*# Phytoresource Research, Inc., College Station, Tex.
TISSUE CULTURE APPARATUS FOR FLIGHT EXPERIMENTATION
H. W. SCHELD, J. W. MAGNUSON (PhytoResource Research, Inc., College Station, TX), and A. D. KRIKORIAN (New York, State University, Stony Brook) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-167, S-168.
(Contract NAS9-17292; NAS9-17291)

The development of an apparatus for in-flight treatment of cells, tissues, or small organisms for microscopic and chemical analyses is discussed. The hardware for the apparatus is to have: (1) automated functions, (2) the capability to interface with ground-based facilities, (3) independently controlled chambers, (4) variable chamber configurations and volumes, and (4) the capabilities for processing the materials. The components of the equipment used on Skylab 3 for the study of animal cells are described. The design of an apparatus which incorporates all the required capabilities is proposed. I.F.

A86-30447#
REDUCTION OF CIRCADIAN DISRUPTION FOLLOWING SURGERY BY INGESTION OF CAFFEINE IN THE LABORATORY RAT
L. A. FARR, C. CAMPBELL-GROSSMAN, S. L. LANGENBERG-PANZER, J. M. MACK, M. J. PETERSEN (Nebraska, University, Medical Center, Omaha) et al. (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-173, S-174. refs
(Contract PHS-R01-NU-001098-01)

The purpose of this study was to test the effects of caffeine ingestion, prior to surgery, on disruption of circadian rhythms following surgery. The study measured 20 male Sprague-Dawley rats' temperature and locomotor activity by short range, radio/telemetry and infrared-monitoring. Eight rats were subjected to surgical laparotomy using general anesthesia and then monitored until their activity had returned to presurgical levels. Two groups of six rats each, received either caffeine in distilled water or distilled water, orally for five days. On day six, animals were subjected to surgical laparotomy and data were recorded as before. Temperature cycles shifted during treatment only with caffeine. Both groups shifted their activity peaks during treatment. Shifts were more pronounced with caffeine. Following surgery, unmanipulated rats shifted their temperature peaks to inappropriate times of day. Animals which received water showed less disruption, while caffeine rats were not shifted following surgery. Activity results were similar. It is concluded that caffeine provides a cue to circadian timing which reduces disruption following surgery. Author

A86-30449*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACE STATION LIFE SCIENCE RESEARCH FACILITY - THE VIVARIUM/LABORATORY
J. D. HILCHEY (NASA, Marshall Space Flight Center, Huntsville, AL) and R. D. ARNO (NASA, Ames Research Center, Moffett Field, CA) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-177, S-178.

Research opportunities possible with the Space Station are discussed. The objective of the research program will be study gravity relationships for animal and plant species. The equipment necessary for space experiments including vivarium facilities are described. The cost of the development of research facilities such as the vivarium/laboratory and a bioresearch centrifuge is examined. I.F.

A86-30451*# California Univ., Davis.
LIFE SCIENCE RESEARCH ON THE SPACE STATION
C. A. FULLER (California, University, Davis) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-181, S-182. refs
(Contract NAG2-349)

The requirements for studying the mechanisms of response and adaptation to the microgravity environment are examined. The necessary facilities, equipments, and technologies for the use of animals in space research are discussed. The application of a centrifuge to the analysis of the effects of microgravity on physiological adaptation is described. I.F.

A86-30452*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
MORPHOLOGY OF HUMAN EMBRYONIC KIDNEY CELLS IN CULTURE AFTER SPACE FLIGHT
P. TODD, M. E. KUNZE, K. WILLIAMS, D. R. MORRISON, M. L. LEWIS, and G. H. BARLOW (NASA Johnson Space Center, Houston, TX; Bioprocessing and Pharmaceutical Research Center, Philadelphia; Pennsylvania State University, University Park, PA; Michael Reese Research Foundation, Chicago, IL) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-183, S-184.

The ability of human embryonic kidney cells to differentiate into small epithelioid, large epithelioid, domed, and fenestrated morphological cell types following space flight is examined. Kidney cells exposed to 1 day at 1 g, then 1 day in orbit, and a 12 minute passage through the electrophoretic separator are compared with control cultures. The data reveal that 70 percent of small epithelioid, 16 percent of large epithelioid, 9 percent of dome-forming, and 5 percent of fenestrated cells formed in the space exposed cells; the distributions correlate well with control data. The formation of domed cells from cells cultured from low electrophoretic mobility fractions and small epithelioid cells from high mobility fractions is unaffected by space flight conditions. It is concluded that storage under microgravity conditions does not influence the morphological differentiation of human embryonic kidney cells in low-passage culture. I.F.

A86-30454*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
RAT MAINTENANCE IN THE RESEARCH ANIMAL HOLDING FACILITY DURING THE FLIGHT OF SPACE LAB 3
T. FAST, R. GRINDELAND, L. KRAFT, M. RUDER, M. VASQUES (NASA, Ames Research Center, Moffett Field, CA) et al. (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-187, S-188.

To test the husbandry capabilities of the Research Animal Holding Facility (RAHF) during space flight, 24 male rats were flown on Spacelab 3 for 7 days. Twelve large rats (400 g, LF), 5 of which had telemetry devices implanted (IF), and 12 small rats (200 g, SF) were housed in the RAHF. Examination 3 hr after landing (R + 3) revealed the rats to be free of injury, well nourished, and stained with urine. At R + 10 the rats were lethargic and atonic with hyperemia of the extremities and well groomed except for a middorsal area stained with urine and food. Both LF and SF rats showed weight gains comparable to their IG controls; IF rats grew less than controls. Food and water consumption were similar for flight and control groups. Plasma concentrations of total protein, sodium, albumin and creatinine did not differ between flight and control groups. LF and SF rats had elevated plasma glucose, and SF rats had increased blood urea nitrogen, potassium and glutamic pyruvic transaminase. These observations indicate that rats maintained in the RAHF were healthy, well nourished and experienced minimal stress; physiological changes in the rats can thus be attributed to the effects of space flight. Author

A86-30455*# Purdue Univ., Indianapolis, Ind.
ELECTRON MICROPROBE ANALYSES OF CA, S, MG AND P DISTRIBUTION IN INCISORS OF SPACELAB-3 RATS
G. D. ROSENBERG (Purdue University, Indianapolis, IN) and D. J. SIMMONS (Washington University, St. Louis, MO) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-189, S-190.
(Contract NASA ORDER-A-21997-C)

The distribution of Ca, S, Mg and P was mapped within the incisors of Spacelab-3 rats using an electron microprobe. The data indicate that Flight rats maintained in orbit for 7 days have significantly higher Ca/Mg ratios in dentin due to both higher Ca and lower Mg content than in dentin of ground-based Controls. There is no statistical difference in distribution of either P or S within Fligth animals and Controls, but there is clear indication that, for P at least, the reason is the greater variability of the Control data. These results are consistent with those obtained on a previous NASA/COSMOS flight of 18.5 days duration, although they are not pronounced. The results further suggest that continuously growing rat incisors provide useful records of the effects of weightlessness on Ca metabolism. Author

A86-30456*# Arizona Univ., Tucson.
RESPONSES OF AMINO ACIDS IN HINDLIMB MUSCLES TO RECOVERY FROM HYPOGRAVITY AND UNLOADING BY TAIL-CAST SUSPENSION
M. E. TISCHLER, E. J. HENRIKSEN, S. JACOB, and P. H. COOK (Arizona, University, Tucson) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-191, S-192. refs
(Contract NAGW-227)

Amino acids were assayed in muscles from rats exposed to 7 days of hypogravity and 12 h of gravity (F) or 6 days of suspension with (R) or without (H) 12 h of loading. In these groups, lower aspartate was common only to the soleus (SOL) relative to control muscles, the smallest difference being in group R. This difference in aspartate for F and H, but not for R, correlated with lower malate suggesting diminution of citric acid cycle intermediates. The R SOL value was increased over the H SOL. Therefore desite 12 h of loading, the F SOL was more comparable to the H SOL. The role of stress in preventing recovery of the F SOL was apparent from the ratios of glutamine/glutamate. Synthesis of glutamine is enhanced by glucocorticoids and is reflected by an increased ratio. In 5 of the 6 F muscles studied, this ratio was greater than in controls. In contrast, the ratio in all R muscles was similar to controls and showed recovery from the values in H muscles. Hence the post-flight treatment of F rats may have produced additional stress. Despite this stress, in some respects the SOL responses to hypogravity were similar to its responses to unloding by suspension. Author

A86-30457*# Arizona Univ., Tucson.
MUSCLE PROTEIN AND GLYCOGEN RESPONSES TO RECOVERY FROM HYPOGRAVITY AND UNLOADING BY TAIL-CAST SUSPENSION
E. J. HENRIKSEN, M. E. TISCHLER, S. JACOB, and P. H. COOK (Arizona, University, Tucson) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-193, S-194. Previously announced in STAR as N85-35591. refs
(Contract NAGW-227)

Previous studies in this laboratory using the tail-bast hindlimb suspension model have shown that there are specific changes in protein and carbohydrate metabolism in the soleus muscle due to unloading. For example, 6 days of unloading caused a 27 percent decrease in mass and a 60 percent increse in glycogen content in the soleus muscle, while the extensor digitorum longus muscle was unaffected. Also, fresh tissue tyrosine and its in vitro release from the muscle are increased in the unloaded soleus, indicating that this condition causes a more negative protein balance. With these results in mind, studies to investigate the effect of hypogravity on protein and carbohydrate metabolism in a number of rat hindlimb muscles were carried out. G.L.C.

A86-30458*# Tennessee Univ., Knoxville.
HEMATOLOGIC PARAMETERS OF ASTRORATS FLOWN ON SL-3
R. D. LANGE, R. B. ANDREWS, L. A. GIBSON, P. WRIGHT, C. D. R. DUNN (Tennessee, University, Knoxville) et al. (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-195, S-196. NASA-supported research. refs

Hematologic studies were performed on a group of large and small rats which were sacrificed after flying in life sciences shuttle engineering flight SL-3. The results are presented on flight (F) and control (C) 200 gm rats. The small flight animals demonstrated a significant increase in hematocrits, red blood cell counts, hemoglobins and peripheral blood percentages of neutrophils as well as a decrease in percentage of lymphocytes. Erythropoietin (Ep) determinations were similar for the two groups as were the bone marrow an spleen differential counts. In vitro cultures for erythroid colonies of bone marrow showed that in response to different doses of Ep, in all cases where differnces were statistically significant, the F rats had increased colony counts. The changes in red cell parameters could be caused by a decrease in plasma volume. However, no isotopic studies were possible on this flight and this lack points up the need for such studies to determine the red cell mass and plasma volume. Author

A86-30459*# Pennsylvania State Univ., University Park.
MICROGRAVITY ASSOCIATED CHANGES IN PITUITARY GROWTH HORMONE (GH) CELLS PREPARED FROM RATS FLOWN ON SPACE LAB 3
W. C. HYMER, M. FARRINGTON, C. HAYES (Pennsylvania State University, University Park), R. GRINDELAND, T. FAST (NASA, Ames Research Center, Moffett Field, CA) et al. (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-197, S-198. refs
(Contract NASA ORDER A-21991-C)

The effect of microgravity on the release of pituitary growth hormone (GH) in rats is studied. The pituitary glands from six adult rats exposed to microgravity are analyzed for in vitro and in vivo changes in pituitary growth hormone cells. The GH cell functions in the somatotrophs of flight rats are compared to a control group. The two assay procedures employed in the experiment are described. It is observed that intracellular levels of GH are two to three times greater in the flight rats than in the control group; however, the amount of GH released from the somatotrophs is 1.11 + or - 0.4 micrograms for the flight rats and 1.85 + or - 1.3 micrograms for the control rats. I.F.

A86-30460*# California Univ., Davis.
HOMEOSTASIS AND BIOLOGICAL RHYTHMS IN THE RAT DURING SPACEFLIGHT
C. A. FULLER (California, University, Davis) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-199, S-200. refs
(Contract NAG2-349; NAS2-10536)

The effects of microgravity on the physiological regulation of homeostatic systems is studied. The temperature and heart rate of rats exposed to seven days of microgravity and a 12:12 light/dark cycle are analyzed. A 24-hour nocturnal rhythmicity is observed in the control and in-flight heart rates and body temperatures. The preflight daytime body temperature was calculated as 37.2 + or - 0.03 C and in-flight as 37.4 + or 0.04 C; nighttime body temperature preflight daytime was determined as 38.0 + or - 0.02 C, and in-flight as 37.8 + or 0.06 C. The 24-hour mean heart rate was

depressed from 412 + or - 3.3 bpm preflight to 373 + or - 2.4 bpm in-flight; this change is noted in both dark and light conditions. It is detected that microgravity alters the steady state regulation of heart rate and body temperature. I.F.

A86-30461*# California Univ., Davis.
EARLY ADAPTATION TO ALTERED GRAVITATIONAL ENVIRONMENTS IN THE SQUIRREL MONKEY
C. A. FULLER (California, University, Davis) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-201, S-202.
(Contract NAG2-349; NAS2-10536)

The feeding behavior of two squirrel monkeys flown in Spacelab 3 is compared to that of six monkeys exposed to 1.5 G through centrifugation. The monkeys in the centrifugation study were housed unrestrained in cages, maintained at 25 C + or - 1 C, exposed to a 12:12 light/dark cycle, and had unrestrained access to food and water. The Spacelab monkeys were maintained at 26 C, exposed to a 12:12 light/dark cycle and had unlimited food and water. It is observed that the centrifuge rats displayed a change in feeding behavior for 4 days prior to resuming a normal pattern; one Spacelab monkey exhibited a 6 day depression before recover to control levels, and the feeding pattern of the second monkey was not influenced by the environment. It is noted that the effect of an altered dynamic environment is variable on the feeding behavior of individual monkeys. I.F.

A86-30462*# California Univ., Davis.
EFFECTS OF WEIGHTLESSNESS ON NEUROTRANSMITTER RECEPTORS IN SELECTED BRAIN AREAS
J. D. MILLER, D. M. MURAKAMI (California, University, Davis), B. A. MCMILLEN, M. M. MCCONNAUGHEY, H. L. WILLIAMS (East Carolina University, Greenville, NC) et al. (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-203, S-204. refs
(Contract NAS2-10536)

The central nervous system receptor dynamics of rats exposed to 7 days of microgravity are studied. The receptor affinity and receptor number at the hippocampus, lateral frontal cortex, prefrontal cortex, corpus striatum, cerebellum and pons-medulla, and the Na(+)/K(+)ATPase activity are examined. The data reveal that there is no significant change in the receptor affinity and receptor number for the lateral frontal cortex, prefrontal cortex, cerebellum and pons-medulla; however, there is an increase from 81 + or - 11 to 120 + or 5 fmole/mg protein in the receptor number for hippocampal binding, and a decrease in receptor number for the striatum from 172 + or - 14 to 143 + or - 10 fmoles/mg protein. A 9 percent decrease in Mg-dependent Na(+)/K(+)ATPase activity is observed. It is detected that the terminal mechanism may be affected by exposure to microgravity. I.F.

A86-30463*# California Univ., Davis.
THE EFFECT OF A HYPERDYNAMIC ENVIRONMENT ON THE DEVELOPMENT OF THE RAT RETINA
D. M. MURAKAMI and C. A. FULLER (California, University, Davis) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-205, S-206. refs
(Contract NAG2-349; NAS2-10536)

The effects of a 2 G field on the retinal development of the layers in the rat and central visual system nuclei are investigated. The thickness of the retinal layers, ganglion cells, and brains of male and female Wistar rats suspended from an 18 foot diameter centrifuge creating a 2 G field are evaluated and compared with a control group. A decrease in the thickness of the outer nuclear layer (ONL) of 37.1 percent, of 58.5 percent in the inner nuclear layer (INL), and of 28.8 percent in the inner plexiform layer (IPL), and a reduction in body weight are observed in the 2-G rats. The data reveal that the ganglion cells and visual system nuclei activity correspond well with the control data; however, the medial terminal nucleus (MTN) activity is inhibited in the 2-G rats. It is concluded that the differences in ONL and IPL are attributed to body weight reduction, but the INL and MTN are affected by the 2-G conditions. I.F.

A86-30464*# Medical Coll. of Wisconsin, Milwaukee.
MORPHOLOGICAL AND BIOCHEMICAL CHANGES IN SOLEUS AND EXTENSOR DIGITORUM LONGUS MUSCLES OF RATS ORBITED IN SPACELAB 3
D. A. RILEY, T. SLOCUM, J. L. W. BAIN, F. R. SEDLAK (Wisconsin, Medical College, Milwaukee), S. ELIS, and T. SATYANARAYANA (NASA, Ames Research Center, Moffett Field, CA) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-207, S-208. refs
(Contract NAS2-11305; NCC2-266; NASA ORDER A-21992-C)

Muscle atrophy in rats exposed to hypogravity for seven days aboard Spacelab 3 is examined. Hindlimb muscles were harvested 12-16 days postflight, and prepared for enzyme studies and electron microscopy. Simple cell shrinkage was found, with a mean fiber area decrease of 35.8 percent for soleus and 24.9 percent for extensor digitorum longus (EDL) flight muscle fibers, as compared with control muscle fibers. EDL and soleus muscles showed increases in alkaline myofibrillar ATPase, alpha glycerophosphate dehydrogenase, and glycogen, and a decrease in NADH dehydrogenase staining. The 26 percent increase in calcium activated protease suggests that the focal degradation of myofibrils is the key process of myofibril breakdown. The presence in the flight soleus muscles of one percent necrotic fibers is unexplained. The observed shift towards histochemical fast-muscle type properties is consistent with previous findings. R.R.

A86-30465*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
MICROGRAVITY CHANGES IN HEART STRUCTURE AND CYCLIC-AMP METABOLISM
D. E. PHILPOTT, A. FINE, K. KATO, R. EGNOR, L. CHENG (NASA, Ames Research Center, Moffett Field, CA; USVA, Medical Center, New York, NY; NIH, National Institute of Dental Research, Bethesda, MD) et al. (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-209, S-210.

The effects of microgravity on cardiac ultrastructure and cyclic AMP metabolism in tissues of rats flown on Spacelab 3 are reported. Light and electron microscope studies of cell structure, measurements of low and high Km phosphodiesterase activity, cyclic AMP-dependent protein kinase activity, and regulatory subunit compartmentation show significant deviations in flight animals when compared to ground controls. The results indicate that some changes have occurred in cellular responses associated with catecholamine receptor interactions and intracellular signal processing. C.D.

A86-30466*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
REDUCTION OF THE SPERMATOGONIAL POPULATION IN RAT TESTES FLOWN ON SPACE LAB-3
D. E. PHILPOTT, J. STEVENSON, R. CORBETT (NASA, Ames Research Center, Moffett Field, CA), W. SAPP, C. WILLIAMS (Tuskegee Institute, AL) et al. (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-211, S-212. refs

Quantization of the testicular spermatogonial population reduction in six rats is performed 12 hours after their return from seven days aboard Space Lab-3. The observed 7.1 percent organ weight loss, and 7.5 percent stage six spermatogonial cell population reduction in comparison with control rats correlate very

well. Accurate dosimetry was not conducted on board, but radiation can not be considered the primary cause of the observed change. The decrease in protein kinase in the heart of these rats indicates that stress from adapting to weightlessness, the final jet flight, or other sources, is an important factor. R.R.

A86-30467*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EFFECT OF FLIGHT IN MISSION SL-3 ON INTERFERON-GAMMA PRODUCTION BY RATS
C. L. GOULD, J. A. WILLIAMS, A. D. MANDEL, and G. SONNENFELD (NASA, Ames Research Center, Moffett Field, CA; Louisville, University, KY) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-213, S-214. refs
(Contract NCC2-213)

Rats flown in Space Shuttle mission SL-3 were sacrificed after flight and spleens were removed. Cultures of spleen cells were challenged with the mitogen concanavalin-A to attempt to induce interferon-gamma. Most control, ground-based rats had spleen cells that produced moderate titers of interferon-gamma. Spleen cells from flown rats did not produce interferon-gamma in most cases, and one flown rat produced minimally detectable amounts of interferon. These data suggest that interferon-gamma production was inhibited in rats flown in mission SL-3 immediately upon return to earth. Author

A86-30468#
BIOCHEMICAL AND MORPHOLOGICAL EVALUATION OF THE EFFECTS OF SPACE FLIGHT ON RAT SALIVARY GLANDS
M. I. MEDNIEKS and A. R. HAND (NIH, National Institute of Dental Research, Bethesda, MD) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-215, S-216. refs

Salivary gland tissues from rats from the Spacelab 3 flight were used for both cellular and molecular level analyses in conjunction with electron microscopic evaluation of tissue ultrastructure. Intracellular processes appear to be modified in salivary gland cells one day after space flight. Changes in cA-PK holoenzyme association and subcellular subunit distribution suggest alterations in reactions which are mediated via cyclic AMP. These observations are consistent with the reported decrease in circulating catecholamines during simulated weightlessness. Since no dramatic pathological changes were observed in the salivary glands, the effects may well be within the homeostatic or adaptational range of the animals. C.D.

A86-30469#
MICROPROBE ANALYSIS OF EPIPHYSEAL PLATES FROM SPACELAB 3 RATS
J. DUKE, L. JANER, M. CAMPBELL, and J. MORROW (Texas, University, Houston) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-217, S-218. refs

Ultrastructural studies of growth plates from Cosmos 1129 rats showed delayed production and mineralization of matrix vesicles. To determine if differences in differentiation could be detected in seven days, proximal tibial growth plates were obtained from rats flown aboard Spacelab 3, and prepared by a freeze-substitution method for microanalysis. Concentration of elements was measured in the matrix of longitudinal septa of the growth plate in the resting, proliferative, hypertrophic, and calcifying zones. In control plates, all four zones had high levels of Na, and in unmineralized regions, low levels of Mg, P and Ca. K and S levels were high in the resting zone, and increased from the proliferative to the calcifying zones. The level of P rose in the mineralized regions and Ca/P ratios ranged from 1.0 to 1.6. Flight animals had low Na and K values, although Mg values seemed unaffected. S values were much less than controls, and Ca was less in unmineralized regions, with Ca/P ratios similar to controls. These data indicate that even a short space flight can alter bone mineralization. Author

A86-30470*# Michigan Univ., Ann Arbor.
OTOCONIAL MORPHOLOGY IN SPACE-FLOWN RATS
M. D. ROSS, K. DONOVAN, and O. CHEE (Michigan, University, Ann Arbor) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-219, S-220. refs
(Contract NAS2-10535)

The inner ear maculas of rats exposed to space flight for seven days were studied, and the findings are discussed. It is concluded that exposure to weightlessness for short periods of time has no morphologically detectable degenerative effect on the macular receptors. The results suggest, however, that slight increases in otoconial mass may have occurred in flight animals compared to ground-based controls. C.D.

A86-30471*# Louisville Univ., Ky.
EFFECT OF SEVEN DAYS OF SPACEFLIGHT ON HINDLIMB MUSCLE PROTEIN, RNA AND DNA IN ADULT RATS
J. M. STEFFEN and X. J. MUSACCHIA (Louisville, University, KY) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-221, S-222. NASA-supported research. refs

Effects of seven days of spaceflight on skeletal muscle (soleus, gastrocnemius, EDL) content of protein, RNA and DNA were determined in adult rats. Whereas total protein contents were reduced in parallel with muscle weights, myofibrillar protein appeared to be more affected. There were no significant changes in absolute DNA contents, but a significant (P less than 0.05) increase in DNA concentration (microgram/milligram) in soleus muscles from flight rats. Absolute RNA contents were significantly (P less than 0.025) decreased in the soleus and gastrocnemius muscles of flight rats, with RNA concentrations reduced 15-30 percent. These results agree with previous ground-based observations on the suspended rat with unloaded hindlimbs and support continued use of this model. Author

A86-30472#
1,25-DIHYDROXYVITAMIN D3 RECEPTORS IN SPACE-FLOWN VS. GROUNDED CONTROL RAT KIDNEYS
D. J. MANGELSDORF, S. L. MARION, J. W. PIKE, and M. R. HAUSSLER (Arizona, University, Tucson) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-223, S-224. refs
(Contract NIH-AM-15781-14)

The effects of microgravity on the ability of 1,25-Dihydroxyvitamin D3 receptors to retain calcium in kidneys is examined. Kidney samples from five space-flown and five ground control rats were studied. The analysis of the 1,25(OH)2D3 receptors using DEAE-filter binding assay is described. The quantity of receptors and binding dissociation constant are derived from the saturation curve of specific hormone-receptors binding by employing the Scatchard transformation. The data reveal that for the ground control rats the receptor number is 27.9 + or - 0.80 fmol/mg protein and the binding dissociation constant is 0.60 + or - 0.27 nM; for the space-flown rats the receptor number is 27.6 + or 10.1 fmol/mg protein and the constant is 0.27 + or - 0.08 nM. No significant difference is observed between the ground control and space-flown kidney 1,25(OH)2D3 receptors. I.F.

A86-30473*# Columbia Univ., New York.
MORPHOLOGIC AND HISTOCHEMICAL STUDIES OF BONE CELLS FROM SL-3 RATS
S. B. DOTY (Columbia University, New York) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-225, S-226. refs
(Contract NCC2-325)

Previous studies of rat bone following space flight indicate a significant reduction in new bone formation as a result of hypogravity. In the present study of animals from SL-3 flight, the cellular activity of the bone forming cells, the osteoblasts, was investigated. Measurements of alkaline and acid phosphatase, Golgi activity, secretory granule size, and lysosomal activity, all indicated very little difference between flight and flight-simulated controls. However, there was a tendency for osteoblasts in compact bone of flight animals to show a smaller cytoplasmic volume compared to non-flight controls. If, as in previous studies, a significant reduction in bone formation occurred, it could be due to a normal level of procollagen degradation within these smaller osteoblasts, resulting in less collagen secretion per cell. Author

A86-30474*# California Univ., San Francisco.
OSTEOCALCIN AS AN INDICATOR OF BONE METABOLISM DURING SPACEFLIGHT
P. E. PATTERSON-BUCKENDAHL, C. E. CANN (California, University, San Francisco), R. E. GRINDELAND, S. B. ARNAUD (NASA, Ames Research Center, CA), and R. B. MARTIN (California, University, Davis) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-227, S-228. refs

The effect of microgravity on osteocalcin (OC) is investigated in rats flown on Spacelab 3. Serum, Ca, Pi, total protein, alkaline phosphatase, and OC contents, and the breaking strength of the humerus of control and Spacelab rats are calculated; the procedures utilized for these analyses are described. It is detected that the OC is reduced, and the serum and alkaline phosphatase are unaffected by microgravity. I.F.

A86-30475#
HEPATIC ENZYMES OF SPHINGOLIPID AND GLYCEROLIPID BIOSYNTHESIS IN RATS FROM SPACELAB 3
A. H. MERRILL, JR., E. WANG, and J. L. HARGROVE (Emory University, Atlanta, GA) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-229.

A86-30476#
HEPATIC ENZYME ADAPTATION IN RATS AFTER SPACE FLIGHT
J. L. HARGROVE and D. P. JONES (Emory University, Atlanta, GA) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-230.

A86-30477#
ATRIOPETIN (AP-3) IN ATRIA AND PLASMA OF RATS ORBITED ABOARD NASA SPACELAB (SL3) FOR SEVEN DAYS
W. H. INGE and D. K. HARTLE (Emory University, Atlanta, GA) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-231, S-232. refs

Six male rats were orbited aboard Spacelab 3 for 7 days, landed in CA and flown to FL where they were anesthetized (halothane), decapitated, blood collected, and plasma separated. Ventricular samples and atria were resected. All samples were frozen at -70 C. Samples from 6 ground control animals were similarly prepared. Atriopeptin immunoreactivity (APir) was determined for plasma and both right and left atria. All plasma levels were an order of magnitude higher than unstressed basal levels, presumably due to anesthesia. Subsequent laboratory studies confirmed that plasma APir is 400 percent higher in rats anesthetized with halothane than in conscious controls. No differences between control and flight rat plasma APir were found. Both right and left atrial APir content in flight rats were slightly elevated over controls but not significantly. It is concluded that an adequate test of the effects of microgravity on AP-3 secretion requires serial inflight plasma sampling in conscious rats to avoid the confounding effects of reentry, postflight delays, and anesthesia. Author

A86-30478#
PLASMA RENIN CONCENTRATION (PRC) OF RATS ORBITED FOR 7 DAYS ABOARD NASA SPACELAB 3
D. K. HARTLE and W. H. INGE (Emory University, Atlanta, GA) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-233, S-234. refs

PRC were determined in six rats (F) orbited aboard SL3 for 7-days and in six ground control rats (G). F were flown from CA to Kennedy Space Center (KSC). Both F and G rats were transported similarly from KSC to Kennedy Research Labs, anesthetized with halothane (HAL) and decapitated. Plasma was obtained from trunk blood and frozen at -70 C. PRC were estimated by measuring the conversion of rat renin substrate to angiotensin I (AI) using radioimmunoassay. PRC were also estimated in four groups of rats to assess the influences of HAL or decapitation on renin secretion in the F and G rats. No significant differences were found in PRC between F and G, although the F mean was lower. Neither HAL nor decapitation produced a significant increase in PRC above the levels measured in control conscious rats. Because of the 12-14 hour delay between reentry and sampling, all renin measured was probably secreted in the postflight period. So the PRC of F do not indicate levels during flight, but only the levels obtained by F 12-14 hrs after reentry, and subjected to HAL anesthesia and decapitation. Author

A86-30479#
BONE MATURATION IN RATS FLOWN ON THE SPACELAB-3 MISSION
J. E. RUSSELL and D. J. SIMMONS (Washington University, St. Louis, MO) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-235, S-236. refs

The matrix/mineral maturational patterns in six male Sprague-Dawley rats exposed to 7 days of spaceflight are studied. The metaphyseal and cortical bone samples are separated into 1.3-1.7, 1.8-1.9, 2.0-2.1, and 2.2-2.9 specific gravity fractions. The calcium, inorganic phosphorous (Pi), and collagen hydroxyproline (HO-Pr) contents are calculated. It is detected that in the spaceflight metaphyseal bone there is a shift in the Ca, Pi, and HO-Pr profiles toward higher density fractions and a low Ca/Pi molar ratio; in the spaceflight cortical bone less Ca, Pi, HO-Pr are observed for lower specific gravity fractions and the Ca/Pi molar ratio is unchanged. The data reveal that spaceflight alters the quality of rat femur, and decreases osteoblast function, and bone mass in the axial and appendicular skeleton. I.F.

A86-30480*# Louisville Univ., Ky.
THE USE OF SUSPENSION MODELS AND COMPARISON WITH TRUE WEIGHTLESSNESS
X. J. MUSACCHIA (Louisville, University, KY) and S. ELLIS (NASA, Ames Research Center, Moffett Field, CA) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-237 to S-240.

A resume is presented of various papers concerning the effect of weightlessness on particular physiological and biochemical

phenomena in animal model systems. Findings from weightlessness experiments on earth using suspension models are compared with results of experiments in orbit. The biological phenomena considered include muscle atrophy, changes in the endocrine system, reduction in bone formation, and changes in the cardiovascular system. C.D.

A86-30682
CAROTID BODIES ARE REQUIRED FOR VENTILATORY ACCLIMATIZATION TO CHRONIC HYPOXIA
C. A. SMITH, G. E. BISGARD, A. M. NIELSEN, L. DARISTOTLE, N. A. KRESSIN (Wisconsin, University, Madison; Wisconsin, Medical College, Milwaukee) et al. Journal of Applied Physiology (ISSN 0161-7567), vol. 60, March 1986, p. 1003-1010. Research supported by the University of Wisconsin. refs
(Contract NIH-HL-15469; NIH-HL-15473)

The effects of moderate and severe hypoxemia on the ventilatory responses of intact and carotid body-denervated (CBD) goats were investigated. In the intact group, both moderate and severe hypoxemia produced time-dependent decreases in arterial PCO2, which were largely complete by 8 hrs and were maintained throughout the 7 days of hypobaria. In contrast, the same levels of arterial hypoxemia produced no significant changes in arterial PCO2, H(+), or HCO3(-) in the CBD animals. While acute restoration of normoxia in chronically hypoxic intact animals produced time-dependent increases in arterial PCO2 over 2 h, acute restoration of normoxia in the chronically hypoxic CBD goats has caused hyperventilation. The results indicate that carotid bodies are required for any significant hyperventilatory response to hypoxemia, and suggest that brain H(+) does not play a crucial role in this ventilatory response. I.S.

A86-30683
VENTILATORY ACCLIMATIZATION TO HYPOXIA IS NOT DEPENDENT ON CEREBRAL HYPOCAPNIC ALKALOSIS
G. E. BISGARD, M. A. BUSCH, and H. V. FORSTER (Wisconsin, University, Madison; Wisconsin, Medical College, Milwaukee) Journal of Applied Physiology (ISSN 0161-7567), vol. 60, March 1986, p. 1011-1015. refs
(Contract NIH-HL-15473)

A86-30685
ENERGY BALANCE IN EXERCISE-TRAINED RATS ACCLIMATED AT TWO ENVIRONMENTAL TEMPERATURES
D. RICHARD, J. ARNOLD, and J. LEBLANC (Universite Laval, Quebec, Canada) Journal of Applied Physiology (ISSN 0161-7567), vol. 60, March 1986, p. 1054-1059. refs

The effect of exercise training (by running on a motor-driven treadmill) on energy balance of rats acclimated at either 24 or 4 C was investigated. Resting and exercise oxygen consumption and the energy contents of diet and feces were measured throughout, and the carcass contents of energy, fat, protein, and carbohydrate, as well as mitochondrial guanosine 5'-diphosphate (GDP)-binding in brown adipose tissue (BAT), were determined after 45 days of training. While cold acclimation led to increased food intake in all rats, its effect on fat gain was seen only in the sedentary group. Cold acclimation has also increased BAT-bound GDP, indicating increased thermogenesis in the BAT, but exercise had no effect on BAT thermogenesis. The energy balance results suggested that energy training in rats does not cause any changes in energy expenditure other than the energy spent on physical activity. I.S.

A86-30892
THERMOENCEPHALOSCOPY [TERMOENTSEFALOSKOPIIA]
I. A. SHEVELEV, E. N. TSYKALOV, K. P. BUDKO, A. M. GORBACH, and G. A. SHARAEV (AN SSSR, Institut Vysshei Nervnoi Deiatel'nosti i Neirofiziologii, Moscow, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 12, Jan.-Feb. 1986, p. 7-15. In Russian. refs

Infrared images of human and animal cerebral cortex were obtained by means of noninvasive thermoscopy, using an AGA-780 thermoscope. The thermal maps, obtained after stimulation by light and sound, electrical skin stimulation, direct electrical irritation of cortex, and motor cortex tests, display the presence of discrete focuses of warming, followed by cooling, in the respective reaction zones of the cerebral cortex. The space-time and amplitude characteristics of the thermograms suggest that changes of local blood flow are among the factors causing the observed thermal changes. The maps display a spatial resolution of 30 microns per element of thermal image, surpassing the resolution ranges provided by the more traditional methods of electroencephalography, radioisotope mapping and blood flow mapping. I.S.

A86-30897
HYPOBIOSIS AND FUNCTIONAL RESISTANCE TO COLD [GIPOBIOZ I FUNKTSIONAL'NAIA KHOLODOVAIA TERMOREZISTENTNOST']
N. N. TIMOFEEV (Institut Farmakologii, Moscow, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 12, Jan.-Feb. 1986, p. 110-124. In Russian. refs

The subcellular biochemical mechanisms responsible for the maintenance of the viability of cells and organisms at prolonged exposures to low temperatures are discussed. It is believed that the primary changes take place at the level of cellular membranes, where the endogenous antioxidants are pumped from most of the membrane circumference to a specific 'locus' in the membrane. The resulting oxidation of arachidonic acid, accompanied by a sharp increase in the saturated fatty acid content in the membrane sections devoid of antioxidants leads to 'gelling' of most of the membrane, except for the antioxidant-rich 'locus', which remains fluid, insuring the membrane's ability to reverse the process. The gelled membrane preserves the membraneous proteins, and thus, the viability of the cell. At near-freezing temperatures the fluid locus can be protected by availability of high concentrations of either endogenous tocopherol (in hibernating animals) or injected antioxidants. I.S.

A86-31224
A BIDOMAIN MODEL FOR THE EXTRACELLULAR POTENTIAL AND MAGNETIC FIELD OF CARDIAC TISSUE
B. J. ROTH and J. P. WIKSWO, JR. (Vanderbilt University, Nashville, TN) IEEE Transactions on Biomedical Engineering (ISSN 0018-9294), vol. BME-33, April 1986, p. 467-469. refs
(Contract N00014-82-K-0107)

A bidomain volume conductor model is developed to represent cardiac muscle strands, enabling the magnetic field and extracellular potential to be calculated from the cardiac transmembrane potential. The model accounts for all action currents, including the interstitial current between the cardiac cells, and thereby allows quantitative interpretation of magnetic measurements of cardiac muscle. Author

A86-31371
PROBLEMS IN MEDICAL BIORHYTHMOLOGY [PROBLEMY MEDITSINSKOI BIORITMOLOGII]
N. R. DERIAPA, M. P. MOSHKIN, and V. S. POSNYI Moscow, Izdatel'stvo Meditsina, April 1985, 208 p. In Russian. refs

The aspects of correlation between internal and external rhythmic processes, the basic correlation principles, and the significance of adaptive biorhythmicity are discussed. Consideration is given to the issues of mental and physical circadian biorhythms and their functional optima, the seasonal rhythms of man's physiological functions, the genetically determined factors in biorhythmicity and in adaptability, and the regional aspects of rhythmicity in physiological processes. Special attention is paid to the aspects of chronopathology: the primary and secondary effects of environmental temporal changes, chronic diseases caused by desynchronization, and the importance of biorhythms in planning pharmacological regimens. I.S.

A86-31375
MECHANISMS OF THE RADIATION PROTECTION EFFECT AND INDICATION OF THE EFFICIENCY OF RADIOPROTECTORS [MEKHANIZMY RADIOZASHCHITNOGO EFFEKTA I INDIKATSIIA EFFEKTIVNOSTI RADIOPROTEKTOROV]
L. M. ROZHDESTVENSKII Moscow, Energoatomizdat, 1985, 128 p. In Russian. refs

Experimental and theoretical research related to the use of radioprotectors in the radiation therapy of malignant growths and in other branches of radiation medicine is reviewed. In particular, attention is given to the estimation of the protective action of radioprotectors, the mechanisms of the oxygen effect and of the radioprotective action, and methods for investigating the possibilities of the indication of the efficiency of radioprotectors. Results of investigations of the indicating possibilities of some pharmacological effects of radioprotectors are presented. V.L.

A86-31650
ECTO-PROTEIN KINASE ACTIVITY ON THE EXTERNAL SURFACE OF NEURAL CELLS
Y. H. EHRLICH, T. B. DAVIS (Vermont, University, Burlington), E. BOCK (Copenhagen, University, Denmark), E. KORNECKI, and R. H. LENOX Nature (ISSN 0028-0836), vol. 320, March 6, 1986, p. 67-70. refs
(Contract AF-AFOSR-84-0331; NIH-MH-35735; NSF BNS-82-09265)

Direct evidence for the existence of an ectoprotein kinase (one which uses extracellular ATP to phosphorylate proteins localized at the external surface of the plasma membrane) is presented, and endogeneous substrates for its activity at the surface of intact neural cells are demonstrated. The phosphorylation of one of these surface proteins is selectively stimulated during cell depolarization. In addition, neuronal cell adhesion molecules appear to be among the substrates of ectoprotein kinase activity. These results suggest a role for surface protein phosphorylation in regulating specific functions of developing and mature neurones. C.D.

A86-31833* Scripps Institution of Oceanography, La Jolla, Calif.
MICROPLANKTON SPECIES ASSEMBLAGES AT THE SCRIPPS PIER FROM MARCH TO NOVEMBER 1983 DURING THE 1982-1984 EL NINO EVENT
F. M. H. REID (California, University, Scripps Institution of Oceanography, La Jolla), C. B. LANGE (Museo Argentino de Ciencias Naturales, Buenos Aires, Argentina), and M. M. WHITE (California, University, Scripps Institution of Oceanography, La Jolla) Botanica Marina (ISSN 0006-8055), vol. 28, no. 10, 1985, p. 443-452. Previously announced in STAR as N85-21926. refs
(Contract DE-AT03-82ER-60031; NAGW-458)

A semiweekly sampling program at the Scripps Institution of Oceanography Pier was begun in 1983 during an El Nino event. Microplankton data for March to November 1983 show a temporal sequence of species assemblages of the 24 important taxa, with a residence time of 1 to 4 weeks. From March to early September, the assemblages consisted of typial neritic taxa. From mid-September to mid-November, the presence of oceanic warm-wave species was associated with positive temperature anomalies characteristic of the El Nino condition. During the period studied numerical abundances were low. Author

A86-32057* Chicago Univ., Ill.
BIOLOGICAL EXTINCTION IN EARTH HISTORY
D. M. RAUP (Chicago, University, IL) Science (ISSN 0036-8075), vol. 231, March 28, 1986, p. 1528-1533. refs
(Contract NAG2-237)

Virtually all plant and animal species that have ever lived on the earth are extinct. For this reason alone, extinction must play an important role in the evolution of life. The five largest mass extinctions of the past 600 million years are of greatest interest, but there is also a spectrum of smaller events, many of which indicate biological systems in profound stress. Extinction may be episodic at all scales, with relatively long periods of stability alternating with short-lived extinction events. Most extinction episodes are biologically selective, and further analysis of the victims and survivors offers the greatest chance of deducing the proximal causes of extinction. A drop in sea level and climatic change are most frequently invoked to explain mass extinctions, but new theories of collisions with extraterrestrial bodies are gaining favor. Extinction may be constructive in a Darwinian sense or it may only perturb the system by eliminating those organisms that happen to be susceptible to geologically rare stresses. Author

A86-32237* Illinois Univ., Urbana.
EUKARYOTIC RIBOSOMES THAT LACK A 5.8S RNA
C. R. VOSSBRINCK and C. R. WOESE (Illinois, University, Urbana) Nature (ISSN 0028-0836), vol. 320, March 20, 1986, p. 287, 288. refs
(Contract NSG-7044)

The 5.8S ribosomal RNA is believed to be a universal eukaryotic characteristic. It has no (size) counterpart among the prokaryotes, although its sequence is homologous with the first 150 or so nucleotides of the prokaryotic large subunit (23S) ribosomal RNA. An exception to this rule is reported here. The microsporidian Vairimorpha necatrix is a eukaryote that has no 5.8S rRNA. As in the prokaryotes, it has a single large subunit rRNA, whose 5-prime region corresponds to the 5.8S rRNA. Author

A86-32524
THE REGULATORY MECHANISMS OF BLOOD SUPPLY IN SKELETAL MUSCLES [MEKHANIZMY REGULIATSII KROVOSNABZHENIIA SKELETNYKH MYSHTS]
A. F. BLIUGER, ED. Riga, Izdatel'stvo Zinatne (Eksperimental'naia Meditsina: Morfologiia, Fiziologiia, Biokhimiia, Immunologiia, No. 19), 1985, 151 p. In Russian. No individual items are abstracted in this volume.

Regulatory mechanisms of circulation in the resting and active skeletal muscles are discussed, together with clinical problems connected with regulatory disorders. Papers are presented on functional correlators of adaptive changes in arterial vessels of skeletal muscles in subjects with chronic arterial hypertension; the dynamics of filling and emptying the lower limb veins; and morphofunctional muscular characteristics as a factor affecting the progress of the pressor reaction caused by muscle contraction under static regimen. Consideration is given to the effect of reinnervation of skeletal muscles on their fatigue and blood supply; the characteristics of the spiroergometric parameters in patients with initial coronary lesions; and the effect of longitudinal stretching of a skeletal muscle on its blood supply at rest and under isometric tetanus. Additional topics include the expression of reactive hyperemia in skeletal muscles of dogs injected intravenously with catecholamines; factors that disrupt the mechanisms of bloodflow redistribution in skeletal muscles; and taxonomic and regional factors of the muscle circulation. I.S.

A86-32697
ACTIVATION OF CHOLESTEROGENESIS UNDER THE EFFECT OF IONIZING RADIATION ON A LIVING BODY [OB AKTIVATSII KHOLESTEROGENEZA PRI VOZDEISTVII IONIZIRUIUSHCHEI RADIATSII NA ZHIVOTNYI ORGANIZM]
I. K. KOLOMIITSEVA (AN SSSR, Institut Biologicheskoi Fiziki, Pushchino, Ukrainian SSR) Radiobiologiia (ISSN 0033-8192), vol. 26, Jan.-Feb. 1986, p. 3-10. In Russian. refs

An analysis of results concerning the effects of ionizing radiation on the biosynthesis of cholesterol and incorporation of lipids into cellular membranes of rat tissues is presented. The collected evidence indicates that the increase of cholesterol biosynthesis in both radiation-sensitive cells (intestinal epithelium cells, lymphocytes, and thymocytes) and liver cells is among the earliest responses to body irradiation. A scheme showing the role of lipogenesis in the regenerative response to radiation is proposed, according to which, the damage of the radiosensitive cells triggers the onset of increased cholesterol synthesis in both the damaged cells and the liver cells. The increasing amounts of lipoproteins synthesized in the liver are released into the blood to supply additional material for the synthesis of cellular membranes in the radiation-damaged cells, promoting cellular division and tissue regeneration I.S.

A86-32698
INVESTIGATION OF MECHANISMS OF THE RADIOPROTECTIVE EFFECT OF AGONISTS OF CATECHOLAMINE RECEPTORS - INVOLVEMENT OF BOTH SUBTYPES OF ALPHA-ADRENORECEPTORS IN THE RADIOPROTECTIVE EFFECT [ISSLEDOVANIE MEKHANIZMOV RADIOZASHCHITNOGO EFFEKTA AGONISTOV KATEKHOLAMINOVYKH RETSEPTOROV - VKLIUCHENIE V RADIOZASHCHITNYI EFFEKT OBOIKH PODTIPOV ALPHA-ADRENORETSEPTOROV]
V. I. KULINSKII, A. D. KLIMOVA, V. G. IASHUNSKII, and T. V. ALPATOVA (Krasnoiarskii Gosudarstvennyi Meditsinskii Institut, Krasnoyarski, Institut Biofiziki, Moscow, USSR) Radiobiologiia (ISSN 0033-8192), vol. 26, Jan.-Feb. 1986, p. 11-16. In Russian. refs

The radioprotective effect of arylalkylamine and imidazole-based stimulators of alpha-adrenoreceptors and the effect of nonstimulating chemical analogs were evaluated in mice irradiated by a 7.5 GR dose of X-rays. Injection of alpha-receptor stimulators, affecting both alpha and alpha 2 receptors, as well as selective stimulators of either the alpha 1 subtype (mesaton) or alpha 2 subtype (clonidine) of the adrenoreceptors was shown to increase survival rate by four to forty times. In contrast, the nonstimulating chemical analogs of mesaton failed to protect mice. Possible intracellular mechanisms of the radioprotection exerted by both types of adrenoreceptor stimulators are discussed. I.S.

A86-32699
STUDIES OF RADIOPROTECTIVE PROPERTIES OF ADETURON AND POLYANION, APPLIED SEPARATELY AND IN COMBINATION [IZLUCHENIE PROTIOVOLUCHEVYKH SVOISTV ADETURONA I POLIANIONA V USLOVIIAKH SAMOSTOIATEL'NOGO I SOCHETANNOGO PRIMENENIIA]
M. I. MINKOVA, T. P. PANTEV, I. T. NIKOLOV, and M. TALASH (Meditsinska Akademiia, Sofia, Bulgaria; Orszagos Sugarbiologiai es Sugaregeszsegugyi Kutato Intezet, Budapest, Hungary) Radiobiologiia (ISSN 0033-8192), vol. 26, Jan.-Feb. 1986, p. 70-75. In Russian. refs

The radioprotective efficiency of polyanion and adeturon, injected separately and in combination, were studied in mice exposed to a lethal dose (8.0 GR) of gamma rays from Cs-135. The effect of the injection regimens was assessed according to values of the survival rate and the haemopoietic indices (weight and cellularity of spleen, cellularity of the bone marrow, and the numbers of peripheral leukocytes), determined at the intervals of 3, 10, 20, and 30 days after irradiation. Both compounds were effective, although the biometric protection coefficients were significantly higher for adeturon. Combined application did not enhance the protective effect. I.S.

A86-33070
ROLE OF DOPAMINERGIC SYSTEMS OF NEOSTRIATUM DURING THE ACTIVITY OF THE CENTRAL NERVOUS SYSTEM IN MAN AND ANIMALS [ROL' DOFAMINERGICHESKIKH SISTEM NEOSTRIATUMA V PROTSESSAKH VYSSHEI NERVNOI DEIATEL'NOSTI ZHIVOTNYKH I CHELOVEKA]
N. F. SUVOROV and G. IU. VOLYNKINA (AN SSSR, Institut Fiziologii, Leningrad, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 72, Jan. 1986, p. 48-55. In Russian. refs

Simple and complex behavioral patterns in man and rats were analyzed in conditions of the surplus and deficiency of dopamine. In rats, the development of situational reactions and conditioned reflexes at levels of increasing complexity correlated linearly with the contents of dopamine in neostriatum and with the dose of injected dopamine. In noninjected rats, the development of complex reflexes was accompanied by the increased biosynthesis of neostriatum dopamine. The time and the number of errors in the performance of simple psychomotor tasks by patients with drug-induced Parkinsonism were comparable to those of normal subjects. Complex psychomotor activity, however, was impaired in these patients. It is concluded that the dopaminergic system is engaged only in psychomotor activities requiring the cooperation of cerebral cortex. I.S.

A86-33071
CORTICORETICULAR INTERACTIONS IN THE MECHANISMS OF REFLEXOTHERAPY [KORKOVO-RETIKULIARNYE VZAIMOOTNOSHENIIA V MEKHANIZMAKH REFLEKSOTERAPII]
R. A. DURINIAN (Tsentralnyi Nauchno-Issledovatel'skii Institut Refleksoterapii, Moscow, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 72, Jan. 1986, p. 56-60. In Russian. refs

Functional interactions between reticular formations of the brain stem and the cerebral cortex during transmissions of stimuli are discussed, together with the role of these interactions in the methodology of reflexotherapy. The stimulation of various acupuncture loci situated above afferent collectors (e.g., on the surfaces of the head, face, and concha auriculae) increases the general tonicity of the organism, stimulating its vegetative-endocrine functions and immune systems, and removing the feeling of fatigue. More local, specific corticorecticular activation by means of drugs or physical stimuli induces specific reflex reactions controlled by the corticofugal system. I.S.

A86-33072
THE THEORETICAL PRINCIPLES OF ADAPTATION [TEORETICHESKIE OSNOVY ADAPTATSII]
I. A. SAPOV and V. S. NOVIKOV Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 72, Jan. 1986, p. 78-82. In Russian. refs

The principle of adaptation is based on the inherited ability of an organism to maintain stable equilibrium with the environment and to make rapid adjustments in various physiological processes to accommodate environmental changes. The regulatory, energy-producing, and nonspecific components of the physiological adaptation complex are discussed. Activity of the central nervous system is believed to play the foremost role in physiological adaptation, correlating the environmental information with the internal activity of the organism and regulating other processes, including the energy-regulating activity of the sympathoadrenal system and the activity of nonspecific protective systems. I.S.

A86-33073
BLOOD TRANSPORT OF OXYGEN (THE ROLE OF ERYTHROCYTES) [TRANSPORT KISLORODA KROV'IU /ROL' ERITROTSITOV/]
O. I. MOISEEVA (AN SSSR, Institut Fiziologii, Leningrad, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 72, Jan. 1986, p. 93-103. In Russian. refs

The factors determining blood transport of oxygen and its utilization by body tissues are described. Environmental changes (i.e., by smoking or hyperventilation), erythrocyte numbers and shape, and the factors determining the affinity of hemoglobin to oxygen are discussed. Quantitative differences exhibited by various body organs under oxygen deficiency are noted. Special consideration is given to changes in the oxygen affinity of hemoglobin caused by genetically determined faulty hemoglobin chains and by variations in the availability of 2,3-diphosphoglycerate, as well as to the mechanisms of adaptation to these changes. Corrective therapeutic measures include oxygenotherapy in cases of impaired ability of lungs to deliver oxygen, and hemotransfusion in conditions of erythrocyte shortage. Elevated oxygen affinity caused by genetically determined faulty hemoglobin cannot be treated. I.S.

A86-33074
ANALYSIS OF THE FUNCTIONAL STRUCTURE OF THERMOGENESIS ON THE BASIS OF PHARMACOLOGICAL TESTS [OPYT ANALIZA FUNKTSIONAL'NOI STRUKTURY TERMOGENEZA NA OSNOVE FARMAKOLOGICHESKOGO TESTIROVANIIA]
L. A. IUDANOVA, R. P. VALOV, and V. V. KHASKIN (Institut Fiziologii, Novosibirsk, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 72, Jan. 1986, p. 109-115. In Russian. refs

The effects of noradrenaline and propranolol on total heat production and contractile thermogenesis were studied in cold-adapted and control rats and in lemmings caught on Wrangel Island. Oxygen consumption, rectal temperature, and the integrated

activity of the trapezius muscle were measured at different ambient temperatures. In rats, the regulatory and adaptive increases in heat production occur due to elevated noncontractile thermogenesis and to a significant extension of the adrenergically modulated fraction of contractile thermogenesis. Propranolol injections led to increases in noncontractile thermogenesis, which was 2.3 times greater in the cold-adapted rats than in the controls. In lemmings, the adaptability to cold is maintained chiefly by rapid activation of the beta-adrenergic control of chemical thermogenesis and causes no alterations in muscle energetics. I.S.

N86-23217 Defence Research Information Centre, Orpington (England).
DEMONSTRATION AND ROLE OF CHEMORECEPTION IN THE MARINE ZOOPLANKTON
S. A. POULET Jan. 1985 31 p refs Transl. into ENGLISH from Oceanis, vol. 10, no. 2, 1984 p 131-149
(DRIC-T-7456; BR94716) Avail: NTIS HC A03/MF A01

Information on chemoreception in zooplankton is reviewed. Examples which suggest that chemoreception is responsible for the survival of plankton organisms by regulating reproduction, locomotion, and nutrition are discussed. Author (ESA)

N86-23218*# Management and Technical Services Co., Washington, D.C.
USSR SPACE LIFE SCIENCES DIGEST, ISSUE 4 Final Report
L. R. HOOKE, ed., M. RADTKE, ed., V. GARSHNEK, ed., R. TEETER, ed., and J. E. ROWE, ed. Feb. 1986 118 p refs
(Contract NASW-3676)
(NASA-CR-3922(04); NAS 1.26:3922(04)) Avail: NTIS HC A06/MF A01 CSCL 06C

The fourth issue of NASA's USSR Space Life Science Digest includes abstracts for 42 Soviet periodical articles in 20 areas of aerospace medicine and space biology and published in Russian during the last third of 1985. Selected articles are illustrated with figures and tables from the original. In addition, translated introductions and tables of contents for 17 Russian books on 12 topics related to NASA's life science concerns are presented. Areas covered are: adaptation, biological rhythms, biospherics, body fluids, botany, cardiovascular and respiratory systems, cytology, developmental biology, endocrinology, exobiology, habitability and environmental effects, health and medical treatment, hematology, histology, human performance, immunology, mathematical modeling, metabolism, microbiology, musculoskeletal system, neurophysiology, nutrition, perception, personnel selection, psychology, and radiobiology. Two book reviews translated from the Russian are included and lists of additional relevant titles available in English with pertinent ordering information are given. Author

N86-23219# Yale Univ., New Haven, Conn.
USE OF MEMBRANE VESICLES AS A SIMPLIFIED SYSTEM FOR STUDYING TRANSPORT OF AUXIN Progress Report
M. H. GOLDSMITH 1985 2 p refs
(Contract DE-FG02-85ER-13337)
(DE86-002264; DOE/ER-13337/1) Avail: NTIS HC A02/MF A01

The accumulation of indoleacetic acid (IAA) inside microsomal vesicles depends on the presence of a pH gradient and is reversible when the (DELTA)pH is collapsed by ionosphores. Accumulation is stimulated by either napthylphthalamic acid or TIBA. The accumulation of IAA by the vesicles can be saturated. At concentrations of 1 microns or less, IAA, synthetic auxins, or auxin antagonists do not affect the pH gradient, but decrease the accumulation of (3)H-IAA, and therefore compete specifically for uptake. Concentrations of 10 microns and above, uptake of either the auxins or weak acids is sufficient to overcome the buffering capacity of the solution within the vesicles. The collapse of the pH gradient by such high concentrations affects uptake of either (3)H-IAA or (14)C-BA to similar extents and thus is nonspecific. DOE

N86-23220# Department of Energy, Washington, D. C.
ANNUAL REPORT AND SUMMARIES OF FY 1985 ACTIVITIES SUPPORTED BY THE DIVISION OF BIOLOGICAL ENERGY RESEARCH
Nov. 1985 48 p
(DE85-009132; DOE/ER-0147/3) Avail: NTIS HC A03/MF A01

The Biological Energy Research (BER) program of the Office of future energy-related biotechnologies are discussed. The study of green plants as producers of renewable resources is a key aspect of the program. Plant productivity encompasses a broad array of processes, integrated to form a complex whole, the producing plant. Another major aspect of the research program examines microbiological conversions that yield fuels and/or chemicals. These bioconversion processes can provide a substitute for fossil energy resources directly or through energy conserving measures in which biological mechanisms displace industrial energy input requirements (e.g., biological nitrogen fixation, recovery of key resources from dilute concentrations, and conversion of noxious waste products to usable materials carbon monoxide to organic acids). In each instance, the research is aimed at understanding the fundamental mechanisms of conversion rather than a description or optimization of a process. One hundred twenty-five projects are described with subject and investigator indexes. DOE

N86-23221# Southwest Research Inst., San Antonio, Tex.
EFFECTS OF 60 HZ ELECTRIC FIELDS ON OPERANT AND SOCIAL STRESS BEHAVIORS OF NONHUMAN PRIMATES Annual Report, 5 Aug. 1984 - 25 Oct. 1985
W. R. ROGERS, J. H. LUCAS, G. T. MOORE, and J. L. ORR 1985 51 p
(Contract DE-AC02-80RA-50219)
(DE86-002587; DOE/RA-50219/T6) Avail: NTIS HC A04/MF A01

Operant behavioral methods have been used to assess the aversiveness of intense electric fields. One aspect of the aversiveness of a stimulus is the ability to act as a negative reinforcer. A negative reinforcer is a stimulus whose response contingent termination maintains behavior. Baboons were trained to perform an operant task to obtain food rewards, determined that the addition of an intense electric field did not disrupt performance, measured the background level of responding in the absence of any primary reinforcers, assessed the ability of electric field termination to maintain operant responding, and verified that the electric field could serve as a discriminative stimulus. DOE

N86-23222# Joint Publications Research Service, Arlington, Va.
USSR REPORT: LIFE SCIENCES. BIOMEDICAL AND BEHAVIORAL SCIENCES
8 Jan. 1986 119 p refs Transl. into ENGLISH from various Russian articles
(JPRS-UBB-86-002) Avail: NTIS HC A06

Research and development in Soviet life, biomedical, and behavioral sciences is reported. The different categories presented include: agrotechnology, biochemistry, biophysics, biotechnology, epidemiology, food technology, genetics, human factors engineering, imunology, marine mammals, medicine, microbiology, molecular biology, pharmacology and toxicology, physiology, public health, veterinary medicine, and virology.

N86-23223# Joint Publications Research Service, Arlington, Va.
BIOCHEMICAL MODELS FOR STUDY OF NERVE CELL PROCESSES
In its USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 2 8 Jan. 1986 Transl. into ENGLISH from Meditsinskaya Gazeta (Moscow, USSR), 18 Sep. 1985 p 3
Avail: NTIS HC A06

Biochemical models for the study of nerve cells were developed to obtain knowledge of the human brain. Neurochemistry studies the most important processes in living organism that are connected with neural control, memory and thinking. To understand the mechanism of these processes means to recognize the form in

which the nervous system receives external and internal information and reacts to it. Vitally important substances were isolated and studied. The information makes it possible to develop preparations for treating diseases of the nervous system, new anesthetics, and artificial memory systems built according to biological principles. E.A.K.

N86-23224# Joint Publications Research Service, Arlington, Va.
INTERACTION OF ASIALOGLYCOPROTEIN RECEPTOR OF HEPATOCYTES WITH CHEMICALLY GALACTOSILATED ACID ALPHA-GLUCOSIDASE Abstract Only
N. K. BYSTROVA *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 3 8 Jan. 1986 Transl. into ENGLISH from Doklady Akademii Nauk SSSR (Moscow, USSR), v. 284, no. 4, Oct. 1985 p 994-996
Avail: NTIS HC A06

The interaction of a mouse hepatic asialoglycoprotein receptor with chemically galactosilated alphaglucosidase (AGC) was studied to determine the feasibility of using such receptors for introducing AGC into hepatic lysosomes. It was shown that binding was specific and predicated on the presence of the galactosyl residue in the AGC molecule. Various galactose-containing substances inhibited the binding to variable extent, with the greatest degree of inhibition exhibited by asialoorosomucoid. The EDTA inhibited binding by more than 79%, confirming the dependence of binding on the presence of calcium ions, a characteristic feature of asialoglycoprotein receptors. It is indicated that under in vitro conditions the receptor recognizes galactosilated AGC as a specific ligand, suggesting that such enzymes can be introduced in this way into hepatic parenchymal cells. This uggests a means of enzyme therapy in such cases as type II glycogenosis. E.A.K.

N86-23225# Joint Publications Research Service, Arlington, Va.
PROTEIN-PROTEIN INTERACTIONS IN SYSTEMS WITH SYNTHETIC POLYELECTROLYTES Abstract Only
A. L. MARGOLIN, S. F. SHERSTYUK, V. A. IZUMRUDOV, V. K. SHVYADAS, A. B. ZEZIN, and V. A. KABANOV *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 4 8 Jan. 1986 Transl. into ENGLISH from Doklady Akademii Nauk SSSR (Moscow, USSR), v. 284, no. 4, Oct. 1985 p 997-1001
Avail: NTIS HC A06

The efficiency of interaction of alpha-chymotrypsin (ACT) with its basic pancreatic inhibitor on the basis of kinetic data was assessed by using free ACT and ALT covalently linked to polyelectrolytes. The association rate constants in pH 7.5 phosphate buffer at 25 was determined and shows that for the free enzyme in solution, ACT-polymethacrylate complex, and for the CH-agarose linked preparation of ACT, the following values are calculated: 2.8 x 1/10,000, 18.0 x 1/10,000, and 1.4 x 1/10,000 M1/sec-1. The inhibition constants for the three versions of ACT were 3.60 x 10 to the 8th power, 0.40 x 10 to the 8th power and 26.0 x 10 to the 8th power M. It is shown that the methods of enzyme linkage to polyelectrolyte carrier and the nature of the carrier have a profound effect on the binding behavior of the enzyme, and that such facts can be used to alter enzyme behavior toward desired final effects. E.A.K.

N86-23226# Joint Publications Research Service, Arlington, Va.
EFFECT OF INTENSIVE VISIBLE LIGHT ON ACTIVITY OF GLUTATHIONE PEROXIDASE IN PIGMENTED EPITHELIUM OF EYE
N. R. VELIYEVA, E. Y. YUSIFOV, and S. V. MAMEDOV *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86=002) p 5-9 8 Jan. 1986 refs Transl. into ENGLISH from Doklady Akademii Nauk Azerbaydzhanskoy SSR (Baku, USSR), v. 41, no. 5, May 1985 p 24-27
Avail: NTIS HC A06

Functional visual damage caused by visible light was studied. The effect of bright light on glutathsione peroxidase (GP) and pigmented epithelium (PE) activity in the retina was investigated. It is shown that GP activity increases in the PE of a frogs eye in response to intense light, and it is suggested that this is associated with the adaptive response to intensified free radical oxidation reactions in the eye's tissues. The important role of GP in the PE is confirmed. E.A.K.

N86-23228# Joint Publications Research Service, Arlington, Va.
PRODUCTION OF GENE BANK FROM COTTON PLANT CHLOROPLAST DNA FOI HC/MF
M. KARIMOV, G. V. AFANASYEVA, and N. I. MATVIYENKO *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 16-21 8 Jan. 1986 refs Transl. into ENGLISH from Doklady Akademii Nauk Tadzhiksoy SSR (Dushanbe, USSR), v. 28, no. 3, Mar. 1985 p 175-178
Avail: NTIS HC A06

The development of model systems that could make it possible to express eukaryotic genes is discussed. The symbiosis of Agrobacterium tumefaciens in higher plants is used to insert foreign genes into the plants. The plasma genes that are located in the cytoplasm organelles of higher plants, particularly in the chloroplasts are examined. Chloroplast DNA has enough information for the synthesis of a number of protein structures, and its amplification level relies on the expression of its own DNA and foreign DNA altered by genetic engineering techniques. Ribosomal RNA genes of plastids and a large subunit of riboso-diphospate carboxylase are encoded by a chloroplast gene. The insertion of strong promoters into these genes and their supplemental modification, affects the level of photosynthetic activity in plant tissue. One of the stages in changing a genetic program of agricultural plants is the creation of a gene bank of chloroplast DNA. It is demonstrated that the enzyme method of isolating protoplasts from cotton plant leaves followed by mechanical lysis and the lysis of chloropplasts in the presence of proteinase k and supplemental purification on biogel A-50, results in the separation of high polymerchloroplast DNA. E.A.K.

N86-23237# Joint Publications Research Service, Arlington, Va.
EFFECT OF PLASMIDS ON VIRULENCE OF PSEUDOMONAS AERUGINOSA STRAINS IN MOUSE EXPERIMENTS Abstract Only
A. S. YANENKO, V. N. KRYLOV, Y. S. STANISLAVSKIY, and Y. V. KHOLODKOVA *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 34 8 Jan. 1986 Transl. into ENGLISH from Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii (Moscow, USSR), no. 7, Jul. 1985 p 19-22
Avail: NTIS HC A06

The effect of plasmids on the virulence of P. aeruginosa PAO strain is reported. Antigen characteristics of P. aeruginosa strains were studied in agglutination reaction on glass with the aid of poly or monovalent agglutinating O-serums of 20 different types. The virulence of 21 strains was studied on white mice. It is shown that the plasmids in PAO strains reduced the virulence of the pathogen. The plasmids that reduce virulence were from various groups of incompatibility and coded various medical resistant determinants with various effects on the growth of P. aeruginosa. Mutations of rpm that stabilized RP4 support in PAO cells also reduced virulence significantly. Chromosome rpm mutations caused changes in cell surfaces of P. aeruginosa. E.A.K.

N86-23247# Joint Publications Research Service, Arlington, Va.
SEARCH FOR DNA HOST SPECIFICITY SYSTEMS IN SALMONELLA TYPHI Abstract Only
A. L. PASHENKOV, I. I. NIKOLSKAYA, T. G. NIGMATULLIN, and S. S. DEBOV *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 57 8 Jan. 1986 Transl. into ENGLISH from Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii (Moscow, USSR), no. 4, Apr. 1984 p 3-6
Avail: NTIS HC A06

Most specificity systems and their components-restriction and modification enzymes were studied. DNA host specificity systems (HSS) in Salmonella typhi, using O- and Vi-bacteriophages were examined. Reduced effectiveness in phage cultivation was regarded as evidence of a restriction system in a given race. During cloning

morphological features such as colony size and form, transparency and the size of negative colony centers and incomplete lysis were recorded. The 11 lines of Vi-phages and 6 lines of O-phages obtained are further classified according to size, transparency and titration potential. Test cross-titration showed DNA HSS in natural hosts and the test phages. It is shown that 10 strains among the titrated lines of S. typhi have DNA host specificity systems.
E.A.K.

N86-23249# Joint Publications Research Service, Arlington, Va.
CLONING AND EXPRESSION OF LEPTOSPIRA POMONA HEMOLYSIN GENE IN ESCHERICHIA COLI Abstract Only
A. A. DAYN, M. N. ROZINOV, T. A. GOLTSMAYER, V. N. GERSHANOVICH, and Y. G. CHERNUKHA *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 66 8 Jan. 1986 Transl. into ENGLISH from Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii (Moscow, USSR), no. 7, Jul. 1985 p 7-10
Avail: NTIS HC A06

The cloning of the genes in E. Coli a approach to the study of microorganism pathogens is another The L. pomona, which in severe cases is accompanied by yellow jaundice, and its expression in E. coil was studied. Chromosome DNA of L. pomona was obtained by a Fisher-Lerman process, DNA phage by phenol extraction and plasmid DNA by alkaline extraction. Cloning involved a gene inventory of bank nd subsequent screening, using cosmides or vectors based on the lambda phage. Features of fragmentation and cloning are summarized. The recombinant phage carrying the hemolysine gene was selected from phage vector lambda l47.1, and also in the phoUC19 vector. Secretions of hemolysin in the culture of E. coli are not observed. E.A.K.

N86-23252# Joint Publications Research Service, Arlington, Va.
DISEASES IN CEMA COUNTRIES
V. PETRUNYA *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86=002) p 78-80 8 Jan. 1986 Repr. from New Times (Moscow, USSR), no. 36, Sep. 1985 p 22-23
Avail: NTIS HC A06

The pooling of the efforts of medical specialists from several countries is outlined. The standing committee on cooperation in health services is an international organization which coordinates the need for organ transplants in East European countries. The commission has worked on 13 large-scale composite problems. Among these problems are cardiovascular diseases, malignant tumors, scientific elaboration and unification of methods and means of clinical laboratory diagnosis. Every participating country acts as coordinator of the work on one or another composite problem. Bulgaria coordintes effort in the field of labor hygiene and occupational diseases, Hungary in research in the standardization of medicines, the G.D.R.--in infectious diseases, and Poland--in maternity and child protection. Czechoslovakia is coordinator of work in transplantation of organs and tissues. E.A.K.

N86-23253# Joint Publications Research Service, Arlington, Va.
MODEL OF EXPERIMENTAL PIXUNA VIRUS INFECTION IN WHITE MICE
N. P. CHIZHOV and R. I. LUKYANOVA *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 91-93 8 Jan. 1986 refs Transl. into ENGLISH from Voprosy Virusologii (Moscow, USSR), no. 2, Mar. - Apr. 1985 p 214-215
Avail: NTIS HC A06

Use of experimental models of virus-infected animals is an important prerequisite of evaluating the spectrum of action of promising antiviral drugs. The development and use of new experimental models of virus infections comparable or similar in pathogenesis to human diseases are significant in the determination of the preventive and therapeutic effectiveness of antiviral drugs. The development of a nonlethal model of experimental infection evoked by Pixuna alpha-virus which is suitable in the evaluation of the effectiveness of antiviral drugs is discussed. The model of nonlethal disease in white mice which is evoked by Pixuna alpha-virus can be used to evaluate the effectiveness of antiviral preparations and interferon inducers. The models critera for evaluating the effectivenss of antiviral preparations are heir influence on viruse reproduction in the spleen and brain. E.A.K.

N86-23254# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL EVALUATION OF PATHOGENICITY OF DIFFERENT VARIANTS OF LASSA VIRUS
A. S. VLADYKO, L. Y. SURIKOVA, T. A. VOVK, I. A. CHEREDNICHENKO, and A. V. TOROP *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences 8 Jan. 1986 refs Transl. into ENGLISH from Voprosy Virusologii (Moscow, USSR), no. 4, Jul. - Aug. 1985 p 454-457
Avail: NTIS HC A06

Lasso, Machupo and Khunin belong to the highly pathogenic group of the arenavirus family. Research is conducted with the less-pathogenic lymphocytic choriomeningitis (LCM) virus. One of the directions of research on arenavirus infections is concerned with the problems of the attenuation--acquisition of both nonpathogenic viruses and viruses with reduced pathogenicity. The characteristics (markers) by which the degree of attenuation of the infectious agent can be evaluated was examined. It is established, using LCM virus as an example, that a phenotypic characteristic such as plaque morphology can be used as such a marker. It was discovered that the color of plaques in viruses that do not evoke death of newborn mice differs from the color of plaques created by the initial virus. A dependence between plaque phenotype and pathogenicity is not discovered in LCM virus. The Lassa virus was used to demonstrate the presence of a dependence between plaque phenotype and pathogenicity. The possibility of reducing pathogenicity by conducting a number of passages of the virus in cell culture and in animals is accounted for. Plaque size serves as the phenotypic characteristic of attenuation of Lassa virus. E.A.K.

N86-23255# Joint Publications Research Service, Arlington, Va.
STANDARDIZATION OF CONDITIONS FOR MEASURING INTENSITY OF SPECIFIC FLUORESCENCE IN CONTINUOUS CELL CULTURES INFECTED WITH VARIANTS OF JAPANESE ENCEPHALITIS VIRUS Abstract Only
Y. N. CHEREDNICHENKO *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 100 8 Jan. 1986 Transl. into ENGLISH from Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii (Moscow, USSR), no. 4, Apr. 1985 p 57-60
Avail: NTIS HC A06

Luminescent microscopy as a method for studying pathogenesis of human and animal viral infections is discussed. The dynamics of the intensity of imposed fluorescence of marked antibodies tied to the antigen of Japanese encephalitis in vitro were studied. Cells of various origins were tested a passive fluorescent antibody method. Procedures for standardization and perfection of methodology and statistical calculations are summarized. A direct linear correlation is found between pathogen activity of Japanese encephalitis and the intensity of imposed fluorescence of marked antibodies. Continuous Viro and L929 cell cultures are more suitable models for registering induced fluorescence than the HeLa line.
E.A.K.

N86-23257# Joint Publications Research Service, Arlington, Va.
METEOROLOGICAL ADAPTATION RESEARCH AT BIOLOGY INSTITUTE Abstract Only
V. N. CHERNYAVSKIY *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 108-109 8 Jan. 1986 Transl. into ENGLISH from Trud (Moscow, USSR), 26 Sep. 1985 p 3
Avail: NTIS HC A06

Natural mechanisms of anticipation of weather changes in animals and human beings, and effects of weather conditions on human behavior and working fitness were studied. A natural phenomenon, meteorological sounds noise of free atmosphere which is caused by turbulent motion of the air was discovered. The sound reflect the atmosphere properties in a certain area,

including the appearance of new air masses in the upper atmosphere. Living organisms unconsciously perceive these sounds, analyze them and modify their behavior accordingly. A hypothesis of human meteorological adaptation proposed that the organism perceives and remembers whole meteorological sound-images which occur at certain intervals in certain localities, and corresponding programs for the readjustment of functional systems of the organism. The biological forecasting mechanism may lead to the development of improved weather-forecasting methods and equipment. An acoustic weather-forecasting method was used in the Rostov-na-Donu area. A medical forecasting method using primary data, based on the meteorological-adaptation hypothesis was also developed. Ecological factors are considered in the forecasting and prevention of illness. E.A.K.

N86-23258# Joint Publications Research Service, Arlington, Va.
USSR REPORT: LIFE SCIENCES. BIOMEDICAL AND BEHAVIORAL SCIENCES
12 Mar. 1986 147 p Transl. into ENGLISH from various Russian articles
(JPRS-UBB-86-004) Avail: NTIS HC A07/MF A01

Progress in research and development in USSR life, biomedical, and behavioral sciences is reported. The following areas of interest are discussed: agrotechnology, biochemistry, biophysics, biochemistry, biotechnology, ecology, epidemiology, genetics, immunology, laser effects, marine mammals, medicine, microbiology, molecular biology, pharmacology and toxicology, physiology, public health, psychology, and virology.

N86-24184# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
US DEPARTMENT OF AGRICULTURE/CORPS OF ENGINEERS COOPERATIVE AQUATIC PLANT CONTROL RESEARCH. ANNUAL REPORT FOR FY 1983; CHEMICAL CONTROL TECHNOLOGY Final Report
T. K. VAN, K. K. STEWARD, A. O. JONES, R. D. CONANT, JR., and H. E. WESTERDAHL Sep. 1985 70 p
(AD-A161867; WES/MP/A-85-3) Avail: NTIS HC A04/MF A01 CSCL 06F

Of the several controlled release herbicide formulations evaluated in FY83, two monolithic polycaprolactone fibers containing fluridone have been found to have significant potential. These fibers, designed to maintain herbicide-plant contact over a period of four to 6 weeks, were proven effective in controlling hydrilla (Hydrilla verticillata Royle) at 2.2 kg a.i./ha (active ingredient per hectare) in flowing water in large outdoor aquaria. Under the same conditions, the commercial formulation Sonar 4AS provided no hydrilla control. Two silicate capsules of dichlobenil showed promising results in the laboratory and were selected for evaluations in large outdoor aquaria in which long-term control of hydrilla regrowth was assessed. Research concerning application of glyphosate indicated that decreasing carrier volume increased phytotoxicity of glyphosate to waterhyacinth, mainly by enhancing herbicide retention and penetration. A treatment of 1.7 kg a.e./ha (acid equivalent per hectare) glyphosate in 438 L/ha water carrier resulted in faster and longer lasting control than did 2.8 kg a.e./ha in 935 L/ha. Long-term effects from glyphosate on torpedograss in standing water were significantly reduced compared to activity achieved on ditchbanks. Studies with 14C-glyphosate indicated that herbicide translocation was impeded in standing water. Sulfumeturon at 0.02 kg a.i./ha completely eradicated waterhyacinth in a 0.07-ha pond in Fort Lauderdale. Residue analyses indicated that levels of 1.3 to 1.6 microgram/L sulfumeturon were present in water 24 hr after application; then decreased rapidly. GRA

N86-24185# National Academy of Sciences - National Research Council, Washington, D. C. Commission on Life Sciences.
STUDY OF BIOTECHNOLOGY APPLIED TO RESEARCH AND DEVELOPMENT
8 Jan. 1985 43 p
(Contract N00014-83-G-0024)
(AD-A161877) Avail: NTIS HC A03/MF A01 CSCL 15B

This report contains summaries of a conference on biosensors, along with the deliberations of the Commitee on Biotechology Applied to Naval Needs. For the purposes of this report, biosensors are defined as devices that utilize some principles or elements of biology, broadly defined, to generate a signal in response to a specific material substance or condition. The committee considered that the appropriate areas of biology to consider were the study of receptors, enzymology, the use of DNA as a detector, immunologly, and the development of synthetic analogs to the relevant natural biological reactions. In contrast to a recent report prepared by the NRC's Board on Army Science and Technology, entitled Assessment of Chemical and Biological Sensor Technologies, which was written in response to a very narrowly and sharply defined charge, the present report focuses on basic biology relevant to biosensors. GRA

N86-24186# Army Medical Research Inst. of Infectious Diseases, Fort Detrick, Md.
CLONING AND ANALYSIS OF GENES FOR ANTHRAX TOXIN COMPONENTS
S. H. LEPPLA, D. L. ROBERTSON, S. L. WELKOS, L. A. SMITH, and M. H. VODKIN 29 Aug. 1985 6 p
(Contract S18-06)
(AD-A161901) Avail: NTIS HC A02/MF A01 CSCL 06O

Genetic analysis and DNA cloning techniques have been used to study the plasmids and genes which determine synthesis of the three protein components of anthrax toxin. After plasmid curing and transfer experiments showed that all three genes were probably located on the large B. anthracis plasmid pX01, DNA libraries of pX01 DNA were constructed. Five colonies containing at least part of the lethal factor gene and six colonies containing protective antigen DNA were identified, and their plasmids were mapped by restriction enzyme digestion. The absence of an equal number of edema factor (EF) recombinants was attributed to the possibility that the EF adenylate cyclase is toxic to the host E. coli.
Author (GRA)

N86-24187# Army Medical Research Inst. of Infectious Diseases, Fort Detrick, Md.
IDENTIFICATION OF VACCINE RESISTANT ISOLATES OF BACILLUS ANTHRACIS
S. F. LITTLE and G. B. KNUDSON 13 Nov. 1985 23 p
(AD-A162002) Avail: NTIS HC A02/MF A01 CSCL 06M

Several strains of Bacillus anthracis have been reported previously to cause fatal infection in immunized guinea pigs. In this study, guinea pigs were immunized with either a protective antigen vaccine or a live Sterne strain spore vaccine, then challenged with virulent B. anthracis strains isolated from various host species from the United States and foreign sources. The authors concluded that antibodies to toxin components may not be sufficient to provide protection against all strains of B. anthracis, and that other antigens may play a role in active immunity. As a practical matter, it follows that the efficacy of anthrax vaccines must be tested by using vaccine-resistant isolates if protection against all possible challenge strains is to be assured. GRA

N86-24188# Naval Ocean Systems Center, San Diego, Calif.
THE EFFECTS OF BIS (TRI-N-BUTYLTIN) OXIDE ON THREE SPECIES OF MARINE PHYTOPLANKTON Final Technical Report, Jun. - Jul. 1982
S. M. SALAZAR May 1985 19 p
(Contract DA PROJ. Z08-29; DA PROJ. ZR0-0001)
(AD-A162115; NOSC/TR-1039) Avail: NTIS HC A02/MF A01 CSCL 07B

The effects of three concentrations of bis (tri-n-butyltin) oxide (TBTO) 1.5, 3.0, and 6.0 ppb) on three species of marine

phytoplankton were assessed. Parameters measured were in vivo fluorescence and DCMU induced fluorescence. Fluorescence ratios were calculated from these values. The effects of TBTO exposure varied considerably from species to species. Gymnodinium splendens was the most sensitive, affected by all concentrations of TBTO. Dunaliella sp. demonstrated inhibition of growth at 3.0 and 6.0 TBTO after 3 days. No measurable effects were detected for Phaedactylum tricornutum at any of the TBTO exposures. These data indicate the effect of TBTO on marine phytoplankton may be species specific. GRA

N86-24189# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
THE EFFECTS OF KETAMINE ON RHESUS MONKEY SKELETAL DYNAMICS
K. N. SWENSON, K. C. SMITH, C. M. OLOFF, and M. E. SOUDER Sep. 1985 52 p
(Contract AF PROJ. 723-1)
(AD-A162848; AAMRL-TR-85-060) Avail: NTIS HC A04/MF A01 CSCL 06O

Four young male Rhesus monkeys were exposed to intramuscular injections of ketamine anesthetic (15 mg/kg) on eight selected days of a 28 day experiment. The subjects were dosed with bone labeling compounds to determine the effect ketamine had on bone modeling/remodeling dynamics. Trabecular bone sections of T sub 9 and L sub 4, and cortical bone sections of proximal femur and midshaft femur were used for histomorphometric analysis. Urine creatinine and calcium, and serum alkaline phosphatase and calcium levels were determined. Vertebral centrum compression tests were conducted on selected thoracic and lumbar levels. Stiffness, ultimate load and modulus showed significant increases in the ketamine exposure group. The results of the trabecular histomorphometry showed a possible increase in mineralization lag time or slower mineralization. Cortical bone histomorphometry could indicate activation of the skeletal system. The experimental results lead to the conclusion that something affected the mechanical strength parameters and the bone remodeling dynamics of the ketamine exposure group. It is unclear as to whether these differences are strictly due to ketamine as stress and age difference were other influencing factors. GRA

N86-24190# California Univ., Berkeley. Lawrence Berkeley Lab.
BIOLOGICAL EFFECTS AND PHYSICAL SAFETY ASPECTS OF NMR IMAGING AND IN VIVO SPECTROSCOPY
T. S. TENFORDE and T. F. BUDINGER Aug. 1985 60 p refs Presented at the American Association of Physicists in Medicine Summer School, Portland, Ore., 4 Aug. 1985
(Contract DE-AC03-76SF-00098)
(DE86-002966; LBL-20053; CONF-8508145-1) Avail: NTIS HC A04/MF A01

An assessment is made of the biological effects and physical hazards of static and time-varying fields associated with the NMR devices that are being used for clinical imaging and in vivo spectroscopy. A summary is given of the current state of knowledge concerning the mechanisms of interaction and the bioeffects of these fields. Additional topics that are discussed include: (1) physical effects on pacemakers and metallic implants such as aneurysm clips, (2) human health studies related to the effects of exposure to nonionizing electromagnetic radiation, and (3) extant guidelines for limiting exposure of patients and medical personnel to the fields produced by NMR devices. On the basis of information available at the present time, it is concluded that the fields associated with the current generation of NMR devices do not pose a significant health risk in themselves. However, rigorous guidelines must be followed to avoid the physical interaction of these fields with metallic implants and medical electronic devices. DOE

N86-24191# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany). Space Div.
STUDY OF BIOSAMPLE PRESERVATION, HANDLING, AND OBSERVATION FACILITIES Final Report
Paris ESA May 1985 199 p refs Prepared in cooperation with Brunel Univ., Uxbridge, England Original contains color illustrations
(Contract ESTEC-5655/83-NL-PR)
(ESA-CR(P)-2126) Avail: NTIS HC A09/MF A01

An autonomous facility for biology experiments in space, to be flown on platforms such as EURECA is proposed. It is a modular, multiuser facility, capable of 6 months automated operation. It includes an experiment area for specimen growth in 1 g and micro-g, sample storage and transport facilities, and observation and data processing units. Tests on breadboards of critical subsystems (culturing, workstation, containers, cameras) show the feasibility of the design. Author (ESA)

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AEROSPACE MEDICINE

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

A86-29855#
HELICOPTER-CONTROL-REFERENCED STRENGTH CAPABILITIES OF SMALL INDIVIDUALS
A. W. SCHOPPER and G. R. MASTROIANNI (U.S. Army, Aeromedical Research Laboratory, Fort Rucker, AL) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 47-54. refs

An evaluation is made of helicopter control-referenced force exertion capabilities in a sample of U.S. Army males and females, with a view to the reevaluation of anthropometric criteria. These data were compared with the values cited as upper force limits for the design of helicopter controls. Due to their small size, these females of 152-167 cm stature and males of 159-167 cm stature represent the portion of the population least likely to meet 1961 strength limits for nonstandard flight maneuvers. Ten percent of the males and 27 percent of the females evaluated failed to achieve existing control force design limits, especially in the downward direction of collective control. O.C.

A86-30169
AEROSOL DEPOSITION ALONG THE RESPIRATORY TRACT AT ZERO GRAVITY - A THEORETICAL STUDY
B. E. LEHNERT, D. M. SMITH, L. M. HOLLAND, M. I. TILLERY (Los Alamos National Laboratory, NM), and R. G. THOMAS (Los Alamos National Laboratory, NM; DOE, Office of Health and Environmental Research, Washington, DC) IN: Lunar bases and space activities of the 21st century . Houston, TX, Lunar and Planetary Institute, 1985, p. 671-677. DOE-supported research. refs

Attention is given to the results of a study conducted to predict the ways in which particle deposition in the human respiratory tract at zero gravity may differ from that on earth. The aerosol deposition model of the Task Group on Lung Dynamics (1966) was used to assess the regional deposition of particles ranging from 0.01 to 10.0 microns in diameter at particulate density values of 1 and 4, during simulated tidal breathing as well as breathing during moderate-to-heavy exercise. The results suggest that the gas exchange regions of the lungs of space travelers and residents are afforded some protection, relative to their earthbound counterparts, against particle deposition in the absence of gravity; a reduction by a factor of approximately 2 to 10 is noted in collection efficiency for the case of particles greater than 0.5 microns in diameter. Deposition along the tracheobronchial tree is not significantly altered in the absence of gravity, indicating that airway

sites contributing to this structure remain susceptible to inhaled aerosols. O.C.

A86-30381#
CRITICAL IMPACT AND ACCELERATION LOADING TO THE HEAD
W. GOLDSMITH (California, University, Berkeley) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-21 to S-24. refs
(Contract NIH-5-R01-AM-18284)

Various loads to the human head are of a few milliseconds duration are surveyed including nonpenetrating blunt impact to the cranium and rotational acceleration loading. Head impact during sporting events is also discussed along with loads experienced in a cannon-bearing military vehicle, whereby gunners are subjected to a direct blow to the head by gun recoil as well as to a wave transmitted through the seat. Experiments that would identify the threshold of very serious, frequently fatal cranial injury caused by blunt impact to the human head, were conducted using extrapolation, scaling, modeling and by extension of impact data from human replicas. Previous assertions equating skull fracture with concussion were proven invalid, as results indicated that skull fracture requires twice the acceleration levels for neutral trauma. It was noted that brain damage can also be caused by indirect loading and that primates exhibit a higher concussion tolerance when exposed to a given level of linear acceleration regardless of simultaneous angular acceleration. K.K.

A86-30382#
IS SPACE SICKNESS A FORM OF MOTION SICKNESS?
H. L. BORISON (Dartmouth College, Hanover, NH) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 12-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-25 to S-27. refs

A comparison is made of space sickness and terrestrial motion sickness with respect to stimulus properties, response proporties and contributing mechanisms. Observations are restricted, as far as possible to spontaneous occurrences of space sickness free from extraneously occurrences of space sickness free from extraneously imposed test motions. Likewise, terrestrial motion sickness is examined under the simplest conditions for its evocation. Convincing differences are evident in some of the stimulus and response properties of the two sickness syndromes while others are equivocal. Possible mechanisms of space sickness are all unproved. It is concluded that decisive experiments on the vestibluar system and the emetic reflex mechanism must be performed in microgravity to erase reasonable doubts that space sickness is a form of motion sickness. Author

A86-30383#
EFFECTS OF GRAVITY ON THE FLUID BALANCE AND DISTRIBUTION IN MAN
D. LINNARSSON, B. TEDNER, and O. EIKEN (Karolinska Institutet, Stockholm, Sweden) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-28, S-29. refs

Marked fluid shifts have been observed during space flight and simulated microgravity. Three components can be identified: First, a rapid cephalad blood shift; second, a shift of extravascular fluids from the legs within hours; and third, a net loss of water within days. We have investigated the second phase in seven healthy men during 7 deg HDT. Segmental fluid distribution and changes in total body fluids were monitored by means of a tetrapolar impedance technique. Leg fluid volume was reduced as an exponentially decaying function of time, with time constants of 25-50 minutes. No simultaneous increase in the fluid volume of the trunk could be detected. This indicates that the fluid removed from the legs then is to be found in the blood. Our results also show the feasibility of the impedance technique to monitor fluid changes during microgravity. Author

A86-30384#
VOLUME REGULATING HORMONES
C. GHARIB, G. GAUQUELIN, G. GEELEN (Lyon I, Universite, Lyons, France), J. L. MAUROUX, A. GUELL (Centre Hospitalier Universitaire, de Rangueil, Toulouse, France) et al. (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-30 to S-33. Research supported by DIGITAL France, CNES, DRET, and CNRS. refs

The decrease of hydrostatic pressure during space flights (microgravity state) or simulations of weightlessness (by immersion, bedrest or head-down tilt) results in body fluid shift and an engorgement of the central circulation where mechanoreceptors involved in plasma volume regulation are located. Their activation induces the initial (first hours) hormonal response with a decrease in plasma vasopressin, renin and aldosterone and an increase of natriuretic factor (Gauer reflex). The long term effects of weightlessness are linked to electrolyte disturbances, mainly a sodium loss which induces an increase in plasma renin and aldosterone and an amplification of the circadian rhythm renin activity. The discrepancies between the results of different studies could be explained by several factors (training level of subjects, diet, the subjects posture during the control period). Author

A86-30385*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
FLUID AND ELECTROLYTE CONTROL IN SIMULATED AND ACTUAL SPACEFLIGHT
C. S. LEACH and P. C. JOHNSON, JR. (NASA, Johnson Space Center, Houston, TX) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-34 to S-37. refs

Effects of microgravity on body fluid distribution and electrolyte and hormonal levels of astronauts have been studied since the early manned space missions. Bedrested subjects have been used as controls to separate effects of microgravity from those of hypokinesia. These investigations have led to documentation of the physiological effects of spaceflight and to a unified theory of response to microgravity. During flight, crewmembers have decreased thirst and a net loss of body water, sodium, and potassium. These changes seem to be initiated by passive transfer of extracellular fluid resulting in increased central venous pressure (CVP), to which the homeostatic mechanisms respond. A new equilibrium state is maintained during flight; it does not change in response to negative calcium and nitrogen balances during flight. On reexposure to gravity, profound water and salt retention occurs to replete extracellular fluid. Attempts to avoid cardiac deconditioning by repleting water and salt before leaving microgravity have somewhat ameliorated postural hypotension but have had little effect on CVP, cardiac chamber size or electrolyte dynamics. Author

A86-30386*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
MECHANISMS FOR NEGATIVE WATER BALANCE DURING WEIGHTLESSNESS IMMERSION OR BED REST?
J. E. GREENLEAF (NASA, Ames Research Center, Moffett Field, CA) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-38, S-39. refs

Results of bedrest and water immersion studies are of interest when formulating an hypothesis to explain inflight changes in water and electrolyte metabolism. A comparison of the two techniques is made, and it is found that the time course of fluid-electrolyte responses with bedrest occur more slowly than during weightlessness and faster with immersion. Hence, the head-down bedrest is the more appropriate model for simulation studies. The

facts lead to the following hypothesis: Because of the head-ward shift of fluid , there is a transient elevation of central venous pressure upon reaching weightlessness that is not sufficiently intense to significantly activate the vasopressin-diuresis mechanism. But the increased pressure is of significant intensity to release atrial natriuretic peptides. A hypotonic fluid moving into the cells contributes to edema and inhibits thirst. In this manner, astronauts gradually lose body water as a result of slightly increased urinary sodium coupled with decreased fluid intake. These responses continue until a new fluid-electrolyte steady state is attained at a reduced level of total body water. Author

A86-30387#
CARDIORESPIRATORY RESPONSES TO LOWER BODY NEGATIVE PRESSURE AND TILT TESTS AFTER EXPOSURE TO SIMULATED WEIGHTLESSNESS
V. P. KATUNTSEV, V. E. KATKOV, V. M. BARANOV, I. F. VIL-VILIAMS, and A. M. GENIN (Institut Mediko-Biologicheskikh Problem, Moscow, USSR) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-40 to S-42. refs

Experimental results are presented concerning the cardiorespiratory responses of healthy male volunteers to -30 mm Hg lower body negative pressure (LBNP) and tilt tests following 6-7 day exposure to simulated weightlessness. In the first series of experiments (LBNP) tests, the magnitude of the responses was significantly smaller than in the second (tilt tests). During LNBP tests there were no syncopal and presyncopal subjects, whereas during tilt tests all subjects developed presyncopic reactions with a decrease of blood pressure. Syncopic reactions were observed in three subjects during the filt tests. Symptoms of imminent syntilation accompanied by a marked decrease of PaCO2 were also observed. The role of extracardiac mechanisms of circulation regulation and arterial hypocapnia in the development of orthostatic intolerance is discussed in detail. I.H.

A86-30445#
CIRCADIAN VARIATION OF VOLUME AND CONCENTRATION OF ORTHOSTATICALLY SHIFTED FLUID
M. MOSER, F. VAUTI, H. PINTER, and T. KENNER (Graz, Universitaet, West Germany) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-169, S-170. Research supported by the Oesterreichische Nationalbank.

The volume and density of the fluid shift due to postural change from supine to standing was measured for six male students at eight times of the day. Earlobe capillary blood samples were measured for blood and plasma density changes, and hematocrit; and the protein content was calculated. A minimum for all parameters was seen at six PM, and there is a variation of -21 percent to +13 percent from the mean of 7.4 percent of the blood volume. The filtrate density of the shifted fluid, determined by the 'mechanical oscillator technique', varied from 1007.6 g/l (O AM) to 1004.5 g/l (6 PM). An elevated filtration permeability during the night and a decreased permeability in the late afternoon are observed, pointing to an increased lower body filtration coefficient during the night hours. R.R.

A86-30446#
DAY COURSE OF BLOOD AND PLASMA DENSITY IN RELATION TO OTHER HEMATOLOGICAL PARAMETERS
F. VAUTI, M. MOSER, H. PINTER, and T. KENNER (Graz, Universitaet, West Germany) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-171, S-172. Research supported by the Oesterreichische Nationalbank. refs

The mechanical oscillator technique (MOT) was used to investigate the relationship between blood composition and intercompartmental fluid shifts with respect to gravity and daytime dependence. In six healthy young men, capillary blood was sampled from both earlobes in supine and upright head-up tilt position at eight different times of day under conditions of normal daily activity. The results demonstrated pronounced circadian alterations of hematological parameters, including values for hemoglobin, hematocrit, erythrocyte count, leucocyte count, and mass density of whole blood and plasma, in supine as well as in standing position. Lower amplitudes occurred in standing than in reclined position. It is concluded that MOT is a very useful method for studying fluid distributions in the cardiovascular system. C.D.

A86-30448#
MICROVASCULAR FLOW ADJUSTMENTS WITH POSTURAL CHANGES IN HUMANS
P. N. SFAKLANOS, A. R. HARGENS, and W. H. AKESON (California, University; USVA, Medical Center, San Diego, CA) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-175, S-176. USVA-supported research. refs
(Contract NIH-AM-25501)

Studies of both simulated and actual weightlessness document significant regional fluid shifts within the body. One manifestation of weightlessness is the accumulation of fluid in the face as a result of the fluid shift away from lower extremities. Blood flow in lip capillaries was investigated in order to determine the relationship between microvascular flow and varying degrees of postural inversion. The head-down tilt posture (reversal of the normal hydrostatic pressure gradient between head and heart) is commonly used to simulate weightlessness in humans. Author

A86-30678
PLASMA LACTATE AND VENTILATION THRESHOLDS IN TRAINED AND UNTRAINED CYCLISTS
J. SIMON, J. L. YOUNG, D. K. BLOOD, K. R. SEGAL, R. B. CASE (Columbia University, New York) et al. Journal of Applied Physiology (ISSN 0161-7567), vol. 60, March 1986, p. 777-781. refs

A86-30679
EFFECT OF ELEVATED FFA ON CARBOHYDRATE AND LIPID OXIDATION DURING PROLONGED EXERCISE IN HUMANS
E. RAVUSSIN, C. BOGARDUS, K. SCHEIDEGGER, B. LAGRANGE, E. D. HORTON (Vermont, University, Burlington) et al. Journal of Applied Physiology (ISSN 0161-7567), vol. 60, March 1986, p. 893-900. refs
(Contract NIH-R01-AM-26317; NIH-RR-109)

A86-30680
PHYSIOLOGICAL CHANGES IN HEMOSTASIS ASSOCIATED WITH ACUTE EXERCISE
M. E. WHEELER, G. L. DAVIS, W. J. GILLESPIE, and M. M. BERN (Northeastern University; New England Deaconess Hospital, Boston, MA) Journal of Applied Physiology (ISSN 0161-7567), vol. 60, March 1986, p. 986-990. Research supported by General Diagnostics. refs
(Contract NIH-RR-07143)

Exercise-induced changes in blood lactate, 2,3-diphosphoglycerate, fibrinolytic activity (FA), and hemostatic activities of factor VIII complex subunits were investigated, using human subjects exercising to maximum effort on a treadmill. All parameters, which were analyzed before, immediately postexercise (IP), and 8 min postexercise, were found to significantly increase postexercise. A positive correlation was found between the IP lactate with the IP FA and factor VIII coagulant activity, and the correlation was strengthened by including the preexercise value of blood high-density lipoprotein (HDL) concentration. It is suggested that the IP lactate concentration and the preexercise HDL content may be useful components of a predictive index for identifying individuals with fibrinolytic system impairments. I.S.

A86-30681
SOMATOSTATIN INHIBITS THE VENTILATORY RESPONSE TO HYPOXIA IN HUMANS
D. L. MAXWELL, P. CHAHAL, K. B. NOLOP, and J. M. B. HUGHES (Royal Postgraduate Medical School, London, England) Journal of Applied Physiology (ISSN 0161-7567), vol. 60, March 1986, p. 997-1002. Research supported by the Wellcome Trust. refs

The effect of a 90-min infusion of somatostatin on ventilation and the ventilatory responses to hypoxia and hypercapnia were investiated in human subjects by measuring minute ventilation, arterial O2 saturation, and arterial PCO2. Somatostatin greatly attenuated the hypoxic response and caused a small fall in resting ventilation, but did not affect the hypercapnic response. When the progressive ventilatory responses and overall metabolism were measured, the somatotoxin responses were found to be similar (mean fall in hypoxic response but no change in hypercapnic response), and no changes in overall O2 consumption or in CO2 production were observed. The results show a hitherto-unsuspected inhibitory potential of somatostatin on the control of breathing; the sparing of the hypercapnic response is suggestive of an action on the carotid body but does not exclude a central effect. I.S.

A86-30684
REMARKABLE METABOLIC AVAILABILITY OF ORAL GLUCOSE DURING LONG-DURATION EXERCISE IN HUMANS
N. PALLIKARAKIS, B. JANDRAIN, F. PIRNAY, F. MOSORA, M. LACROIX (Liege, Universite, Belgium) et al. Journal of Applied Physiology (ISSN 0161-7567), vol. 60, March 1986, p. 1035-1042. Research supported by the Fonds de la Recherche Scientifique Medicale, FNRS, and FRFC. refs

A86-30893
COMPLEX APPROACH TO THE STUDY OF ADAPTIVE SYSTEMIC REACTIONS AND FUNCTIONAL STATES IN MAN. I - THE TIME FACTOR IN THE FORMATION OF SUBCOMPLEXES OF SYSTEMIC PHYSIOLOGICAL INDEXES OF FUNCTIONAL STATE DYNAMICS, AND THE INSTRUMENTATION USED IN THE STUDY [KOMPLEKSNYI PODKHOD K IZUCHENIIU ADAPTIVNYKH SISTEMNYKH REAKTSII I FUNKTSIONAL'NYKH SOSTOIANII CHELOVEKA. I VREMENNOI FAKTOR V FORMIROVANII SUBKOMPLEKSOV SISTEMNYKH FIZIOLOGICHESKIKH POKAZATELEI DINAMIKI FUNKTSIONAL'NYKH SOSTOIANII I APPARATURNOE OBESPECHENIE ISSLEDOVANII]
V. A. ILIUKHINA and S. G DANKO (Institut Eksperimental'noi Meditsiny, Leningrad, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 12, Jan.-Feb. 1986, p. 25-37. In Russian. refs

The complex method used to study the functional stability and adaptive systemic reactions in man is based on correlating the dynamics of ultraslow physiological processes registered in the brain (such as the omega potential and ultraslow potential oscillations in the tau and zeta waves) with changes in vegetative indices and in the adaptive psychological reactions of memory, attention, and emotional display. A multiparameter instrumental system, which permits simultaneous registration of the ultraslow reactions and of the correlated adaptive psychophysiological reactions is described. The method is illustrated by a study of the effect of nacom in patients with Parkinsonism. I.S.

A86-30894
NEURONAL RESPONSES AND THE EVOKED POTENTIALS IN SUBCORTICAL STRUCTURES OF THE HUMAN BRAIN DURING VISUAL RECOGNITION. II - THE EFFECT OF STIMULI RELEVANCE ON THE EVOKED NEURONAL RESPONSES [REAKTSII NEIRONOV V VYZVANNYE POTENTSIALY V PODKORKOVYKH STRUKTURAKH MOZGA CHELOVEKA PRI ZRITEL'NOM OPOZNANII. II - VLIIANIE RELEVANTNOSTI STIMULOV NA VYZVANNYE REAKTSII NEIRONOV]
IU. D. KROPOTOV and V. A. PONOMAREV (Institut Eksperimental'noi Meditsiny, Leningrad, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 12, Jan.-Feb. 1986, p. 58-64. In Russian. refs

A86-30895
THE EFFECT OF INTENSE MENTAL WORK UNDER STRESS ON CARDIAC ACTIVITY, HEMODYNAMICS, AND BRAIN CIRCULATION [VLIIANIE NAPRIAZHENNOI UMSTVENNOI RABOTY V STRESSORNYKH USLOVIAKH NA SERDECHNUIU DEIATEL'NOST', GEMODINAMIKU I KROVOOBRASHCHENIE GOLOVNOGO MOZGA]
B. M. FEDOROV, E. N. STRELTSOVA, T. V. SEBEKINA, and T. M. SINITSYNA Fiziologiia Cheloveka (ISSN 0131-1646), vol. 12, Jan.-Feb. 1986, p. 65-71. In Russian. refs

A86-30896
THE ROLE OF HORMONAL CHANGES IN THE DEVELOPMENT OF MOTION SICKNESS IN MAN [O ROLI IZMENENII GORMONAL'NOGO STATUSA CHELOVEKA V RAZVITII BOLEZNI DVIZHENIIA]
A. I. GRIGOREV, I. A. NICHIPORUK, and G. S. ARZAMAZOV Fiziologiia Cheloveka (ISSN 0131-1646), vol. 12, Jan.-Feb. 1986, p. 76-81. In Russian. refs

Clinical symptoms of experimentally induced motion sickness were correlated with measured blood contents of adrenocorticotropin, somatotropin, vasopressin, prolactin, cortisone, and aldosterone. The onset of motion sickness was found to coincide with sharp increases in somatotropin, vasopressin, and prolactin in highly susceptible but not in resistant subjects. The endocrine reactions indicate the involvement of the hypophyseal-hypothalamic system in the adaptive reactions expressed by the motion sickness syndrome. The role of the endogenous opiate-like compounds, such as enkephalins, in interconnecting the endocrine system and the neuromediating system is suggested. I.S.

A86-30898
THE ALLEVIATING EFFECT OF ARBITRARY MOVEMENTS ON THE VESTIBULOMOTOR [OBLEGCHAIUSHCHEE DEISTVIE PROIZVOL'NYKH DVIZHENII NA VESTIBULOMOTORNUIU REAKTSIIU]
B. N. SMETANIN, V. IU. SHLYKOV, and M. P. KUDINOVA (AN SSSR, Institut Problem Peredachi Informatsii, Moscow, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 12, Jan.-Feb. 1986, p. 133-140. In Russian. refs

The effects of various arbitrary movements on manifestations of the vestibulomotor reaction were studied in human subjects receiving electrical stimuli to the vestibular apparatus. Certain body maneuvers, such as rapid sideward head movements, forward body bending, or arm swinging, had little or no effect. On the other hand, the destabilizing movements specifically associated with spatial displacements of the body and with postural rearrangements, such as rapid squatting, rapidly repeated rising on one's toes, or walking in place, incerased the compensatory motor reaction and lowered the threshold of its appearance. The observed effect was not caused by induced instability per se but had to do with the volitional initiation of the destabilizing movements. I.S.

A86-30899
DYNAMICS OF THE SALIVARY ELECTROLYTE COMPOSITION AND RENAL EXCRETORY FUNCTION DURING HUMAN ADAPTATION TO AN ALTERED GASEOUS ENVIRONMENT [DINAMIKA ELEKTROLITNOGO SOSTAVA SLIUNY I EKSKRETORNOI FUNKTSII POCHEK PRI ADAPTATSII CHELOVEKA K IZMENENNOI GAZOVOI SREDE]
N. A. AGADZHANIAN, A. I. ELFIMOV, and Z. B. MININA Fiziologiia Cheloveka (ISSN 0131-1646), vol. 12, Jan.-Feb. 1986, p. 157-164. In Russian. refs

The effects of increasing atmospheric contents of O2 and CO2 on the renal excretory function and on salivary electrolyte composition were studied in men kept in a controlled atmosphere. Elevated CO2 has led to increases in salivary potassium, with hyperoxia reinforcing the effect, while the kidney water excretion was inversely proportional to atmospheric oxygen content. Hypercapnia was seen to adversely affect renal ion and osmoregulating functions, but both of these could be normalized

by increasing the atmospheric oxygen to 29 percent. Atmospheric changes have also affected the circadian rhythms of diuresis and electrolyte concentrations. I.S.

A86-31150
CATCHING ZZZS IN ZERO-G
D. PINE Space World (ISSN 0038-6332), vol. W-2-266, Feb. 1986, p. 27-29.

A discussion on zero-g sleep over the history of the space program is presented. On the early flights, astronauts slept in their seats, whereas beginning with Apollo 7, they could stretch out and free float in sleep restraints. Shuttle improvements include bunks which help block out noise. An ESA designed restraint with inflatable tubes on the exterior helps prevent the feeling of free fall during sleep. Early experiments on reorganizing sleep/wake patterns were unsuccessful. A Skylab test found that stage-three sleep increased during the flight but decreased on return home, and that REM increased only after return home, indicating that the astronauts were still adapting to space. This test also indicated that the crew did not awake more frequency than normal in space, despite complaints of insomnia. R.R.

A86-31223
CORRELATION OF CONSTANT FLOW RATE WITH FREQUENCY SPECTRUM OF RESPIRATORY SOUNDS WHEN MEASURED AT THE TRACHEA
C. S. LESSARD and W. C. WONG (Texas A&M University, College Station) IEEE Transactions on Biomedical Engineering (ISSN 0018-9294), vol. BME-33, April 1986, p. 461-463. refs
(Contract F33615-83-F-0602-001)

The relationship between the spectral composition of respiratory sounds and respiratory flow rates was studied in normal subjects during inspiration and expiration at six constant flow rates. Respiratory sounds were measured with an electronic stethoscope placed at the anterior cervical triangle, while the flow rates were measured by a pneumotachometer. From each sound spectrum, the variable parameters of the mean frequency of the power spectra (MPF), the frequency of the maximum power, and the highest frequency at which the power in the spectrum is at least 10 percent of maximum power, were calculated. The expiratory spectra had higher frequency values than the inspiratory spectra. Of all variable parameters, only the MPF values were seen to increase linearly with increasing flow rate, and that only to the flow rate of 0.75 liter/s. Above the rate of 0.75 liter/s, all spectral parameters appear to level off during both inspiration and expiration. I.S.

A86-32875
DISTURBANCES IN THE NIGHT SLEEP STRUCTURE AND ORGANIZATION AND THEIR SIGNIFICANCE IN THE ADAPTIVE-RECUPERATION PROCESSES
A. A. VARBANOVA and I. M. STOILOVA (B'lgarska Akademiia na Naukite, Tsentralna Laboratoriia za Izuchavane na Moz'ka, Sofia, Bulgaria) Bolgarskaia Akademiia Nauk, Doklady (ISSN 0366-8681), vol. 38, no. 12, 1985, p. 1721-1724. refs

Night sleep was recorded as part of an evaluation of the adaptive capacity of man exposed to prolonged hyperbaric influences. The results obtained for 22 individuals, placed for a continuous period of time (7-30 days) under conditions of an increased atmospheric pressure corresponding to depths of 200-450 m, indicate that a complex of hyberbaric factors significantly affects the structure and organization, but not the total duration, of night sleep. A considerable decrease in rapid eye movement (REM) sleep and a decrease in slow-wave sleep (stages 3 and 4) occurs, up to a total lack of the 4th stage. The percentage of superficial sleep (stages 1 and 2) rises, and the normal distribution of the stages during the night hours is disturbed, with a lack of well-formed cycles. The normal tendency towards a gradual deepening of the sleep and elongation of the REM periods which complete the sleep cycle are not evident. The REM stage, when present, is markedly broken up and frequently removed to the second half of sleep. C.D.

A86-33459
NEUROMAGNETISM - THEORY, TECHNIQUES, AND MEASUREMENTS
R. ILMONIEMI Espoo, Helsinki University of Technology, Doctor of Technology Thesis, 1985, 49 p. Research supported by the Academy of Finland, Emil Aaltonen Foundation, Cultural Foundation of Finland, and Instrumentarium Science Foundation. refs

The genesis, calculation, measurement, and interpretation of neutromagnetic fields are discussed. Electromagnetic fields of biological origin are addressed, including the cellular basis for EMF, the postsynaptic and action potentials, the forward problem, piecewise homogeneous and cylindrically symmetric conductors, the spherically symmetric head model. The neuromagnetic inverse problem is examined, including the current space, the lead field, the best estimate concept, minimum norm estimates, and the current dipole model. The SQUID magnetometer is discussed, and a collection of abstracts of publications in the field of neuromagnetism is presented. C.D.

N86-23227# Joint Publications Research Service, Arlington, Va.
DISCOVERY REGARDING ELECTRON REDISTRIBUTION AMONG CELL MEMBRANES Abstract Only
I. NOVODVORSKIY *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 12 8 Jan. 1986 Transl. into ENGLISH from Izvestiya (Moscow, USSR), 27 Sep. 1985 p 3
Avail: NTIS HC A06

The transfer of electrons between individual membranes inside a cell and between cells in an organ or tissue. The process of redistribution of electrons between membranes combines all membranes into a single coordinated system. These chemical reactions are delayed and inhibited in a number of illnesses which involve changes in cells and constitute practical application of this discovery since it will help in the diagnosis of serious illnesses. E.A.K.

N86-23229# Joint Publications Research Service, Arlington, Va.
PRODUCTION OF GAMMA- AND ALPHA-INTERFERON BY HUMAN BLOOD LEUKOCYTES UNDER SUCCESSIVE INDUCTION CONDITIONS
T. G. ORLOVA, L. V. ZHDANOVA, M. N. SOLOYEVA, and L. M. MENTKEVICH *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 22-24 8 Jan. 1986 refs Transl. into ENGLISH from Voprosy Virusologii (Moscow, USSR), no. 2, Mar. - Apr. 1985 p 196-198
Avail: NTIS HC A06

Alpha and Gamma Interferons are produced by different blood cells--by B lymphocytes and T lymphocytes. This predetermines the possibility for simultaneous or successive induction of the same blood leukocytes by inducers eliciting formation of these types of interferon. When inducers interacting with different producer cells are used in this way, the interferon tolerance phenomenon is avoided. Successive induction means a savings of leukocytes, because the same cells can be used to obtain two yields of interferons. Favorable results in research on production of human gamma - and alpha-interferons involving successive use of gamma interferon inducers--phytohemagglutinin (PGA) and staphylococcal enterotoxin (SEA), and an alpha-interferon inducer--Newcastle disease virus (NDV)--are presented. It is concluded that the double successive induction method of the same human peripheral blood leukocytes allows yields of interferon from gamma and alpha interferons. E.A.K.

N86-23230# Joint Publications Research Service, Arlington, Va.
FARM ANIMALS AS SOURCE OF YERSINIOSIS Abstract Only
Y. N. KOLOS, I. N. GIUTOV, G. V. YUSHCHENKO, and V. I. DUNAYEV *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 25-26 8 Jan. 1986 Transl. into ENGLISH from Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii (Moscow, USSR), no. 4, Apr. 1985 p 77-80
Avail: NTIS HC A06

The role of farm animals as sources of yersiniosis in humans and as possible carriers was studied. The linear agglutination

method was used to study the disease in cattle, sheep and goats, and swine. Samples from mucous membranes, blood and meat and excrement were analyzed. The clinical course of the disease was like that of dysentery. Study of 252 workers at a meat packing plant showed that as many as 42.5% had antibodies of strain 09, while 39.7% had antibodies of strain 03 and 24.6% had antibodies of strain 05B. Similarly, 42.9% of the workers at a pork processing plant had 03 antibodies, while lesser incidence of other strains was noted. At a milk plant, 30.9% showed antibodies of 05 and 26%, those of strain 08. It is suggested that the likely method of human infection from sheep and swine was by contact, while for cattle it was also alimentary. The Y enterocolitica is considered to be an occupational disease. E.A.K.

N86-23231# Joint Publications Research Service, Arlington, Va.
TEST OF ERYTHROCYTE ANTIGEN DIAGNOSTIC AGENT FOR DETECTING ANTIBODIES TO COXIELLA BURNETTI Abstract Only
N. K. TOKAREVICH, S. SHRAMEK, and G. A. BAYAR *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 26 8 Jan. 1986 Transl. into ENGLISH from Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii (Moscow, USSR), no. 4, Apr. 1985 p 51-55
Avail: NTIS HC A06

The development of a diagnostic procedure and its testing on laboratory models, naturally infected humans and domestic animals is reported. Procedures include determination of the optimum sensitizing dose of lipopolysaccharides (LPS) and preparation of various test and control compounds, and analysis of the retarding effect of passive hemagglutination with a homologous antibody. Negative findings are reported for the serum of laboratory animals not infected with C. burnetti, and there are no false positive results with unsensitized LPS erthrocytes of sheep and data of passive hemagglutination reaction tests with the homologous pathogen. It is indicated that time of detection, titers and the duration of antibody circulation determined by various tests differ markedly. Combined use of complement fixation and passive hemagglutination tests increases the effectiveness of serological detection of Q-fever ricketsiosis, and helps n predicting the course of such infections. E.A.K.

N86-23232# Joint Publications Research Service, Arlington, Va.
DETECTION OF HBSAG IN FAMILIES OF CHILDREN WITH VIRAL HEPATITIS B Abstract Only
A. R. REYZIS, A. N. DRONDINA, A. A. ASRATYAN, M. Y. IVANOVA, and L. K. KOZHEVNIKOVA *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 27 8 Jan. 1986 Transl. into ENGLISH from Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii (Moscow, USSR), no. 4, Apr. 1985 p 48-51
Avail: NTIS HC A06

The incidence of viral hepatitis (VHB) iin a families of children with confirmed cases of the disease is reported. Over a period of 3 years 142 mothers, 81 fathers and 7 relatives of 162 sick children were studied. Control groups included 39 members of 30 children with HBs-negative VH. Serum studies and countercurrent electrophoresis, precipitation and modifications, and passive hemagglutination reaction tests were conducted. The presence of HBsAg was confirmed in 6.9% of the relatives of children with clinically and laboratory confirmed VHB. A lesser number of medical parental involvement was found in HBsAg-positive parents, which suggested domestic infection of the children by chronic carriers of VHB to be a common phenomenon. Use of passive hemagglutination and countercurrent electrophoresis increased the frequency of detection by a factor of 2.4. E.A.K.

N86-23233# Joint Publications Research Service, Arlington, Va.
HBEAG AND ITS ANTIBODIES IN CARRIERS OF HSSAG IN VARIOUS REGIONS OF USSR Abstract Only
M. I. MIKHAYLOV, S. A. ARAKELOV, T. Y. VOROZHBIYEVA, S. V. ZHAVORONOK, S. V. ZUBOV, A. Y. KOZHUKHAR, G. N. KHORVAT, and V. A. ANANYEV *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 27-28 8 Jan. 1986 Transl. into ENGLISH from Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii (Moscow, USSR), no. 7, Jul. 1985 p 71-74
Avail: NTIS HC A06

The surface antigen of hepatitus B (HBsAg), was studied in healthy carriers in regions showing various levels of incidence of the disease. Serum of 13,150 donors from the cities of Gorkiy, Vitebsk, Kishinev and Tashkent was studied by precipitation in gel and passive hemagglutination using a diagnostic approach. The HBeAg e-antigen and anti-HBe were determined and data indicate that regions with high incidence of HBsAg also have higher appearance of concentrations of the antigen which could be identified with gel precipitation procedures. The frequency of HBsAg appearance among carriers of the disease antigen is in direct relationship to the level of antigen incidence in a given region, while an inverse relationship is noted for HBeAg. While the level of HBsAg in Gorkiy, Kishinev and Tashkent is 1.4%, 5.0% and 9.0%, respectively, the corresponding figures for HBeAg are 5.5%, 12.3% and 13.3%. E.A.K.

N86-23234# Joint Publications Research Service, Arlington, Va.
SOME CHARACTERISTICS OF EPIZOOTIC PROCESS IN HEMORRHAGIC FEVER WITH RENAL SYNDROME Abstract Only
V. N. BASHKIRTSEV, Y. V. RYLTSEVA, Y. A. TKACHENKO, and A. G. STEPANENKO *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-022) p 30 8 Jan. 1986 Transl. into ENGLISH from Voprosy Virusologii (Moscow, USSR), no. 4, Jul. - Aug. 1985 p 463-468
Avail: NTIS HC A06

Wild rodents caught on natural foci of hemorrhagic fever with renal syndrome (HFRS) in Ufa were analyzed for the presence of specific antigen of HFRS virus, for antibodies to this pathogenic agent and for native HFRS virus. A specific relationship was shown between the infection rate of bank voles with HFRS virus and the levels of circulating antigen and antibody to this virus. The immunity of test animals differed with age, older animals had higher immunity while, the younger animals showed more frequent presence of live virus. When selecting various age groups for isolation of viruses, the younger ones should be taken which have not manifested antibodies to the HFRS virus. E.A.K.

N86-23235# Joint Publications Research Service, Arlington, Va.
AIDS-FREE USSR MONITORING POTENTIAL OUTBREAK THERE Abstract Only
In its USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 32 8 Jan. 1986 refs Transl. into ENGLISH from TRUD (Moscow, USSR), 6 Oct. 1985 p 4
Avail: NTIS HC A06

Clinical factors about the nature of the acquired immune deficiency syndrome (AIDS) and information on its incidence in the USA and on efforts of medical researchers to find a way of fighting it are reported. World health organization data about AIDS and its incidence around the world, and what is known about the virus are summarized. It is stated, that no cases AIDS have been recorded in the USSR. It is assumed that the problem is largely a social one, which is associated with sexual licentiousness, which is tolerated in certain circles in the West, but contrary to the nature of Soviet society. Soviet scientists are studying all aspects of the new diease. Taking part in the general struggle of the medical profession against this exceptionally serious ailment, the Soviet scientists are ready to cooperate with specialists from other countries. E.A.K.

N86-23236# Joint Publications Research Service, Arlington, Va.
ANTIBIOTIC PROPERTIES OF BIFIDOBACTERIA Abstract Only
M. B. SUNDUKOVA, V. F. SEMENIKHINA, V. I. GANINA, V. V. POSPELOVA, N. G. RAKHIMOVA, and M. P. KHALENEVA *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 33 8 Jan. 1986 Transl. into ENGLISH from Molochnaya Promyshlennost (Moscow, USSR), no. 8, Aug. 1985 p 36-38
Avail: NTIS HC A06

The spectrum of antibiotic activity of Bifidobacterium adolescentis MS-42, isolated from the GI-tract of a nursing infant was tested to determine the potential use of this bifidobacterium in the production of dairy products. Growth inhibition studies on Petri dishes showed that B. adolescentis MS-2 yielded inhibitation zones of 26 to 28 mm on streak plates with Shigella flexneri, Sh. sonnei. Straphylococcus aureus 209-p, Proteus vulgaris, and Proteus mirabilis. The antibiotic effects were confirmed with tube-dilution studies, which also encompassed Escherichia coli. In general, B. adolescentis was shown to exhibit greater antibiotic activity than B. bifidum, which is commonly used for enrichment of various darily products. Dietetic and therapeutic darily products were devsed which contain B. adolescentis MS-2. E.A.K.

N86-23238# Joint Publications Research Service, Arlington, Va.
ARTIFICIAL VACCINES AND STIMULATION OF IMMUNITY
V. SAMOILOVA *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 36-37 8 Jan. 1986 Repr. from Moscow News (Moscow, USSR), no. 33, 25 Aug. 1 Sep. 1985 p 10
Avail: NTIS HC A06

The creation of artificial vaccines and the possibility to produce an effective vaccine against any disease is discussed. Substances which could stimulate the organism's protective system, bypassing the gene patrol were examined. Such substances were found in some unsuitable polymeric molecules--polyelectrolytes. It is demonstrated that antigen-carrying polymer molecules include only those lymphocytes which can produce antibodies against the alien substance planted on the carrier. The new vaccines for preventing typhus in mice were tested. New vaccine injection into animals made it possible to save all of them from the disease. The dose of th eantigen was from 50 to 100 times less than in the usual vaccine. The virus has three main antigens two of them are proteins positioned on the surface of the virus particle, while the third is hidden int he membrane of the virus. The antigen planted on the polymeric molecule, ensures a strong generation of antibodies and protects the animals after they are infected with the virus.
E.A.K.

N86-23239# Joint Publications Research Service, Arlington, Va.
ARTIFICIAL ANTIGENS, VACCINES REVIEWED
V. V. POKROVSKIY *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 38-41 8 Jan. 1986 refs Transl. into ENGLISH from Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii (Moscow, USSR), no. 7, Jul. 1985 p 106-111
Avail: NTIS HC A06

The chemical synthesis of molecular structures with the desired immunobiological characteristics of antigens to agents of infectious diseases in humans and animals is a new direction in constructing vaccine preparations and bacterial viral diagnostics. The artificial antigens which have a direct relationship to the agents of infectious diseases are examined. The artificial antigens the determinants are arranged in the form of offshoots from a polyacrylamide chain and these antigens possess the serological and immunoenic activity of he prototypes. The serological activity of the artificial antigen in a number of reactions is higher than the natural analog. The serological activity of artificial antigens was strictly group-specific. The unique properties of completely artificial antigens were used in creating highly specific diagnostic systems for immunoenzyme analysis. The artificial antigens activate specific immunity without using adjuvant and protective activity which keeps animals from becoming infected with virulent strains of salmonella. E.A.K.

N86-23240# Joint Publications Research Service, Arlington, Va.
OBTAINING HYBRIDOMAS THAT SYNTHESIZE MONOCLONAL ANTIBODIES TO POLYSACCHARIDE OF GROUP A STREPTOCOCCUS Abstract Only
Y. Y. PYTYEVA and E. I. DROBYSHEVSKAYA *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 42 8 Jan. 1986 Transl. into ENGLISH from Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii (Moscow, USSR), no. 7, Jul. 1985 p 35-39
Avail: NTIS HC A06

Production of monoclone antibodies (MCA) for A-polysaccharides for A-polysaccharides (A-PS) using group A streptocuccus as the immune agent, and treating the resulting culture with pepsin is reported. Details of cell line identification, screening and storage of clones and production of ascites are summarized. Mice subsequently immunized with the compounds had the lowest titers for A-PS and for the vaccine with lower doses, and the highest with doses of 50 mcg/mouse. Analysis of experiments on determining optimum conditions for forming hybrids of spleen and myeloma cells mice. Screening was done with pepsin created vaccines of group A streptococcus and A-PS. It is shown that three of the monoclonal antibodies have ecipitation properties. Hybrid formation depends on the presence of immune splenocytes, rather than on ratios of myeloma cells and lymphocytes. The hight yield of hybrids came with growth of cells in 80 to 100% of alveoli. E.A.K.

N86-23241# Joint Publications Research Service, Arlington, Va.
FAB-FRAGMENT OF HETEROLOGIC IMMUNOGLOBULIN FOR FLU PROPHYLAXIS AND TREATMENT Abstract Only
V. I. DEGTYARENKO, V. F. ZEVAKOV, I. M. MAKSIMENKO, and V. A. DIVOCHA *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-022) p 43 8 Jan. 1986 Transl. into ENGLISH from Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii (Moscow, USSR), no. 4, Apr. 1984 p 114-115
Avail: NTIS HC A06

Enzyme breakdown of heterologic immunoglobulin, particularly the bivalent Fab-fragment of antibodies, were studied for prophylactic and treatment effects. A Rivanol-alcohol method was used to separate the antiinfluenza immunoglobulin. After immunication, hyperimmune antiinfluenza serum was obtained from calves and subjected to enzyme hydrolysis. The effectiveness in neutralizing viruses was assessed. It is indicated that fundamentally new preparations should be studied for serum prophylaxis and serotherapy based on the Fab-fragment. E.A.K.

N86-23242# Joint Publications Research Service, Arlington, Va.
DESCRIPTION OF PREPARATION OF CAPSULAR ANTIGEN ISOLATED FROM YERSINIA PESTIS STRAIN EV Abstract Only
V. I. VEYNBLAT, M. M. TITENKO, M. S. VERENKOV, P. I. MENSHOV, A. V. KORMILITSYN, O. T. MOZHAROV, A. A. SHCHERBAKOV, A. S. VASENIN, and S. Y. ZADUMINA *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences 8 Jan. 1986 Transl. into ENGLISH from Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii (Moscow, USSR), no. 4, Apr. 1985 p 19-23
Avail: NTIS HC A06

The capsule antigen (FI) plays an important role in the virulence of Y. pestis and is a leading component of antiplague vaccine. The antigen obtained under mild conditions from hydrolysates of animal protein cultivated at 37C for 38 to 46 hours described. The bacterial mass was separated, distilled and dialysed to obtain test materials for passive hemagglutination. Amino acids, sugars, proteins, nucleic acids, polysaccharides and nitrogen were measured, along with the immunochemical activity of FI in comparison to other antiserums. It is indicated that the physicochemical and immunochemical homogeneity and activity of the preparation, along with viscosity, molecular weight, sedimentation and the isoelectric point, are distinct from those of previously known FIA and FIB capsule antigens. The capsule antigen is pure protein and not a glucoproteide. EAK

N86-23243# Joint Publications Research Service, Arlington, Va.
STUDY OF CELL-WALL ANTIGEN DETERMINANTS IN RIBOSOMAL PREPARATIONS OF GROUP A STREPTOCOCCUS Abstract Only
A. R. SHIKHMAN, L. V. NIKOLAYEV, O. A. KONDRAKOVA, B. B. DZANTIYEV, Y. I. BLINNIKOVA, N. F. DMITRIYEVA, Y. P. SAVELYEV, and G. I. PETROV *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences 8 Jan. 1986 Transl. into ENGLISH from Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii (Moscow, USSR), no. 4, Apr. 1985 p 15-19
Avail: NTIS HC A06

Ribosomal vaccines offer maximum immunity and minimum secondary reactions. Group A29, M-type, streptococcus ribosomes collected in of antibodies to M-protein, lipoteichoic acid and A-polysaccharides was studied. Double immunodiffusion by the Ouchterlony method were included that immunization of animals with ribosomes of group A29, M-type streptococcus caused development of antibodies to A-polysaccharides and lipoteichoic acid. E.A.K.

N86-23244# Joint Publications Research Service, Arlington, Va.
HYPOXIA PROPHYLAXIS AGAINST RADIATION INJURY
Y. SAMOILOV *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 48-50 8 Jan. 1986 Repr. from Moscow News (Moscow, USSR), no. 32, 18-25 Aug. 1985 p 10
Avail: NTIS HC A06

A method which enables patients to breathe mountainous air was developed. The method also reduces side effects resulting from radiotherapy treatment of malignant tumors. Method for the protection from ionizing radiation was developed. Air similar to that found at the mountain altitudes of 5.3 to 5.5 thousand meters above the sea level is pumped in through a face mask. Its oxygen content is twice as low as that of normal air on the plain. The effectiveness of oxygen-poor air is outlined. The reduction of oxygen content is considered to be a universal way to increase the adaptability potential of the organism, and its survivability under extreme conditions. E.A.K.

N86-23245# Joint Publications Research Service, Arlington, Va.
MANY MEDICAL USES FORESEEN FOR ARTIFICIAL SKIN
A. POMINOV *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences 8 Jan. 1986 Transl. into ENGLISH from Trud (Moscow, USSR), 25 Sep. 1985 p 4
Avail: NTIS HC A06

An artificial biological skin was developed. In 5 to 7 days the skin took, and no scars remained. Skin covering the burn was clear and normal, exhibiting only a color difference at first. The artificial skin is a mixture of two liquids a turbid yellow solution and a crystalline coligen, the main protein in connective tissue. The living water is used for burns, serious injuries, cuts, and scratches. E.A.K.

N86-23250# Joint Publications Research Service, Arlington, Va.
ASSESSMENT OF SELECTED PHYSIOLOGICAL INDICATORS IN ANTENNA OPERATORS AT SHORT-WAVE TRANSMITTING AND RECEIVING CENTERS
L. V. POKHODZEY *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 67-68 8 Jan. 1986 Transl. into ENGLISH from Gigiyena Truda i Professionalnyye Zabolevaniya (Moscow, USSR), no. 7, Jul. 1985 p 36-39
Avail: NTIS HC A06

The effects of electromagnetic emission on personnel servicing antenna feeder systems at short-wave transmitting and receiving stations were assessed. The workers in question were employed at low intermediate, and high wattage stations. No general or long-lasting effects were found on psychological and most physiological parameters, with the different levels of exposure generating a pattern of similar changes which differed somewhat in intensity. Deviations from normal noted, however subsided by the intensity. Deviations from normal noted, however subsided by the end of a working day. The visual analyzer noted functional lability at the end of a day, particularly in workers exposed to the higher intensity fields. Moderate hypotension persisted in workers exposed to moderate and high intensity fields. In all groups hand strength diminished by 18.6 to 25.4% at the end of a working week while the level of reduction in a control--unexposed--group was 10%. Determination of safe levels of electromagnetic exposure requires djustment of radiation intensity. E.A.K.

N86-23251# Joint Publications Research Service, Arlington, Va.
STATUS OF CALCIUM METABOLISM IN COAL MINERS WITH VIBRATION SICKNESS Abstract Only
V. V. KOLOMIYETS *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 75-76 8 Jan. 1986 Transl. into ENGLISH from Gigiyena Truda i Professionalnyye Zabolevaniya (Moscow, USSR), no. 9, Sep. 1985 p 13-16
Avail: NTIS HC A06

The status of calcium metabolism in coal miners with various degree of vibration sickness was with data from 32 healthy control males. Total and ionized serum calcium levels were significantly elevated in 94 coal miners with vibration sickness, the degree of elevation show a direct correlation with the clinical severity of the illness. The data show that renal calcium clearance and the calcium binding capacity of the serum in the patient group is diminished in comparison with the control subjects. Urine calcium levels did not show any statistical differences between these two gropus. It is indicated that vibration sickness is accompanied by a profound alteration in calcium homestasis, due in large to enhanced calcium resorption in the kidneys. E.A.K.

N86-23256# Joint Publications Research Service, Arlington, Va.
VACCINE PROTEINS R AND D ON SALYUT-7 Abstract Only
T. CHESANOVA *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 107 8 Jan. 1986 Transl. into ENGLISH from Leningradskaya Pravda (Leningrad, USSR), 13 Oct. 1985 p 2
Avail: NTIS HC A06

Experiments performed on Salyut orbiting stations were aimed, at obtaining extrapure hemagglutinin and other surfae proteins of the influenza virus, using the electrophoresis method. The space experiments demonstrated that such products can be obtained in conditions of zero gravity. A new-generation electrophoretic unit the EFU-Robot is used on the Salyut-7 station. The EFU-Robot can be programmed to select samples of substances purified in the course of experiments and automatically transfer the samples from the unit's working chamber to ampules, by syringes. E.A.K.

N86-23259# Joint Publications Research Service, Arlington, Va.
ESTIMATE OF EMOTIONAL STRESS DURING WORKING ACTIVITY BASED ON SYSTEMS ANALYSIS OF SKIN-GALVANIC REACTION Abstract Only
G. K. RAKOV and Y. A. FADEYEV *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-004) p 101 12 Mar. 1986 Transl. into ENGLISH from Fiziologiya Cheloveka (Moscow, USSR), v. 11, no. 3, May - Jun. 1985 p 463-469
Avail: NTIS HC A07/MF A01

Emotional factors of labor and the nature of their relationship to emotional reactions of female electronics-industry workers during assembly and subsequent testing of the electronic-optical system of color kinescopes. Twenty healthy female workers 18 to 40 years of age were determined were studied during assembly of electronic equipment. Significant differences were found between three working stages: (1) pressing in of subassemblies; (2) testing of the capacitance of electron guns; and (3) attachment of cathods holders. It was found that the skin-galvanic reaction is an adequate indicator of emotional stress during working activity. Systems analysis of operations or pressing in assemblies in correlation with development of skin-galvanic responses revealed emotiogenic stages of activity. E.A.K.

N86-23260# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF COMPLEXITY OF CONTROL TASK ON LEVEL OF ACTIVATION OF OPERATORS PHYSIOLOGICAL FUNCTIONS WHEN WORKING WITH WAITING Abstract Only
M. A. GRITSEVSKIY and Z. I. ZAYTSEVA *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-004) p 102 12 Mar. 1986 Transl. into ENGLISH from Fiziologiya Cheloveka (Moscow, USSR), v. 11, no. 3, May - Jun. 1985 p 504-510
Avail: NTIS HC A07/MF A01

Experiments were conducted to answer two questions: (1) do model experiments reveal differences in the functional status in comparing operator's work with various degrees of complexity; and (2) are these changes similar in nature to those manifestations of differing intensity discovered under production conditions. Programs with various specific shares of single and multiple movement control tasks were used to model operators work of varying degrees of complexity. During the experiments, reaction time, EEG, skin-galanic reaction and pulse rate were continually recorded. Differences in bioenergetic activity of the cerebral cortex and differences in autonomic activity and regulations were observed. It is indicated that waiting for signals requiring complex processing is accompanied by higher mobilization of preparedness of the operator. Decreased attention level was observed at the beginning of the day and toward the end of long days. E.A.K.

N86-23263# Joint Publications Research Service, Arlington, Va.
METHOD OF CHANGES IN REVERSIBLE PATTERN MASKING AS FACTOR IN VISUAL PERCEPTION Abstract Only
V. M. KROL and Y. I. BONDAR *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-004) p 122 12 Mar. 1986 Transl. into ENGLISH from Voprosy Psikhologii (Moscow, USSR), no. 3, May - Jun. 1985 p 162-164
Avail: NTIS HC A07/MFen1] A01

Temporal characteristics of form perception were analyzed in relation to masking patterns. It is demonstrated that different masks exert different effects on various stages of perception. Three stages were identified in form perception using stimuli consisting of alternating bands and lines arranged in horizontal patterns, and masking patterns consisting either of random curvilinear lines alone or supplemented with solid, short, bands. The different masking patterns exerted different effects (prolongation) on the threshold times for amorphous perception, approximate classification of test pattern, and on object identification. It is demonstrated that different masking patterns significantly affect different stages of form perception, and can be utilized in the analysis of the latter.
E.A.K.

N86-23265* National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY: A CUMULATIVE INDEX TO THE 1985 ISSUES
Jan. 1986 291 p
(NASA-SP-7011(280); NAS 1.21:70011(280)) Avail: NTIS HC A13 CSCL 06E

This publication is a cumulative index to the abstracts contained in the Supplements 268 through 279 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

N86-23266 California Univ., Berkeley.
HUMAN HEAD/NECK/UPPER-TORSO MODEL RESPONSE TO DYNAMIC LOADING Ph.D. Thesis
Y. C. DENG 1985 282 p
Avail: Univ. Microfilms Order No. DA8524927

A human head/neck/upper-torso replica was constructed and instrumented to study its reponse to impact and dynamic loading. The model consists of a water-filled cadaver skull; plastic vertebrae, sternum and ribs; silicon rubber disks and ligaments; and fabric muscles. The static behavior of the system under sagittal plane and lateral loading was adjusted so as to correspond to that of cadaver behavior under similar loading. The tests conducted involved impulsive loading to the torso generated by means of a sled and track system and by direct head impact with a suspended steel ball. A three-dimensional lumped-parameter model of the human head/neck/upper-torso was developed in order to predict its motion for any specified initial conditions that could also be used to compare with other investigators' results. The simulation results indicate favorable comparison with the human volunteer test data for both flexion and lateral whiplash. However, the physical structure appeared to be more flexible than the numerical model.
Dissert. Abstr.

N86-23267 National Physical Lab., Teddington (England). Div. of Radiation Science and Acoustics.
A SURVEY OF SPEECH AUDIOMETRY IN THE NATIONAL HEALTH SERVICE
H. C. FULLER and I. K. MOSS Aug. 1985 52 p refs
(NPL-AC-105; ISSN-0143-7143) Avail: Issuing Activity

Nine clinics in the UK National Health Service (NHS) were visited to discuss with the audiologists the technique of speech audiometry and to observe how the tests were conducted. The information gained was used to construct a questionnaire which was then circulated to NHS hearing aid clinics throughout the UK. Topics covered included the frequency of use of speech audiometry, word lists, recordings, equipment and test procedures, criticisms of test material, and limitations on the use of speech audiometry. Author (ESA)

N86-23268# British Aerospace Aircraft Group, Bristol (England). Human Factors Dept.
THE BAE D TARGET ACQUISITION MODEL ORACLE: AN OVERVIEW, 1984
J. L. HINTON Feb. 1984 30 p refs
(BAE-JS-10009; BR94986) Avail: Issuing Activity

The concepts used in the ORACLE model of human visual performance, and in system models that may be used with it are outlined. The state of the model is described, including the modeling of human visual performance and treatment of visual aids. Model uses are summarized. Author (ESA)

N86-23269# Sloan-Kettering Inst. for Cancer Research, New York.
BIOMEDICAL RESEARCH WITH CYCLOTRON PRODUCED RADIONUCLIDES Progress Report, 1 Aug. 1984 - 31 Jul. 1985
J. S. LAUGHLIN 31 Aug. 1985 62 p refs
(Contract DE-AC02-77EV-04268)
(DE86-000327; DOE/EV-04268/T4) Avail: NTIS HC A04/MF A01

Nine interrelated studies are reported on experimental and clinical uses of nitrogen-13 or carbon-11. Chemical and enzymatical methods are provided for the production of labelled amino acids. Comparative distribution studies of N-13 ammonia, glutamine, (ALPHA)-aminobutyric acid, methionine, valine, leucine, and glutamate after retro-orbital injection have been completed. The data show most of the label (% dose/organ) going to liver and muscle regardless of the injected agent. DOE

N86-23270# Oak Ridge National Lab., Tenn.
RADIATION INDUCTION OF CANCER OF THE SKIN
R. J. M. FRY, J. B. STORER, and F. J. BURNS 1985 13 p refs Presented at the Workshop on Radiation Damage To Skin: Fundamental and Practical Aspects, Paris, France, 9 Oct. 1985 Prepared in cooperation with New York Univ., N.Y.
(Contract DE-AC05-84OR-21400)
(DE86-002201; CONF-851065-1) Avail: NTIS HC A02/MF A01

The induction of epidermal tumors was studied using exposures to 25 kV X-rays with or without subsequent exposures to 12-0-tetradeconyl phorbol-13 acetate (TPA) or ultraviolet radiation (UVR) 280 to 400 nm. Fractionation regimens and total exposure up to 4000R produced no squamous cell carcinomas. When these regimes were followed by TPA an incidence of about 80% was obtained, and incidence of 60% when UVR exposures followed the x-irradiation. A dose-dependent increase in fibrosarcomas was

found when x-irradiation was followed by 24 weeks of topical treatment with TPA. These results support the contention that UVR can enhance the expression of cells initiated by X-rays. The experimental evidence is compared with the data from the tinea capitis patients treated with X-rays. In C3HF/He male mice exposed to 50, 100, 150 and 200 rads (137)Cs gamma rays the induction rate for fibrosarcomas was 2.9 x 10(-4) per cGy/per mouse. This result compares with 2.5 x 10(-6) transformations per surviving cell per cGy with 10T1/2 cells that are fibroblasts derived from C3H mice. DOE

N86-23271# Oak Ridge National Lab., Tenn.
PRODUCTION AND CHARACTERIZATION OF ANTIBODIES TO BENZO(A)PYRENE
G. D. GRIFFIN, K. R. AMBROSE, R. N. THOMASON, C. M. MURCHISON, M. MCMANIS, P. G. R. ST.WECKER, and T. VO-DINH 1985 13 p refs Presented at the 10th International Symposium on Polynuclear Aromatic Hydrocarbons, Columbus, Ohio, 21 Oct. 1985 Prepared in cooperation with Tennessee Univ., Knoxville, Tenn.
(Contract DE-AC05-84OR-21400)
(DE86-002204; CONF-851068-3) Avail: NTIS HC A02/MF A01
This report describes the preparation of antibodies to benzopyrene labelled bovine serum albumin. DOE

N86-23272# Food and Drug Administration, Rockville, Md. Center for Devices and Radiological Health.
MEASUREMENT TECHNIQUES FOR USE WITH TECHNIQUE/EXPOSURE GUIDES Final Report
E. F. MANNY and R. L. BURKHARDT Aug. 1985 30 p
(PB86-123718; HHS/PUB/FDA-85-8248; FDA/CDRH-86/7)
Avail: NTIS HC A03/MF A01 CSCL 06E
The Center for devices and Radiological Health recommends that diagnostic radiology facilities evaluate the radiation exposure received by their patients. The technical factors which must be considered in instituting a radiation exposure measurement program as a basis for this evaluation are discussed. Center radiation exposure measurement methods are described. GRA

N86-23273# Food and Drug Administration, Rockville, Md. Center for Devices and Radiological Health.
EVALUATION OF RADIATION EXPOSURE FROM DIAGNOSTIC RADIOLOGY EXAMINATIONS: GENERAL RECOMMENDATIONS Final Report
Aug. 1985 10 p refs
(PB86-125903; HHS/PUB/FDA-85-8246; FDA/CDRH-86/5)
Avail: NTIS HC A02/MF A01 CSCL 06E
Optimization of the medical radiation the public receives by minimizing unnecessary radiation exposure and improving the diagnostic benefit from the necessary exposure is discussed. Steps toward this goal include a performance standard for the manufacture and installation of X-ray equipment, quality assurance guidance for the maintenance of the equipment, training in the proper use of the equipment, and selection criteria for X-ray examinations. Recommendations are listed that introduce an additional basic step. GRA

N86-23274# Food and Drug Administration, Rockville, Md. Center for Devices and Radiological Health.
EVALUATION OF RADIATION EXPOSURE FROM DIAGNOSTIC RADIOLOGY EXAMINATIONS: TECHNIQUE/EXPOSURE GUIDES FOR THE CRANIOCAUDAL PROJECTION IN MAMMOGRAPHY Final Report
Aug. 1985 10 p refs
(PB86-126075; DHHS/PUB/FDA-85-8244; FDA/CDRH-86/4)
Avail: NTIS HC A02/MF A01 CSCL 06E
Suggestions for appropriate Technique/Exposure guides for use with the mammographic craniocaudal projection are presented. This type of projection is the most commonly used mammographic view and much exposure data is available for it. Problems affecting radiation exposure and image quality with one projection often are problems affecting all projections conducted with a particular X-ray imaging systems. The use of T/E guides to detect and correct the problems with the craniocaudal projection will have a beneficial effect on exposure levels and image quality of other projections conducted on the same system. GRA

N86-23275# Food and Drug Administration, Rockville, Md. Center for Devices and Radiological Health.
BEHAVIORAL EFFECTS OF MICROWAVE RADIATION ABSORPTION Final Report
J. C. MONAHAN and J. A. DANDREA Aug. 1985 173 p refs Prepared in cooperation with Utah Univ., Salt Lake City
(PB86-113735; HHS/PUB/FDA-85-8238; FDA/CDRH-85/72)
Avail: NTIS HC A08/MF A01 CSCL 06R
The need for an understanding of the biological effects induced by exposure to microwave radiation has increased in recent years because of increased usage and applications and also concerns about potential adverse health effects. Although many research studies have been conducted to examine the question of biological effects, the information is scattered in many diverse sources. This publication brings together in a single source the major research findings related to the behavioral consequences of microwave exposure. In addition it attempts to provide a critical assessment of this information and to provide a perspective upon which the reader can interpret the findings. This publication begins with a review of behavioral-microwave research in the Soviet Union and then proceeds to examine the work of researchers in the Western countries. Both learned and unlearned behaviors are examined in the context of microwave induced effects. GRA

N86-23276# Health Effects Research Lab., Research Triangle Park, N. C.
SYSTEM FOR MEASUREMENT OF SMALL VIBRATIONS AT MATERIAL INTERFACES INDUCED BY ELECTROSTRICTIVE FORCES
J. S. ALI and W. T. JOINES Oct. 1985 157 p refs
(PB86-116530; EPA-600/1-85-021) Avail: NTIS HC A08/MF A01 CSCL 06B
The mechanisms of interaction of ELF and ELF-modulated RF fields with biological systems is presently an active area of research. Some models propose that field-induced forces may influence certain observed biological effects such as RF hearing and calcium ion efflux. To investigate the validity of the field-induced force model for the calcium-ion efflux effect, a system is needed which is capable of exposing samples to ELF fields or to ELF-modulated RF fields. At the same time the induced vibration caused by the forces of electrostriction must be monitored preferably by a non-contacting method. A microwave phase-sensitive receiver was designed to sense the small vibrations. Limitations on the receiver sensitivity imposed by phase noise is discussed. Phase noise measurement systems were designed and used to charactrize the key receiver components. A limiting amplifier in the IF section of the receiver eliminates the need for knowledge of the reflection coefficient of the object of interest for quantitative vibration measurements. GRA

N86-23277# Johns Hopkins Univ., Laurel, Md. Applied Physics Lab.
HUMAN REACTIONS TO TRANSIENT ELECTRIC CURRENTS Final Report
J. P. REILLY and W. D. LARKIN Jun. 1985 172 p Sponsored in part by the Maryland Dept. of Natural Resources, Annapolis and the Canadian Electrical Association, Montreal, Quebec
(PB86-117280; PPSP/JHU/PPSE-T-34) Avail: NTIS HC A08/MF A01 CSCL 06P
Research carried out at the Johns Hopkins University Applied Physics Laboratory on aspects of human sensitivity to transient electrical stimulation is described. High-voltage short-duration currents of the kinds that may be encountered near power substations, transmission lines, or industrial apparatus are emphasized. Human sensitivity is measured for a variety of stimulating conditions, both at the threshold of perception and above it, up to the tolerance limit. A neural excitation model is invoked to account for a wide array of sensory effects, and to serve as a framework for predicting effects not studied. Among

the factors studied are: voltage, capacitance; polarity, waveshape, and duration of the stimulating waveforms; ac versus dc stimulating; electrode approach velocity and contact force;l skin temperature; skin resistance; skin hydration; electrode contact area; and stimulated body location. GRA

N86-24192* National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 283)
Apr. 1986 69 p
(NASA-SP-7011(283); NAS 1.21:7011(283)) Avail: NTIS HC A04 CSCL 06E

This bibliography lists 184 reports, articles, and other documents introduced into the NASA scientific and technical information system in March 1986. Author

N86-24193 Institut fuer Flugmechanik, Brunswick (West Germany).
THE EFFECT OF HIGH FREQUENCY ELECTROMAGNETIC FIELDS ON HUMAN BEINGS (FREQUENCY RANGE BETWEEN 1 KHZ AND 1000 GHZ) [DIE WIRKUNG HOCHFREQUENTER ELEKTROMAGNETISCHER FELDER AUF DEN MENSCHEN (1KHZ UND 1000 GHZ)]
A. H. FRUCHT (Deutschen Zentralinstituts fuer Arbeitsmedizin, Berlin-Lichtenberg, West Germany), N. KRAUSE, G. NIMTZ (Technische Univ., Berlin), and H. SCHAEFER 1984 128 p refs In GERMAN
Avail: Issuing Activity

The biological effects of high frequency electromagnetic fields were investigated to provide information for industrial safety personnel. The high frequency radiation problem is described. Medicinal and technical applications of high frequency electromagnetic fields are presented. The interactions between high frequency electromagnetic waves and matter are explained. Health problems due to these fields are depicted. Diathermy as a source of danger is discussed. A case of death after extreme exposure to radar radiation is given. Tasks and possibilities for epidemiological research are presented. It is concluded that health damage due to high frequency electromagnetic fields do not occur as long as the known power thresholds are not exceeded.
Author (ESA)

N86-24194# Ohio State Univ., Columbus.
OPTICAL AND EVENT-DURATION VARIABLES AFFECTING SELF-MOTION PERCEPTION Interim Paper Jan. 1984 - Apr. 1985
D. H. OWEN Nov. 1985 198 p
(Contract F33615-83-K-0038)
(AD-A161836; AFHRL-TP-85-23) Avail: NTIS HC A09/MF A01 CSCL 01D

Four experiment sections are included in this paper. The first pair of experiments investigated the usefulness of optical flow acceleration in detecting descent. When sink rate and ground speed are constant, optical flow accelerates. Holding fractional loss in altitude constant throughout a descent event also holds flow rate invariant, eliminating flow acceleration as a potential source of information. Detection of descent was accomplished easily without flow acceleration, and it was found that at least one of the remaining functional optical variables specifying fractional loss in altitude must be highly salient. Also, the effect of optical texture density was optimal when linkages with other relevant variables were taken into account. The third experiment compared eyeheight and ground-unit size as metrics for global optical information specifying descent. Given that flow acceleration is not an essential source of information, the study focused on eyeheight-scaled change in optical display and ground-unit-scaled change in optical density as functional specifiers of fractional loss in altitude. The fourth experiment investigated the interation between global optical flow rate and duration of a constant-speed preview period. Of particular interest was the possibility that preview periods of different durations would differentially favor or interfere with sensitivity given particular optical conditions, e.g., different flow rates. GRA

N86-24195# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).
THE ENERGY COST OF COMBAT ENGINEER TASKS
W. S. MYLES and T. T. ROMET Aug. 1985 20 p
(AD-A161861; DCIEM-85-R-31) Avail: NTIS HC A02/MF A01 CSCL 06S

Canadian combat engineers performed abatis (blocking a road by falling trees), minelaying and road cratering for 8 hours each day on four consecutive days. Energy expenditure was estimated from heart rate continuously recorded using the VITALOG personal monitoring system (PMS-8). The average heart rates were below 120 bpm for all three combat engineer tasks indicating that, for these subjects, energy expenditure did not exceed 35 to 40% of their VO2max. Since abatis, minelaying and cratering are considered to be the most physically demanding tasks performed by combat engineers, it seems safe to conclude that the average energy expenditure for sustained operations will be at, or below, this level. This experiment also provided an opportunity to evaluate the PMS-8 as a means of collecting physiological data in a nonintrusive manner during military maneuvers. The system proved to be very robust, reliable and, because data collection is continuous, ideal for intermittent work of varying intensity. In addition, the PMS-8 appears to have considerable potential as a means of monitoring the effect of sleep deprivation and fatigue on the work/recovery cycle in sustained operations.
Author (GRA)

N86-24196# Federal Aviation Administration, Washington, D.C. Office of Aviation Medicine.
DRUGS OF ABUSE IN AVIATION FATALITIES. 1: MARIJUANA
D. J. LACEFIELD, P. A. ROBERTS, and P. M. GRAPE Aug. 1985 6 p
(AD-A161911; DOT/FAA/AM-85/8) Avail: NTIS HC A02/MF A01 CSCL 06O

Isopropyl alcohol swabs taken from the oral cavities of pilots killed in general aviation accidents were analyzed for marijuana by the modified Duquenois-Levine test. During the 2-year period from October 1982 through September 1984, 289 pilot fatalities (of 809 sampled for other toxicological reasons) were sampled for marijuana; a positive test indicated the recent use of marijuana. Six of the pilots' samples (2.1%) were positive. GRA

N86-24197# Army Research Inst. of Environmental Medicine, Natick, Mass.
ENVIRONMENTAL STRESS AFTER ATROPINE TREATMENT
M. A. KOLKA, L. A. STEPHENSON, and R. R. GONZALEZ Oct. 1985 23 p
(Contract DA PROJ. 3M2-63764-D-995)
(AD-A161923) Avail: NTIS HC A02/MF A01 CSCL 06O

Atropine administration resulted in higher skin temperatures in both sensible and insensible environments and a higher core temperature in the hot environment, due to the reduction in whole body sweating. The effect of heat storage (significantly higher after atropine) was shown to be greater in the hot environment due to inadequate sweat secretion for subsequent evaporative cooling. In the warm environment, enhanced skin blood flow resulted in more effective thermoregulation. The results suggest that exercise in the heat can be accomplished during environmental stress at warm temperatures after atropine treatment.
Author (GRA)

N86-24198# Army Research Inst. of Environmental Medicine, Natick, Mass.
RESPIRATORY RESPONSE AND MUSCLE FUNCTION DURING ISOMETRIC HANDGRIP EXERCISE AT HIGH ALTITUDE
R. L. BURSE, A. CYMERMAN, and A. J. YOUNG 15 Jul. 1985 33 p
(AD-A162003; USARIEM-M-2/86) Avail: NTIS HC A03/MF A01 CSCL 06S

The purpose of this investigation was to determine if the hyperventilatory response to fatiguing isometric exercise at sea level could predict resting ventiliation and acute mountain sickness

(AMS) at 4300 m altitude. Exercise consisted of four successive endurance handgrips held to complete fatigue at 40% of maximum isometric handgrip strength (MHS). There was no relationship between the magnitude or pattern of exercise-induced hyperventiliation 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 to 90 s into the recovery period, providing support for the central command theory of ventilatory control during isometric exercise. MHS was significantly increased at altitude, by 11% on day 2 and 16% on day 6. Endurance times to fatigue were reduced, but not always significantly so. GRA

N86-24199# Illinois Univ., Chicago. Chicago Circle Dept. of Bioengineering.

REMOTE SENSING OF BODY SIGNS AND SIGNATURES Final Report, 1 Aug. 1982 - 30 Sep. 1985

J. C. LIN and K. H. CHAN Oct. 1985 82 p

(Contract N00014-82-C-0659)

(AD-A162106; BES-5) Avail: NTIS HC A05/MF A01 CSCL 17I

This report describes the development of a microprocessor-based remote sensing system for noncontact detection of heart rate and respiration. Low power sinusoidal microwave signal at a frequency of 10.525 GHz is generated by a Gunn diode oscillator in an integrated Doppler transceiver. A standard gain horn is used to direct the microwave energy to the chest of a subject at a distance of a few centimeters. Since movements associated with the contraction of the heart and expansion of the lungs are translated into motions of the chest wall, the Doppler microwave reflected from the chest is processed to yield information on the frequency and regularity of these *cardiopulmonary events. The microprocessor-based* battery-powered system is designed to provide continuous operation for approximately one hour. It allows selection of heart rate or respiration to be displayed on a 3-digit LCD. An analog output jack is provided for oscilloscope display or chart recording. The design range of heart rates is from 40 to 200 beats per minute and that for respiration is from 3 to 30 breaths per minute. The signal acquisition times for heart rate and respiration determinations are 12 and 48 seconds. respectively. GRA

N86-24200# Illinois Univ., Urbana-Champaign. Inst. of Aviation.

ANTIEMETIC DRUGS AND PILOT PERFORMANCE Interim Report, Feb. 1983 - Feb. 1984

H. L. TAYLOR, J. A. DELLINGER, M. H. WELLER, B. C. RICHARDSON, and F. C. HYMAN Nov. 1985 44 p Prepared in cooperation with Michigan Univ., Ann Arbor

(Contract F33615-83-K-0612)

(AD-A162109; USAFSAM-TR-84-52) Avail: NTIS HC A03/MF A01 CSCL 06O

This study evaluated the effects on human performance of three antiemetic drugs. The effects on pilot performance in a flight simulator were determined using the commonly prescribed dosages, standardized for a 70 kg person, of thiethylperazine (10 mg), promethazine hydrochloride (25 mg) cimetidine (300 mg), and a placebo control. Two tasks, a two-dimensional tracking task which part of an instrument landing system (ILS) approach and the Sternberg choice reaction time task, were used to generate pilot performance data. A Latin square design was used to balance treatment order effects, and each subject received each treatment condition. Log root mean square (RMS) deviation values, computed from the simulator flight data (altitude straight and level, altitude turning, localizer (lateral) tracking, glideslope (vertical tracking) were used in a multivariate analysis of variance to test the main effects. An approximate F-test, based on Wilk's criterion, resulted in $F(12,87) = 2.47$, ($P0.0008$) for the treatment main effect (drug). Univariate analyses resulted in a significant drug main effect on two primary task variables--altitude straight and level and localizer tracking. Contrasts between the three antiemetic drugs and the placebo were used to test the hypothesis of no significant difference between treatment pairs. The contrasts between promethazine hydrochloride and the control were significant for altitude straight and level and for glideslope tracking. The other contrasts were not significant except for the control-thiethylperazine contrast for the localizer tracking variable. GRA

N86-24201# Federal Aviation Administration, Washington, D.C. Office of Aviation Medicine.

CHARACTERISTICS OF MEDICALLY DISQUALIFIED AIRMAN APPLICANTS IN CALENDAR YEARS 1982 AND 1983

S. J. DARK Sep. 1985 23 p

(AD-A162209; DOT/FAA/AM-85/9) Avail: NTIS HC A02/MF A01 CSCL 06E

This study presents comprehensive data reflecting pertinent denial rates with respect to the medical and general attributes of those airmen denied medical certification in calendar years 1982 and 1983. The study updates previously reported data with respect to medical certification denials. The denial data were obtained from computer files as of July 1, 1983, for calendar year (CY) 1982 applicants and July 1, 1984, for CY 1983 applicants. The data were summed for the 2 calendar years to provide a larger group for comparison with the December 31, 1982, active airman population, the midpoint population date for the denied applicant group. The annual denial rate based on the airman applicants is 6.2 per 1,000 airmen. By class of certificate applied for, the annual denial rate per 1,000 applicants is 3.3 for first class, 3.8 for second class, and 8.6 for third class. As anticipated, general aviation and new applicants contribute greatly to total denials. The most significant causes for denial (regardless of class applied for) are cardiovascular, the miscellaneous pathology category (endocrinopathies, disqualifying medications, and administrative denials), neuropsychiatric, and at a substantially lower level, eye pathology. The updated data on medically disqualified applicants are consistent with expectations and previous findings, with cardiovascular diseases still the number one cause for denial. GRA

N86-24202# Army Research Inst. of Environmental Medicine, Natick, Mass.

EFFECTS OF WEARING NBC (NUCLEAR, BIOLOGICAL AND CHEMICAL) PROTECTIVE CLOTHING IN THE HEAT ON DETECTION OF VISUAL SIGNALS

J. L. KOBRICK and L. A. SLEEPER Feb. 1985 26 p

(Contract DA PROJ. 3M1-61102-BS-10)

(AD-A162321; USARIEM-T7/85) Avail: NTIS HC A03/MF A01 CSCL 06P

Sensitivity for detection of visual signals distributed at various locations throughout the visual field was studied in 16 male subjects during degrees of ambient heat exposure (91F/61%RH; 70F/35%RH; 55F/35%RH), in combination with and without wearing of the Army NBC protective clothing system (MOPP-IV). Response time for signal detection increased systematically and significantly with peripheralization of stimulus locations, was most impaired in the superior and inferior visual field areas, and least affected along the horizontal axis area. The data support previous results obtained using this task. Both the heat and the heat+MOPP-IV exposure conditions produced highly significant systematic increases in response time to all signals; the worst performance occurred under the heat+MOPP-IV combination. Implications for visual performance while wearing chemical protective gear are discussed. GRA

N86-24203# Army Research Inst. of Environmental Medicine, Natick, Mass.

AN EVALUATION OF TESTS OF ANAEROBIC POWER

J. F. PATTON and A. DUGGAN Dec. 1985 22 p

(AD-A162826; USARIEM-M7/86) Avail: NTIS HC A02/MF A01 CSCL 06P

The objectives of this study were to examine the relationship between two laboratory tests of anaerobic power (AnP) and to compare these tests to field measures of AnP. Fifteen Soldiers, aged 20 to 34 yrs, performed: (1) a 30S maximal cycle ergometer test (Wingate test, WT); (2) a 60S isokinetic knee extension test (isokinetic endurance test, IET); (3) a 50m spring; (4) a 200m

sprint; and (5) the Margaria stairclimb test. Significant correlations ranging from 0.52 to 0.76 were found between the WT and IET for peak and mean values of power and torque, respectively. Indices from both these tests also correlated significantly with the field tests of AnP. The best single index was mean power from the WT which had correlations of -0.79, -0.82, and 0.74 with the 50m and 200m sprint times and the Margaria test, respectively. The data suggest that both the WT and IET represent valid laboratory tests for evaluating high-intensity short-term exercise in which the muscle is primarily dependent upon anaerobic processes for energy release. Author (GRA)

N86-24204# IIT Research Inst., Chicago, Ill.
EXTREMELY LOW FREQUENCY (ELF) COMMUNICATIONS SYSTEM BIO-EFFECTS LIBRARY DEVELOPMENT Final Technical Report, Mar. - Oct. 1985
M. M. ABROMAVAGE, J. J. ENGLISH, L. M. KUDIA, and M. S. MACINTYRE Oct. 1985 255 p
(Contract N00039-84-C-0070)
(AD-A162839; IITRI-E06549-21) Avail: NTIS HC A12/MF A01 CSCL 06C

The professional literature published and available since August 1984 on the biological, ecological and health effects from exposure to Extremely Low Frequency (ELF) electromagnetic fields is compiled alphabetically by principal author. Each of the 485 citations is categorized according to electromagnetic field characteristics. Key biological and engineering terms are provided, and species of interest are identified. Author (GRA)

N86-24205# IIT Research Inst., Chicago, Ill.
ELF (EXTREMELY LOW FREQUENCY) BIOLOGICAL EFFECTS LITERATURE DATA BASE MANAGEMENT SYSTEM Final Report
J. J. ENGLISH and L. M. KUDIA Oct. 1985 44 p
(Contract N00039-84-C-0070)
(AD-A162900; IITRI-E06549-20) Avail: NTIS HC A03/MF A01 CSCL 09B

Described are the functions and operation of the ELF biological effects literature data base management system. It covers functional requirements, system implementation, data base description, system operations, and detailed procedures. The system utilizes an IBM PC/XT computer and dBASE-III software. GRA

N86-24206# Naval Health Research Center, San Diego, Calif.
CHANGES IN FITNESS AND SHIPBOARD TASK PERFORMANCE FOLLOWING CIRCUIT WEIGHT TRAINING PROGRAMS FEATURING CONTINUOUS OR INTERVAL RUNNING Final Report
E. J. MARCINIK, J. A. HODGDON, C. E. ENGLUND, and J. J. OBRIEN Aug. 1985 18 p
(AD-A163110; NAVHLTHRSCHC-85-33) Avail: NTIS HC A02/MF A01 CSCL 05I

This investigation compared physical fitness and work performance changes following participation in circuit weight training regimes featuring either interval or continuous running programs. Results indicated that participation in the circuit weight training/run regimes was associated with differential changes in fitness but not shipboard work performance. Furthermore, the association between training induced fitness gains and relative improvement in job performance appeared to be specific to the task modelled. Important predictors of criterion job performance included measures of both upper and lower torso muscular strength. Regression analyses yielded the following prediction equation: Composite shipboard performance(s) = 194.15097-1.59492 (arm curl)-, 18369 (leg press) r=0.74. GRA

N86-24207# Naval Health Research Center, San Diego, Calif.
L-TRYPTOPHAN ADMINISTERED TO CHRONIC SLEEP-ONSET INSOMIACS: LATE-APPEARING REDUCTION OF SLEEP LATENCY Final Report, Dec. 1980 - Nov. 1985
C. L. SPINWEBER 1 Nov. 1985 19 p
(AD-A163115; NAVHLTHRSCHC-85-42) Avail: NTIS HC A02/MF A01 CSCL 06P

The effects of 3 g 1-tryptophan on sleep, performance, arousal threshold, and brain electrical activity during sleep were assessed in 20 male, chronic sleep-onset insomniacs (mean age 20.3 + or - 2.4 years). Following a sleep laboratory screening night, all subjects received placebo for 3 consecutive nights (single-blind), 10 subjects received 1-tryptophan and 10 subjects received placebo on 2 withdrawal nights (single-blind). There was no effect of 1-tryptophan on sleep latency during the first 3 nights of administration. On the 4th-6th nights of administration, sleep latency was significantly reduced. Unlike benzodiazepine hypnotics, 1-tryptophan did not alter sleep stages, impair performance, elevate arousal threshold, or alter brain electrical activity during sleep. GRA

N86-24208# Harvard Univ., Cambridge, Mass. Energy and Environmental Policy Center.
ANALYSIS OF HEALTH EFFECTS RESULTING FROM POPULATION EXPOSURES TO AMBIENT PARTICULATE MATTER. HEALTH AND ENVIRONMENTAL EFFECTS DOCUMENT, 1985
J. D. SPENGLER Sep. 1985 77 p refs
(Contract DE-AC02-81EV-10731)
(DE86-002161; DOE/EV-10731/5) Avail: NTIS HC A05/MF A01

Findings from our recent epidemiologic analyses reported here indicate variations in ambient fine particle mass (d sub a 2.5 (MU)m toxic substances include arsenic, cadmium, sulfur, and carbonaceous compounds). SO4 sup = mass are more important to public health than variations in the levels of particle mass measures which also include coarse particles (d sub a 2.5 (MU)m). Sulfates and FP mass wsere often very significant predictors of variations in residual mortality throughout the US, even after controlling for socio-economic factors. Analysis of 12 years of daily mortality and air pollution in New York City showed that aerosol extinction coefficient (b sub ext), a good surrogate for fine particles, is significantly associated with observed mortality. DOE

N86-24209# Oak Ridge National Lab., Tenn.
FIBEROPTICS IMMUNOFLUORESCENCE SPECTROSCOPY FOR CHEMICAL AND BIOLOGICAL MONITORING
T. VO-DINH, G. D. GRIFFIN, K. R. AMBROSE, M. J. SEPANIAK, and B. J. TROMBERG 1985 17 p Presented at the 10th International Symposium on Polynuclear Aromatic Hydrocarbons, Columbus, Ohio., 21 Oct. 1985 Prepared in cooperation with Tennessee Univ., Knoxville
(Contract DE-AC05-84OR-21400)
(DE86-002239; CONF-851068-2) Avail: NTIS HC A02/MF A01

The feasibility of the fluoroimmuno-sensor (FIS) detection of IgG proteins tagged with fluorescein isothiocynate was demonstrated. In view of the biotechnological advances in the area of monoclonal antibodies and the production of anti-hapten sera it is believed that fiberoptics-based FIS could be generally useful in a wide spectrum of biochemical and clinical analyses. Specifically, the FIS could be employed in the assessment of an individual's exposure to chemical PAH carcinogens, response to drug therapy, or in the characterization of naturally occurring biochemicals. For example, studies investigating the presence of carcinogens and carcinogen-DNA adducts in tissues and body fluids could be performed with the FIS using immunochemical techniques. An integration of fluorescence immunoassay principles with laser-based fiberoptics systems is planned in order to develop FIS which should be capable of providing reliable analytical data for such studies. DOE

N86-24210# Los Alamos National Lab., N. Mex.
EFFECTS: DOCUMENTATION AND VERIFICATION FOR A BEIR 3 CANCER RISK MODEL BASED ON AGE, SEX AND POPULATION DYNAMICS FOR BIOTRAN
W. J. WENZEL and A. F. GALLEGOS Sep. 1985 108 p refs
(Contract W-7405-ENG-36)
(DE86-003285; LA-10371-MS) Avail: NTIS HC A06/MF A01

The computer simulation code EFFECTS is coupled with the radionuclide uptake and environmental transport strategies of the BIOTRAN code to predict cancer risks and deaths in a dynamic human population. Total mortalities due to all causes are incorporated with projected radiation-induced cancer mortalities caused by all previous chronic or acute radiation exposures of the population as a function of age and sex. Superpositioning radiation-induced cancer mortalities on current total mortalities in each age group allows a realistic and dynamic estimate of cancer risks for complex radiation exposure scenarios. EFFECTS was developed on the CDC 7600 and can be executed on the Cray computer system at Los Alamos National Laboratory. EFFECTS can simulate the upper boundary of cancer risk estimates where population exposures occur over many years and where organ burdens are integrated over the lifetime of the individual. This report gives new insight on age-specific cancer risks. As part of the code verification, the simulated impacts to a small population from natural background uranium and an accidental release of airborne plutonium are compared. For the long-term continuous exposure to natural background uranium, the impact to the population is very small (2 x 10(-6) to 7 x 10(-6) deaths/10,000 people) with young adults receiving the largest bone doses and risks. For the long-term intakes following a simulated accidental air release of plutonium, young teenagers receive the highest bone doses while young adults receive the largest risk. Simulating these two scenarios, using BIOTRAN/HUMTRN/EFFECTS, illustrates sufficient resolution to predict the age/sex-specific response from human populations from contaminants in our environment. DOE

N86-24211# Health Effects Research Lab., Research Triangle Park, N. C.
USING ASHFORD'S GENERAL MODEL TO AID IN THE UNDERSTANDING OF A PESTICIDE'S NEUROTOXIC EFFECT THROUGH PESTICIDE-DRUG MIXTURE EXPERIMENTS
D. J. SVENDSGAARD and K. M. CROFTON Nov. 1985 15 p
Prepared in cooperation with North Carolina Univ., Chapel Hill
(PB86-130028; EPA-600/D-85-241) Avail: NTIS HC A02/MF A01 CSCL 06T

A framework for interpreting the joint action of mixtures of drugs is discussed. The concepts are applied to the situation in which the mechanism of three drugs are fairly well understood and mixtures of pesticides and drugs are studied to aid in the understanding of the mechanism of certain types of pesticides. Laboratory data are fit by nonlinear regression to suggested models. The conclusions drawn from fitting these models and the implication of the design of experiments for further studies are discussed. GRA

N86-24212# Resources for the Future, Inc., Washington, D. C.
EXECUTIVE SUMMARY: AMBIENT OZONE AND HUMAN HEALTH: AN EPIDEMIOLOGICAL ANALYSIS Final Report
P. R. PORTNEY and J. MULLAHY Aug. 1985 23 p
(Contract EPA-68-02-3583)
(PB86-114089; EPA-450/5-85-005D) Avail: NTIS HC A02/MF A01 CSCL 06T

The report by the Office of Air Quality Planning and Standards of the Environmental Protection Agency is the executive summary of an analysis of the relationship between ozone and human health benefits. GRA

N86-24213# Resources for the Future, Inc., Washington, D. C.
AMBIENT OZONE AND HUMAN HEALTH: AN EPIDEMOLOGICAL ANALYSIS, VOLUME 3 Final Report
P. R. PORTNEY and J. MULLAHY Jun. 1985 180 p refs
(Contract EPA-68-02-3583)
(PB86-114105; EPA-450/5-85-005C) Avail: NTIS HC A09/MF A01 CSCL 06F

The report is the third volume by the Air Quality Planning and Standards Office of EPA of an analysis of the relationship between ozone and human health benefits. GRA

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BEHAVIORAL SCIENCES

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

A86-29851
SYMPOSIUM ON AVIATION PSYCHOLOGY, 3RD, COLUMBUS, OH, APRIL 22-25, 1985, PROCEEDINGS
R. S. JENSEN, ED. and J. ADRION, ED. (Ohio State University, Columbus) Symposium sponsored by the Ohio State University and Association of Aviation Psychologists. Columbus, OH, Ohio State University, 1985, 777 p. For individual items see A86-29852 to A86-29861, A86-29863 to A86-29936.

The present conference on the complex interactions between pilots and their cockpit environments discusses topics in such fields as cockpit design, voice data entry for avionics, cockpit displays, air traffic control automation, pilot workload monitoring and management, pilot judgment and reliability, cockpit communications and resource management, pilot selection and training, pilot visual perception, pilot physiology, and accident investigation. Specific attention is given to cockpit design and evaluation data bases, ergonomic principles for auditory signals in military aircraft, subjective assessments of workloads in an advanced fighter cockpit, time-sharing ability in zero-input tracking analyzer scores, cockpit speech interference considerations, psychosocial aspects of male and female pilot errors, test anxiety in cockpit simulators, fatigue, stress and preoccupation effects, and aircraft accident investigation psychological methods. C.D.

A86-29853#
VISION IN SPATIAL DISORIENTATION (SDO) AND LOSS OF SITUTATIONAL AWARENESS
G. B. MCNAUGHTON (USAF, Life Support System Program Office, Wright-Patterson AFB, OH) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 25-38. refs

The pilot-vehicle interfaces (PVIs) of current fighter and attack aircraft are noted to have been designed without sufficient attention to pilot orientation factors and requirements. Pilots are accordingly denied important cues, or subjected to cues that under certain circumstances disorient, misorient, or otherwise fail to furnish critical control parameters in a way that enhances information acquisition. There has been an additional failure to design PVIs that provide the inputs needed by a pilot to maintain or quickly regain awareness of attitude and other critical flight parameters. Recommendations for future PVI designs are made. O.C.

A86-29863#
THE EFFECT OF USING SPEECH GENERATION AND RECOGNITION SYSTEMS ON THE PERFORMANCE OF DISCRETE TASKS
D. DAMOS (Arizona State University, Tempe) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 127-133.
(Contract N00014-82-C-0179)

Twenty-eight male subjects performed a task combination consisting of a spatial short-term memory task and a verbal short-term memory task. Stimuli for the verbal task could be presented either visually on a CRT or auditorily through headphones. Subjects responded to the verbal task either manually using a keypad or vocally using a voice recognition system. Analyses revealed significantly more accurate dual-task performance with auditory rather than visual stimuli. However, there was no significant difference between speech responses and manual responses on measures of either speed or accuracy.
Author

A86-29865#
COMPARISON OF NOVICE AND EXPERIENCED PILOTS USING ANALOG AND DIGITAL FLIGHT DISPLAYS
J. M. KOONCE, M. GOLD, and M. MOROZE (Massachusetts, University, Amherst) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 143-149. refs

Attention is given to the differences in performance of flight-naive and experienced pilots in the acquisition of restrictive flight skills using both digital and analog flight display formats and in their performance under high cognitive workload stress. The results obtained indicate that the performance of basic flight tasks is superior when analog displays are used, in the cases of both the acquisition of those skills and their performance in the presence of a cognitively demanding side task. The naive subjects appeared to perform better than the experienced pilots with digital displays.
O.C.

A86-29867*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PITCH CHANGE THRESHOLDS AS INFLUENCED BY ANGULAR RATE AND DURATION OF THE APPARENT HORIZON'S DISPLACEMENT
R. F. HAINES (NASA, Ames Research Center, Moffett Field, CA) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 159-166. refs

The displacement threshold (DT) during voluntary visual tracking of a line and during fixation of a stable spot located at the initial stimulus position was determined to help in the modeling pilot manual dynamics during the nose-up 'flare' maneuver. Forty-six observers made paired comparison, forced choice judgments of the maximal downward displacements of a horizontal line moving at various speeds for the durations of 0.25, 0.50, and 1.00 sec. The results indicated that the DT is significantly lower, the confidence is higher, and the number of errors and guesses is smaller when a fixation dot is present; moreover, increasing both the stimulus velocity and duration significantly improves the accuracy of displacement discrimination and increases mean confidence.
I.S.

A86-29879*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PREDICTED VERSUS EXPERIENCED WORKLOAD AND PERFORMANCE ON A SUPERVISORY CONTROL TASK
V. BATTISTE and S. G. HART (NASA, Ames Research Center, Moffett Field, CA) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 255-262.

The multitask simulation of a supervisory control system was examined in order to evaluate the ability of operators to predict the workload and performance impact of unfamiliar task features, using their basic knowledge and specific information provided before each scenario. Task difficulty and experienced workload were varied by manipulating the number of elements per task, the number of tasks, task schedule, and availability of task elements for performance. The results have indicated that an operator might correctly predict the workload of a realistically complex task if (1) he is familiar with the basic system, and (2) the design, functional requirements, and operational procedures of the proposed modifications are described clearly. He is less able to predict unfamiliar rate or schedule complexity manipulations for which timing is an important element.
I.S.

A86-29882#
IN SEARCH OF A TIME-SHARING ABILITY IN ZERO INPUT TRACKING ANALYZER SCORES
G. D. SIERING and L. W. STONE (U.S. Army, Aeromedical Research Laboratory, Fort Rucker, AL) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 279-286. refs

The Zero Input Tracking Analyzer (ZITA) is a small psychomotor test that attempts to measure time-sharing ability by use of tracking tasks performed with and without a secondary task. Scores from a sample of Army aviators were intercorrelated and factor analyzed. Separate factors were identified for a time-sharing dimension and for a general ability to perform higher order tracking tasks. Three other factors were extracted and interpreted. The results are interpretable as demonstrating the existence of a time-sharing ability that is separate from the ability to perform various types of tracking tasks.
Author

A86-29883#
THE STERNBERG MEMORY SEARCH TASK AS AN INDEX OF PILOT WORKLOAD
C. D. WICKENS, F. HYMAN, J. DELLINGER, H. TAYLOR, and M. MEADOR (Illinois, University, Savoy) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 287-294. refs
(Contract DAMD17-83-C-3150; F33615-83-K-0612)

Studies of Taylor et al. (1985) concerning application of the Sternberg memory search task for evaluating pilot's mental work load and the residual capacity are reanalyzed and compared with earlier investigations. Based on the results, a number of recommendations is offered with respect to some particular details in the Sternberg task procedure. In particular, it is proposed to (1) minimize peripheral input-output delays, (2) avoid using the memory sets (MSETs) of 1 point, and avoid using the same fixed MSET for too many consecutive trials, (3) avoid running different MSETs on different days or blocks, and (4) collect data on large number of subjects. Statistically, presentation of raw data points, rather than derived statistics from regression equations, is recommended.
I.S.

A86-29884#
RELIABILITY OF MILITARY PILOTS - PROBLEMS AND PROSPECTS
B. O. HARTMAN, R. A. ALBANESE (USAF, School of Aerospace Medicine, Brooks AFB, TX), and G. B. HUMPHRESS (Southwest Research Institute, San Antonio, TX) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 297-307. refs

The objectives of the USAF physiologic training program are threefold: (1) to identify the top 20 percent of the operational fighter pilot pool, (2) to develop special training techniques for making each member a 99th percentile pilot, and (3) to develop biologically based designs for the pilot/aircraft interface. The elements of the training objective (cognitive skills training, sensory/motor skills training, and operational skills training) and the principal techniques, training protocols, the software, and the mathematical models involved are discussed. Establishing local, artificially intellirgent training work stations, the 'Challenge Work Stations' is proposed, to serve as a device to support locally the training and maintaining pilot attributes conditioning. The functions of each Challenge Work Station will be those of a coach: (1) to

present challenges, (2) to record, maintain, and trend scores on individual challenges, upon request, (3) to serve as a personal aid and tutor for individual pilot, (4) to tailor training prescriptions and advisories to every pilot's individual circumstances, and (5) to use feedback from actual cockpit performances by the pilot. I.S.

A86-29885#
THE SOCIAL-PSYCHOLOGICAL ASPECTS OF PILOT-ERROR - MALE VS FEMALE
G.J. VAIL (St. Mary's Graduate Institute, Minneapolis, MN) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 309-319. Research supported by the Ninety Nines, Inc. refs

The National Transportation Safety Board data on pilot-error fatalities for general aviation, years 1977 through 1981, have been analyzed by gender differences. The analysis included following variables: (1) age of pilot, (2) certificate of pilot, (3) kind of flying, (4) type of aircraft, (5) type of power, (6) total time, by time in type of aircraft, (7) broad cause/factor, (8) specific cause/factor, (9) phase of operation, and (10) pilot's occupation. When compared to the total population of female and male pilots, the relative number of female pilot-error fatalities was significantly less than the number of male pilot-error fatalities. On the other hand, female pilots incur more of their fatalities when flying solo-instructional than male pilots (11.1 pct and 1.5 pct, respectively). Females also incurred relatively more of their fatalities during practice-noncommercial runs (9.3 pct compared to 2.4 pct for males). I.S.

A86-29886*# Ohio State Univ., Columbus.
A REVIEW OF CRITICAL IN-FLIGHT EVENTS RESEARCH METHODOLOGY
W. C. GIFFIN, T. H. ROCKWELL, and P. E. SMITH (Ohio State University, Columbus) IN: Symposium on Aviation Phychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 321-328. refs
(Contract NAG2-112; NAG2-75; NAS2-10047)

Pilot's cognitive responses to critical in-flight events (CIFE's) were investigated, using pilots, who had on the average about 2540 flight hours each, in four experiments: (1) full-mission simulation in a general aviation trainer, (2) paper and pencil CIFE tests, (3) interactive computer-aided scenario testing, and (4) verbal protocols in fault diagnosis tasks. The results of both computer and paper and pencil tests showed only 50 percent efficiency in correct diagnosis of critical events. The efficiency in arriving at a diagnosis was also low: over 20 inquiries were made for 21 percent of the scenarios diagnosed. The information-seeking pattern was random, with frequent retracing over old inquiries. The measures for developing improved cognitive skills for CIFE's are discussed. I.S.

A86-29887#
THE SCARE PILOT
J. L. PARNELL (Icarus, Inc., Houston, TX) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 329-336. refs

The roots of pilot's 'human errors', in reality caused by faulty or inconsistent designs in an aircraft, deficient pilot's operating handbook (POHB's), stress or outright fear are discussed with examples for each type of situation. It is concluded that fear-caused panic is often uncontrollable, but the emergency reflex-like actions taken in extreme emergencies are often the correct ones. However, some emergencies cannot be practiced in real flight situation (e.g., fire in the cockpit, a tire blowout on landing), and can be taught in classroom only by instructors who have actually experienced these emergency situations themselves. The importance of finding the true reasons in every 'pilot error' event is emphasized, for these must be used as guides for future airplane designs, pilot screening and upgrading of instructors. I.S.

A86-29888#
JUDGMENT TRAINING EFFECTIVENESS AND PERMANENCY
G. P. BUCH (Transport Canada, Toronto) and I. J. DE BAGHEERA (Montreal, Universite, Montreal, Canada) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 337-343.

Partial results of a study evaluating the relative permanency of acquired skills and the effectiveness of a judgment training (JT) program for student pilots, conducted at a three-year college, are presented. Twenty flight and ground instructors underwent a 14-d intensive course on the study of the JT principles, followed by a 16-week control period. Aggressiveness and anxiety tests were administered to students in their first year. In the course of their second year, but prior to receiving the Student Judgment Manual, a written pretest dealing with flight judgmental instances was administered along with a personality trait test. Teaching styles and initial reaction of judgment training are discussed. One result of the study was a higher quality of judgment achieved by the second-year students, as compared with the more experienced third-year group. The cause for this is believed to lie in the close contact of the less experienced group with their instructors, who were carrying out their own training. I.S.

A86-29889#
RECURRENT COCKPIT RESOURCE MANAGEMENT TRAINING AT UNITED AIRLINES
R. L. ARNOLD and D. L. JACKSON (United Airlines Denver Training Center, Loveland, CO) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 345-351.

Cockpit Resource Management (CRM) training is an integral part of United Airlines' recurrent training program. Each flight crewmember is trained and checked once per year. Crews participate in all training and checking activities as a crew unit. The training and checking is spread over three consecutive days. *On day one, crews participate in a structured exercise designed* to review and apply CRM techniques. On day two, the crews perform line oriented flight training (LOFT) in a flight simulator. The LOFT is guided by a scenario structured to promote crew application of CRM principles. A problem is introduced, and the outcome of the LOFT is dependent upon how the crew deals with the problem. The LOFT session is video taped for post session critique. Crews are given a flight check on day three. Efforts are under way to develop assessment scales for CRM application. Author

A86-29890#
PRIVATE PILOT JUDGMENT TRAINING IN FLIGHT SCHOOL SETTINGS - A DEMONSTRATION PROJECT
L. F. LESTER (Colby College, Waterville, ME), A. E. DIEHL (FAA, Office of Aviation Medicine, Springfield, VA), and G. BUCH (Canadian Air Transportation Administration, Ottawa, Canada) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 353-365. refs

A86-29891#
WHEN SHOULD PILOT DISCIPLINE END AND PILOT SAVVY BEGIN?
J. N. KOMICH (Flight Safety Institute, Sacramento, CA) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 367-371.

Case studies of several fatal accidents and of incidents where a seemingly imminent crash has been avoided by an unusual maneuver are presented. In some extenuating circumstances a crash was prevented by a procedure not covered by a pilot manual. In others, a prescribed procedure was misleading due to unusual situations, but the thoroughly conditioned pilot was unable to depart from the learned procedure. Changes in the airline captain evaluation and in recurrent training process are suggested, which include greater emphasis on the quality, rather than quantity, of

flight time and teaching the pilot to analyze each flight for unique or unusual occurences in the flight. Simulators should provide greater variety of situations, simulating actual cities and circumstances. Finally, every pilot should have access to other pilots' experiences of having avoided a near-crash situation. I.S.

A86-29892#
THE ATTITUDE AND INFORMATION COMPONENTS OF THE RISK ASSESSMENT-JUDGEMENT PROCESS
J. KRAMER IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 373-380. refs

The FAA regulations regarding the individual's rights to 'voluntary exposure to risk' and the 'rights to incur risk' to others are discussed in light of existing hazards and incompliances to prescribed safety procedures which exist in the area of personal and business aviation. The attitude of pilots towards safety is analyzed, and the examples of accidents caused by a macho attitude, alcohol and drug abuse, and negligence towards one's health problems are presented. The existing FAA flight test guides are found inadequate, especially with respect to 'other than standard' take-off conditions and to aircraft manufactured prior to March 1979. A realignment of the Biennial Flight Review, which is the only mechanism available for judgement training of the general aviation pilot, is suggested. I.S.

A86-29894#
'CAPTAIN I WAS TRYING TO BRING UP THE FACT THAT YOU MADE A MISTAKE EARLIER' - DEFERENCE AND DEMEANOR AT 30,000 FEET
R. M. FRANKEL (Wayne State University, Detroit, MI) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 403-410. refs

Results of a NASA-sponsored study, which uses videotechnology and microinteractional analysis to identify the rules and structures of the mutual participation of the crew in the cockpit, are presented. The report focuses on the analysis of a conversational sequence between an air traffic control voice and the crew in the cockpit of a flight simulator, which involves the occurence of an uncorrected error on the part of the flight captain. While the original error was caused by an interactional complexity, with the 1st pilot being simultaneously engaged in three different conversation sequences, the reason for perpetuation of the error was found in the attitude of deference and demeanor on the part of a subordinate pilot who knew about the error. I.S.

A86-29895#
COCKPIT SPEECH INTERFERENCE CONSIDERATIONS
W. T. SHEPHERD (FAA, Washington, DC) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 411-417. refs

The problem of cockpit interference by aircraft-generated noise and the levels of interference for different aircraft are discussed, together with the means to minimize the interference. The measures of acceptability of a cockpit noise environment, the Articulation Index, the Speech Interference Level (SIL), and the Preferred SIL (PSIL) are described; their values as quantitative criteria are compared; and the threshold values of these criteria are indicated. Among the devices and means commonly recommended for increasing the speech-to-noise ratio, the use of intercom systems with noise-cancelling microphones is found to be the only effective practical method. I.S.

A86-29896#
THE ROLE OF FUNDAMENTAL EXPRESSION IN INSTRUMENT FLIGHT PERFORMANCE
C. E. MCCOY (Ohio State University, Columbus) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 419-426. refs

The application of the expressive or qualitative aspects of communication to instrument flight is discussed. How these expressive aspects affect pilot performance is examined. The role of phenomenology in the relationship between pilot and aircraft is addressed. C.D.

A86-29897#
AN ANALYSIS OF THE DEARTH OF ASSERTIVENESS BY SUBORDINATE CREWMEMBERS
J. N. KOMICH (Flight Safety Institute, Sacramento, CA) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 431-436.

The problem of an aberrant decision made by the flight captain and remaining unchallenged by the subordinate crewmembers is analyzed. The roots of the problem are seen in the occasional professional inadequacy and/or in the personality of a 'too strong' captain, in the desire of the crew to maintain harmony in the cockpit, and in the 'captain mystique' concept, supported at all levels of aviation bureaucracy. To alleviate this so called 'lack of assertiveness' in the supporting crew, it is suggested that a method be developed that quantitates all aspects of the flight regime. Such quantitative parameters would facilitate the 'out of limits' definition of the flight, which would reduce the subjectiveness of pilots' decisions and judgments, and, in addition, would provide the subordinate crewmembers with concrete basis from which to speak. The need to further stiffen the quality checks by the ATP and to support a crewman who speaks up is emphasized. I.S.

A86-29898#
COCKPIT RESOURCE MANAGEMENT - WHERE DO WE STAND?
B. STRAUCH (National Transportation Safety Board, Washington, DC) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 437-443. refs

Unresolved issues of the cockpit resource management (CRM) programs, such as definition of the program's objectives, addressing specific objectives to each crewmember's position, and evaluation of program's effectiveness for maximal retaining, are discussed. Consideration is given to critical variables that can influence individual CRM skills: experience level, sociocultural and sociopsychological factors, and instructional media. Special emphasis is made on the need to correlate the CRM program development with the instructional systems design methods, in order to guide the CRM program developer to specific, obtainable objectives. I.S.

A86-29899*# Texas Univ., Austin.
COCKPIT RESOURCE MANAGEMENT - EXPLORING THE ATTITUDE-PERFORMANCE LINKAGE
R. L. HELMREICH (Texas, University, Austin), H. C. FOUSHEE (NASA, Ames Research Center, Moffett Field, CA), R. BENSON, and W. RUSSINI (People Express Airlines, Newark, NJ) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 445-450. refs
(Contract NAG2-137; NCC2-286)

Measured attitudes regarding cockpit management were contrasted for pilots whose line flying performance was independently evaluated by check airmen as above or below average. A highly significant discriminant function was obtained indicating that these attitudes are significant predictors of behavior. The performance of 95.7 percent of the pilots was correctly classified by the analysis. Implications of the results for cockpit

resource management training and pilot selection are discussed. Author

A86-29900#
FORMULA FOR A BETTER UNDERSTANDING OF PILOT PERFORMANCE
L. V. CURRERI (Cigna Corp., Windsor Locks, CT) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 451-458. refs

The factors of motivation and ability in the Vroom's formula (which evaluates human performance as a multiplicative function of motivation and ability), as they apply to the training of pilots, are discussed. The most important issues in the ability factor include the need of effective communication among the crewmembers, especially in cases of negative experiences, and the need to correlate the individual behavioral traits with the requirements of the new technical skills. The aspects of the motivation factor include performance standards, responsibility, rewards, and team spirit, as well as 'hygienic factors' of job security, fair play, and working conditions. Although the hygienic factors cannot motivate by themselves, they are prerequisites for motivation. The need to integrate the motivation programs into pilots' technical training is emphasized. I.S.

A86-29901#
THE INFLUENCE OF PREVIEW PERIOD AND GLOBAL OPTICAL FLOW RATE ON SENSITIVITY TO LOSS IN SPEED OF SELF MOTION
D. H. OWEN, I. E. PALLOS, L. J. HETTINGER, and J. C. FOGT (Ohio State University, Columbus) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 459-466. refs
(Contract F33615-83-K-0038)

The effects of the preview period and the global optical flow rate on the judgment of one's own speed were evaluated, using a special purpose scene generator. A test event consisted of seven preview segments, in the 0-40 s range, of constant speed followed by a 10-s segment of either constant speed or constant-rate deceleration. The subjects were to mark the initiation of their perception of deceleration by pressing a button. Six optical flow rates, ranging from 1.63 to 26.1 eyeheights/s crossed with the constant speed motion. The results indicate that the errors of reporting 'constant speed' on deceleration trials increase at first, then decrease as the preview period increases on duration, whereas the reaction times between initiation of deceleration and the button press show an opposite effect. Errors of reporting 'deceleration' on constant speed trials were relatively constant over preview durations of up to 20 s, then rose between 20 and 40 s. Implications for optimizing observation time before initiating a control adjustment and for video simulation of high-speed self motion are discussed. I.S.

A86-29902#
THE EFFECTS OF PREVIEW PERIOD ON DESCENT DETECTION
A. E. JOHNSON and D. H. OWEN (Ohio State University, Columbus) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 467-473. refs
(Contract F33615-83-K-0038)

Preview period (segments of level flight preceding a test segment), fractional loss in altitude, and event type (level or descent) were factorially crossed to investigate their influence on the ability of observers to detect descent. Observers made 'level' or 'descent' judgments and rated how confident they were in their decision while viewing computer-generated events which represented either descent or level flight. For level trials, the fastest reaction times resulted from preview periods between 1.25 and 5.0 s. Errors and reaction times decreased as the rate of fractional loss increased. Methodological and practical implications of the findings are discussed relevant to developing systems which optimize an individual's ability to control the altitude of an aircraft. Author

A86-29903#
SOURCES OF OPTICAL INFORMATION AND THEIR METRICS FOR DETECTING LOSS IN ALTITUDE
L. WOLPERT and D. H. OWEN (Ohio State University, Columbus) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 475-481.
(Contract F33615-83-K-0038; AF TASK 2313T3)

This experiment was designed to test the usefulness of two metrics for optical information specifying loss in altitude. Eyeheight and ground-texture-unit metrics were contrasted at three levels of global optical flow rate under conditions of constant and accelerating flow. Observers were required to make 'descent' or 'level' judgments based on 15-s computer-generated events simulating level flight or loss in altitude. Analyses of errors and response latencies indicated that the eyeheight metric was more functionally relevant than the ground-texture-unit metric and that performance decrements occurred with increases in flow rate. Likewise, better performance resulted with constant optical flow than with optical flow acceleration. These results and their implications for theory of self-motion perception and for the control of high-speed, low-level flight are discussed. Author

A86-29904#
INCREASING SENSITIVITY TO OPTICAL INFORMATION SPECIFYING LOSS IN ALTITUDE
L. J. HETTINGER and D. H. OWEN (Ohio State University, Columbus) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 483-490. refs

An experiment was conducted to assess the effect of training with advance information sensitivity to visual information specifying loss in altitude. Two groups of observers were assigned to two training conditions, designated as 'easy' and 'difficult', and were tested in four separate sessions, the last three being preceded by training sessions. Both groups showed significant improvement in discriminating descent from level flight. Although no significnat effect of training condition was observed, the overall trend was for difficult training to result in more sustained and, in the end, more effective learning. Previously observed negative effects of high values of global optical flow rate on descent detection diminished with training. Distinctions between fast and slow learners are drawn, and the results are discussed in terms of their relevance to perceptual learning theory and pilot training. Author

A86-29905#
ALTITUDE ESTIMATION OF PILOT AND NON-PILOT OBSERVERS USING REAL-WORLD SCENES
E. J. RINALDUCCI, M. J. PATTERSON, M. FORREN, and R. ANDES, JR. (Georgia Institute of Technology, Atlanta) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 491-498. refs

The present investigation was primarily concerned with the perceptual factors associated with low altitude flight, and was directed towards the assessment of the ability of pilots to accurately estimate altitude using a psychophysical technique. Pilot and non-pilot observers in the study were required to estimate altitude from photographs taken at different altitudes over six terrain areas in the Southwestern United States. These terrain areas differed in various cue factors such as object density, objects of known size, vertical development, and shading. In general, the results indicated that pilots were more accurate in their estimates than non-pilots, but both groups showed a similar pattern of responding to the different terrains. The ability of pilots and non-pilots to estimate altitude appeared to depend upon the presence of certain cue factors. Recommendations are made relative to the assessment of pilot's ability to estimate altitude before and after low altitude flight training. Author

A86-29906#
SIMULATED TERRAIN FOLLOWING FLIGHT - VISUAL AND RADAR TERRAIN CORRELATION REQUIREMENTS
D. MCCORMICK (Singer Co., Link Flight Simulation Div., Sunnyvale, CA) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 499-503.

The components of a Weapon System Trainer (WST), used in training military pilots for the hazardous low altitude terrain-following flight (TF) missions are described. A WST consists of an aircraft simulator within an interactive tactical environment, provided by a computer data base. Visual imagery, representing out-the-window scenes, infrared, or Low Light Level TV image scenes, is provided by a Computer Image Generator, whereas the corresponding, and more accurate, radar terrain information is supplied by a Digital Radar Land Mass System. The amount of correlation needed for the two systems in different types of flight is discussed. A correlation error where the visual terrain is at an altitude greater than 10 percent of the TF altitude above the radar terrain is a potential source of pilot detected, WST generated TF system failure. I.S.

A86-29907#
PERCEPTION OF ALTITUDE IN THE LOW AND MEDIUM ALTITUDE RANGES
J. DE MAIO (Honeywell, Inc., Minneapolis, MN) and R. BROOKS (USAF, Human Resources Laboratory, Williams AFB, AZ) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 505-512. refs

The effectiveness of computer-generated imagery in providing visual cues needed for perception of altitude above ground level (AGL) was evaluated from the results of a magnitude estimation task presented to 33 pilots. Subjects estimated AGL altitude after viewing videotaped presentation of five two-dimensional square patterns, which ranged in area from 450-ft x 450-ft to 4000-ft x 4000-ft. The accuracy of perception was indexed by the slope of a regression line of log perceived altitude on log presented altitude. The results show that accuracy of perception is a function of log altitude. Among the three visual scene features examined: the squares, the sides of the squares, and the square corners, the corner density was by far the best predictor of estimation slope. The corner density required to support accurate altitude estimation decreased with altitude: e.g., six corners/sq mile were required at the altitude of 2233 ft, as opposed to nine corners/sq mile at 629 ft. I.S.

A86-29908#
CANADIAN AUTOMATED PILOT SELECTION SYSTEM
J. A. JAMES (Department of National Defence, Canadian Forces Personnel Applied Research Unit, Willowdale, Canada) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 513-519.

The Canadian Automated Pilot Selection System (CAPSS) designed for psychomotor testing of airforce candidates is described, including such details as the simulator test facility, the analysis center, the syllabus, the instruction and testing audio-visual system, and the performance feedback. CAPSS is based on a 'job sample' approach, in which the candidates are required to perform a standard set of exercises involving flight tasks representative of those required in learning to fly a light aircraft. The test produces reliable measures of such behavioral characteristics and abilities as basic psychomotor abilities, learning rates, multiple-task integration, and performance under overload. Although variations of the job sample approach were found to be not cost-effective in the U.S., this is believed to be due to the decentralized character of the U.S. testing system and to the much greater numbers of the candidates to be tested. I.S.

A86-29909#
AN EXPLORATORY STUDY OF COMPUTER-BASED AVIATOR TESTING
R. BRAUNE, A. STOKES, and C. D. WICKENS (Illinois, University, Savoy) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 521-528. refs
(Contract N00204-82-C-0113)

The data obtained by Braune and Wickens (1984) during the 'Functional Age Profile' validation test for aviators are reanalyzed, to test the information processing performance battery's predictive power at a level independent of age-related changes. A total of fifty single and dual task performance variables were submitted to a stepwise multiple regression analysis. The results on correlations of selected single and dual task measures with the primary flight performance measures and the secondary communications task are discussed. I.S.

A86-29910#
TEST ANXIETY IN THE SIMULATOR ENVIRONMENT
J. F. HANSON (Republic Airlines, Inc., Ann Arbor, MI) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 529-532.

The aspects of test anxiety particular to the environment of a periodic simulator checkride for airline pilots are discussed. A succession of four stages of the test anxiety phenomenon: (1) recognition by the pilot of a test situation, (2) initial reaction, (3) mental state changes, referred to by psychologists as 'A-state' reaction, and (4) self-inspection and reaction are analyzed. Measures that can help to eliminate or alleviate stages (1) and (2), and to help the subject to develop a positive, rather than negative reaction in stages (3) and (4), or at least to alleviate the negative impact of these stages, are suggested. I.S.

A86-29911
MICROPAT - A PROGRESS REPORT ON THE VALIDATION OF AN AUTOMATED TEST BATTERY FOR PILOT SELECTION
H. C. A. DALE (Bartdale, Ltd., Beverley, England) and D. BARTRAM (Hull, University, England) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 533-539. Research supported by the Army Personnel Research Establishment. refs

The Micropat test system, developed to improve the selection of Army helicopter pilots, is described. The current Micropat library contains the following tests: (1) adaptive tracking, (2) compensatory tracking, (3) risk, (4) signal detection, (5) dual-task (two-dimensional step tracking and a mental arithmetic test), (6) landing, (7) schedule assessing, and (8) memory span. The results of a validation study have shown that intercorrelations between the pass/fail within the sample and P-score were in most cases low, indicating that most measures are independent both of each other and the P-score. The schedule, risk, and subject-controlled tracking tests, predict aspects of criterion variance unaccounted for by the traditional tests incorporated in the P-score. I.S.

A86-29912#
STUDENT PILOT STRESS - AN EMOTIONAL BARRIER TO EFFICIENT FLIGHT TRAINING
I. HENLEY (Transport Canada, Winnipeg) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 541-549. refs

Research has shown that learning to fly is a stressful experience and that stress impedes learning, impairs performance and interferes with decision making processes. To obtain optimal training efficiency, one of the necessary functions of the flight instructor should be to assist to bring about a reduction in the stress level of the student should that stress level be detrimental to efficient learning. Unfortunately, a disturbing finding by researchers in the field of flight training reveals that frequently flight instructors, instead of alleviating stress, impose additional stress on the student pilot. Research addressing the issue of

providing special educational training to flight instructors is in progress. This paper considers the issue of flight instructor training emphasizing the recognition of emotional barriers experienced by students in flight training and the reduction of student pilot stress. Author

A86-29913#
A CONTROL THEORY MODEL OF AVIATOR BEHAVIOR
B. A. SMITH (Singer Co., Link Flight Simulation Div., Binghamton, NY) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 551-558. refs

The Control Theory Model of Shipley and Smith (1980) is applied to describe student behavior during training in a General Aviation Trainer. Four groups of subjects received cognitive training at different times during the acquisition of motor skills associated with a basic flight maneuver. Subject performance was displayed in the form of learning curves and analyzed by use of Taylor's theorem. It was found that the individual subject's learning curves contained 'quantum jumps' from one level of performance to another, with an inflection point in the learning curve preceding the onset of these jumps. The inflection points occurred sooner in subjects receiving more cognitive training than in those with less cognitive training. The performance level at which the inflection point occurred was virtually the same for all groups. I.S.

A86-29914#
A PRELIMINARY STUDY - A MULTIVARIATE ANALYSIS OF ATTITUDINAL CHARACTERISTICS OF FLIGHT INSTRUCTORS
R. A. BUCKINGHAM and S. R. WIERSTEINER (Indiana State University, Terre Haute) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 559-566. refs

A86-29915#
PROFESSIONAL FLIGHTCREW HUMAN RESOURCE DEVELOPMENT DEVELOPING A NEEDS ASSESSMENT PROGRAMME
G. J. F. HUNT (Massey University, Palmerston North, New Zealand) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 567-574. refs

The short-term and long-term goals of New Zealand's Needs Assessment Program of the professional development of the country's pilots are described. The general issues of the program established in the Feasibility Study phase include the areas of pilot judgment, cockpit management, the need for an applicable attitude modification program and instructional competency for various pilot categories. Additional issues involve educational qualifications, the education and training programs in aviation schools and their cost, and the aspects of the program affecting the Civil Aviation Division. To implement the program, three project areas were established: Human Factors, Flight Training, and Civil Aviation Development, with a committee for each project area co-chaired by a senior aviation expert and an academic specialist. I.S.

A86-29919#
THE EFFECTS OF PSYCHOPHYSICAL MATCHING ON THE TRANSFER OF TRAINING BETWEEN ALTERNATIVE MOTION SIMULATORS
J. M. FLACH (Illinois, University, Urbana), G. R. MCMILLAN, R. WARREN (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH), and M. K. SNELL (Systems Research Laboratories, Inc., Dayton, OH) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 601-608. refs

Psychophysical matching techniques were employed to equate the subjective experience of motion in two motion simulation devices - the RATS, a whole-body motion environment and the ALCOGS, which presented motion cues through a moving seat-pan. The psychophysical matching technique was designated SIGMA, for Subjective Interactive Gain Measurement Analysis. Use of the motion drive algorithm, derived using SIGMA, resulted in equivalent roll-axis tracking performance between the two simulators. However, training subjects in the ALCOGS using this motion drive algorithm did not result in better transfer between simulators than training with no motion cues. Author

A86-29921#
KNOWING WHAT WE GET FROM TRAINING DEVICES - SUBSTITUTING A LITTLE ARITHMETIC FOR A MEASURE OF EMOTION
J. M. ROLFE, J. R. COOK (Royal Air Force, Support Command, London, England), and C. G. DUROSE IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 617-624. refs

The problem of making an objective assessment of the effectiveness of the training provided by a flight simulator or a training aircraft is discussed. The concept of the percentage utilization of a flight simulator is explained. Special consideration is given to an assessment scheme, called relative training effectiveness, that converts combined subjective judgments on the aircraft training characteristics and the effectiveness of learning of individual exercises into an objective measure. Use of this method is recommended during the course of training on a given device for optimizing the time needed for learning a particular skill. I.S.

A86-29923#
COMPARISON OF THE EFFECTS OF ATROPINE SULFATE AND ETHANOL ON PERFORMANCE
J. A. DELLINGER, H. L. TAYLOR, and B. C. RICHARDSON (Illinois, University, Savoy) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 631-638. refs
(Contract F33615-83-K-0612; DAMD17-83-C-3150)

The flight simulator performance decrements resulting from atropine injections were compared to similar decrements resulting from ethanol toxicsis. Twenty volunteers received 0.0, 0.5, 1.0, 2.0 and 4.0 mg/75 kg of atropine sulfate under double-blind conditions. The performance decrements at each atropine sulfate treatment level for each subject were determined by computing RMS deviations for five flight performance variables. The data set from a previous study concerned with the effects of ethanol on pilot performance was reanalyzed, and the decrements for the five variables at the 0.082 percent blood alcohol level (BAL) were computed. Probit analysis was used to estimate the Effective Dose (ED50) at which 50 percent of the subjects in the atropine sulfate experiment were expected to display decrements in excess of those observed for the 0.082 percent BAL. The ED50 was 3.12 mg of atropine sulfate. Author

A86-29924#
PSYCHOLOGICAL RECOVERY AFTER INCIDENTS AND ACCIDENTS WITHIN AVIATION
J. TERMOEHLEN IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 639-644.

A86-29925#
FITNESS-FOR-DUTY, A PILOT'S VIEWPOINT
H. L. SPROGIS (Aviation Research Associates, Ltd., Los Angeles, CA) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 645-652.

No more relevant examination of pilot reliability can perhaps be undertaken than that which overviews the pilot's fitness-for-duty both physically and mentally. Aviation is special to the needs and requirements of maintaining exacting standards of fitness. This paper attempts to define fitness-for-duty and additionally suggests a fitness-for-duty model that may be of assistance to pilots, management, and researchers. Finally, from the model, some principals have surfaced which may help in the further investigation of this critical problem of fitness-for-duty, and how pilots might react to certain solutions. Author

A86-29926#
THE ROLE OF THE FLIGHT PSYCHOLOGIST IN THE RNLAF IN A/C ACCIDENT INVESTIGATION AND PREVENTION
F. H. J. I. RAMECKERS (Royal Netherlands Air Force, Behavioral Sciences Dept., The Hague) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 653-660.

A86-29928#
TRAINING AIRCRAFT ACCIDENT INVESTIGATORS USING SIMULATIONS
J. ROLFE and A. F. TAYLOR (Cranfield Institute of Technology, England) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 669-676.

A86-29930#
'THE CAUSES OF CAUSES' - DETERMINANTS AND BACKGROUND VARIABLES OF HUMAN FACTOR INCIDENTS AND ACCIDENTS
K. GERBERT and R. KEMMLER (DFVLR, Institut fuer Flugmedizin, Fuerstenfeldbruck, West Germany) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 683-690.

The kind of human errors most frequently responsible for in-flight accidents and the primary causes of the errors are discussed. The most frequent critical errors were found to be the delay or omission of necessary actions/reactions (57.5 pct), failure to maintain altitude (41.5 pct), misjudgment of weather conditions encountered enroute (30.2 pct), failure to maintain airspeed (23.2 pct), and misjudgment of distances (21.3 pct). The most important factors responsible for the performance capability of a pilot are his physical and psychological fitness as well as his abilities, skills, knowledge, and experience, which, however, can be reduced by external disturbances and by a greatly increased workload. It is believed that some of the most recent advances in the cockpit avionics have not been completely adapted to the needs of the human operator. I.S.

A86-29931#
HUMAN PERFORMANCE ASPECTS OF ACCIDENT INVESTIGATION
J. A. MCINTYRE and R. B. STONE (Air Line Pilots Association, International, Washington, DC) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 691-695.

The two principal methods used to evaluate the 'human performance' factors responsible for safe in-flight operations and the specific areas of concern in the application of these methods are discussed. The one method is related to the factors directly tied to performance in the operating envelope, i.e., of training, air traffic control, cockpit resource management, fatigue, and illness. The other method relates to evaluating the phychological profile of the flight crew, i.e., the individual lifestyles, stresses, and personal relationships, which are difficult to link with the general accident proneness. Even in the postaccident investigations, the tendency to focus on easy-to-understand human aberrations may water down the technical and complex overall systems approach needed. As an illustration, investigation findings on two aircraft accidents are presented, together with a discussion of the coverage and its omissions. I.S.

A86-29932#
PROGRESS IN HUMAN PERFORMANCE ACCIDENT INVESTIGATION
C. E. SANDLER (National Transportation Safety Board, Washington, DC) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 705-710. refs

The particulars of transportation accidents, most of them involving aircraft, for which a specific human performance factor was identified by a National Transportation Safety Board investigation, are presented. The examples include fatal accidents caused by marijuana use, the erratic behavior of a pilot previously known to possess autocratic personality, overreliance of a crew on an automated system that had a history of discrepancies, and an instance of improper maintenance, due to a change in procedures, by a conscientious and experienced maintenance crew. The Safety Board recommendations, based on the particular performance factors, are presented. I.S.

A86-30360
PERCEPTUAL 'TRAPS' OF THE VISUAL SYSTEM
R. CLAPP (Boeing Military Airplane Co., Wichita, KS) IN: 1985 Summer Computer Simulation Conference, Chicago, IL, July 22-24, 1985, Proceedings . San Diego, CA, Society for Computer Simulation, 1985, p. 732-737. refs

Peculiar operational loops in the human visual system are considered. These loops act as 'traps' in the attempted perception of surrounding real world (or displayed) scenes. These traps belong to three categories, including physical, physiological, and psychological. Attention is given to ambient mode and sensor interactions, visual cue sets, sensory interactions, decisional process flow, motion detection 'interrupts', physical processes, physiological processes, psychological processes, the resolution of eye, the resting point of accommodation, luminance/accommodation relation, the resolution/contrast relation, expectance effects, illusion (learned), and emotion and perception. It is found that many traps of the visual process exist, taking into account psychological, physiological, and physical traps. G.R.

A86-30362
SIMULATOR INSTRUCTOR TASK LOADING - THE TIDE IS TURNING
R. A. GAMACHE (Singer Co., Link Flight Simulation Div., Binghamton, NY) IN: 1985 Summer Computer Simulation Conference, Chicago, IL, July 22-24, 1985, Proceedings . San Diego, CA, Society for Computer Simulation, 1985, p. 744-749.

The designer of the simulator instructional system faces a new challenge each time when he is concerned with a new training requirement. Virtually all simulator instructional systems are composed of three major components, including the console or instructor station, CRT displays, and interactive devices such as keyboards and control panels. The instructor's environment is considered along with aspects of display control and interaction, questions of data display and interaction, task oriented systems, multifunction keyboards, and problems of orchestrating and improvising. It is found that instructional system design is a dynamic and evolutionary process, one that requires the designer to thoroughly analyze the problem, identify the potential solutions, make the selections, and create the design. G.R.

A86-31820* New Mexico State Univ., Las Cruces.
BIGNESS IS IN THE EYE OF THE BEHOLDER
S. N. ROSCOE (New Mexico State University; ILLIANA Aviation Sciences, Las Cruces, NM) Human Factors (ISSN 0018-7208), vol. 27, Dec. 1985, p. 615-636. refs
(Contract NAS2-9094; F49620-77-C-0117; AF-AFOSR-80-00224)

This report reviews an investigation of judgments of size and distance as required of pilots in flight. The experiments covered a broad spectrum of basic psychophysiological issues involving the measurement of visual accommodation and its correlation with various other dependent variables. Psychophysiological issues investigated included the size-distance invariance hypothesis, the projection of afterimages, the moon illusion, night and empty-field myopia, the dark focus and its so-called Mandelbaum effect, the nature and locus of the accommodative stimulus, the relation between accommodation, retinal size, and perceived size, and possible relationships among accommodative responses, autonomic balance, and personality variables. Author

A86-31821
VISUAL LOBE AREA FOR SINGLE TARGETS ON A COMPETING HOMOGENEOUS BACKGROUND
A. J. COURTNEY and H. S. CHAN (University of Hong Kong, Hong Kong) Human Factors (ISSN 0018-7208), vol. 27, Dec. 1985, p. 643-652. refs

The binocular visual lobe for a detection task, with a peripherally presented target embedded in a homogeneous competing background, was mapped on eight axes passing through the fixation point. The lobes were very irregular in shape and there were differences between the subjects. The eight-axis area correlated highly with area based on only the horizontal and vertical axes, but the latter area gave no indication of even gross irregularities in lobe shape. Lobe areas for two subjects were exhaustively mapped; resulting boundaries were very irregular and there were regions of insensitivity within the lobe area. It was suggested that lobe shape as well as area is important to visual search. The irregular boundary and areas of insensitivity may partly account for the difficulty experienced by some subjects in locating targets even after repeated scanning. Author

A86-31822* Arizona State Univ., Tempe.
THE RELATION BETWEEN THE TYPE A BEHAVIOR PATTERN, PACING, AND SUBJECTIVE WORKLOAD UNDER SINGLE- AND DUAL-TASK CONDITIONS
D. DAMOS (Arizona State University, Tempe) Human Factors (ISSN 0018-7208), vol. 27, Dec. 1985, p. 675-680. refs
(Contract NCC2-202)

Twenty Type A and 20 Type B subjects performed two discrete tasks alone and together. Half of the subjects performed paced versions of both tasks; half, unpaced versions. Workload ratings were obtained for all subjects under single- and dual-task conditions using eight bipolar adjective scales. Under single-task conditions there was a significant interaction between behavior pattern and pacing on one of the tasks. This interaction indicated that Type A subjects responded more rapidly under unpaced conditions than did Type B subjects, although there was little difference between the groups under paced conditions. Under dual-task conditions, Type A subjects responded more rapidly than did Type B subjects regardless of pacing. There was one significant interaction between behavior pattern and task on one of the workload scales. Author

A86-31823
THE FUNCTIONAL AGE PROFILE - AN OBJECTIVE DECISION CRITERION FOR THE ASSESSMENT OF PILOT PERFORMANCE CAPACITIES AND CAPABILITIES
R. BRAUNE and C. D. WICKENS (Illinois, University, Urbana) Human Factors (ISSN 0018-7208), vol. 27, Dec. 1985, p. 681-693. refs
(Contract N00204-82-C-0113)

The initial development of a computer-based information-processing performance battery with aviation-relevant task structures is reported. It is shown that the currently existing prototype is sensitive to individual differences within chronological age groups as well as to age-related changes across different age groups. The utilization of such a test battery for the longitudinal assessment of aviator performance capabilities is discussed. Author

A86-31824
EFFECTS OF SPEECH RATE AND PITCH CONTOUR ON THE PERCEPTION OF SYNTHETIC SPEECH
L. M. SLOWIACZEK and H. C. NUSBAUM (Indiana University, Bloomington) Human Factors (ISSN 0018-7208), vol. 27, Dec. 1985, p. 701-712. refs
(Contract NIH-NS-12179; NIH-NS-07134; F33615-83-K-0501)

The effects of speaking rate, meaning, length of speech, and pitch contour on the perception of synthesized speech were examined with reference to the development of high-quality voice response systems. In the first of the two experiments conducted, the subjects transcribed sentences that were either syntactically correct and meaningful or syntactically correct but semantically anomalous. In the second experiment, the sentences varied in length and syntactic structure. In both experiments, presentation, delivered at the rate of either 150 or 250 words/min, varied from monotone to normally inflected clausal intonation. Accelerating the speaking rate, increasing the sentence length or the syntactic complexity of the sentence, and removing semantic information were all found to significantly worsen the performance of the identification of words in sentences. Removing normal pitch cues had only a minor negative effect. I.S.

A86-32072
THE METRIC OF VISUAL SPACE
M. WAGNER (Franklin and Marshall College, Lancaster, PA) Perception and Psychophysics (ISSN 0031-5117), vol. 38, no. 6, Dec. 1985, p. 483-495. refs

The geometric properties of visual space in the horizontal plane were measured by four different procedures. Five observers were asked to judge distances, angles, and areas defined by pairs and triplets of stakes, using magnitude estimation, category estimation, mapping, and perceptual matching. All judgements took place outdoors in a broad, open field under full-cue conditions. Stimuli oriented in depth were judged to be half as large as the same stimuli oriented in the frontal plane. Angles facing either directly toward or directly away from the observer were seen as approximately twice as large as those seen on their sides. Four mathematical models for visual space are examined. Both the hyperbolic model of Luneburg (1947) and the spherical model of Reid (1813) fail, each for different reasons. Two other models, however, produce a reasonably complete description of visual space. In the first model, visual space is an affine-transformed version of a Euclidean physical space. In the second model, distances are viewed as vectors that can be broken down into in-depth and frontal components relative to the observer. The in-depth component of this vector is contracted by a constant amount in visual space. Author

A86-32073
IMPROVEMENT IN DIRECTION DISCRIMINATION - NO ROLE FOR EYE MOVEMENTS
W. KOSNIK, J. FIKRE, and R. SEKULER (Northwest University, Evanston, IL) Perception and Psychophysics (ISSN 0031-5117), vol. 38, no. 6, Dec. 1985, p. 554-558. refs
(Contract AF-AFOSR-80-0246)

Practice improves observers' ability to discriminate between highly similar directions of motion. In an effort to clarify the basis for this improvement, an observer's eye movements were recorded while he made direction discriminations. It is found that the observer did not need to track the moving target in order to learn the discrimination. Both at the beginning and at the end of training the observer's eye movements more closely resembled movements made while fixating a stationary target, and did not at all resemble movements made while intentionally tracking the stimulus. These results suggest that the learned discrimination of the direction of moving targets is perceptual in nature and does not depend on the learning of a sensorimotor response. Author

A86-32523
THE METHODOLOGY AND TECHNIQUES USED IN ANALYSES OF OPERATOR ACTIVITY [METODIKA I TEKHNIKA ISSLEDOVANII OPERATORSKOI DEIATEL'NOSTI]
V. G. VOLKOV, ED. Moscow, Izdatel'stvo Nauka, 1985, 104 p. In Russian. No individual items are abstracted in this volume.

The methods used in the assessment of the emotional and physiological states as well as the work efficiency of industrial operators are discussed. Papers are presented on the status and characteristics of biosystem modeling, EEG correlates in the process of learning how to drive, experimental studies on the formula of informational theory of emotions, the optimization of operator activity under conditions of monotony, and assessment of the functional state of the human brain at different levels of emotional stress. Consideration is given to the analysis of the effect of corrective methods on the functional state of an organism under conditions of intense visual activity, the oculomotor reaction

in human subjects with functional disorders of the central nervous system, and the dynamics of psychophysiological test indices the period during operator activity. I.S.

A86-33103
MECHANISMS OF HUMAN MOTION PERCEPTION REVEALED BY A NEW CYCLOPEAN ILLUSION
M. SHADLEN and T. CARNEY (California, University, Berkeley) Science (ISSN 0036-8075), vol. 232, April 4, 1986, p. 95-97. refs
(Contract NIH-EY-01175; NIH-EY-05636)

A new cyclopean illusion of motion may bear on neural mechanisms of direction selectivity. Stationary flickering patterns were presented to each eye, and the resulting fused pattern was perceived to be moving. To determine direction of motion, the visual system seems to integrate image components differing by 90 degrees in spatial and temporal phase. On the other hand, image speed seems to be derived from displacement of features over time. A model of neural direction selectivity is discussed in light of these results. Author

N86-23248# Joint Publications Research Service, Arlington, Va.
ELECTRIC SLEEP METHOD OF PREVENTING FATIGUE BUILD-UP IN SAILORS ON EXTENDED CRUISES
Y. STENKO, I. I. VARENIKOV, and V. A. SKRUPSKIY *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 60-65 8 Jan. 1986 refs Transl. into ENGLISH from Gigiyena Truda i Professionalnyye Zabolevaniya (Moscow, USSR), no. 5, May 1985 p 42-44
Avail: NTIS HC A06

The effectiveness of drugs and the electric sleep method in the correction of sleep disturbances were compared. It is suggested that the maintenance of normal sleep and the correction of sleep disturbances is kept by prevention of fatigue build up in special forms of work organization in extended sea cruises. It is concluded that electric sleep therapy is the most effective method in the prevention of adverse effects which are the results of the impact of a ship's environmental factors over a period of many months, also includes the cumulative effects of noise. E.A.K.

N86-23261# Joint Publications Research Service, Arlington, Va.
REVIEW OF BOOK ON PRINCIPLES OF AVIATION PSYCHOLOGY Abstract Only
A. MOROZOV *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-004) p 118 12 Mar. 1986 Transl. into ENGLISH from Vozdushnyy Transport (Moscow, USSR), 17 Dec. 1985 p 2
Avail: NTIS HC A07/MF A01

Aviation psychology substantiates interrelated principles of occupational screening, the structure of in-flight work, and flight capabilities which are connected with the instruction and training of future pilots is discussed. Psychological features of flight duty, problems of flight capabilities, occupational screening, the formation and maintenance of flight skills, the role of the personal factor in ensuring the quality of flights, the instruction and training of flight personnel, are examined. Recommendations for the use of psychological data to heighten flight safety are formulated. E.A.K.

N86-23278# Defence Research Information Centre, Orpington (England).
PSYCHOLOGICAL SELECTION OF PERSONNEL FOR EMPLOYMENT IN THE ANTARTIC
L. CROCQ, J. RIVOLIER, and G. CAZES Mar. 1985 21 p Transl. into ENGLISH from Medecine et Armees vol. 1, no. 7, 1973
(DRIC-T-7449; BR95294) Avail: NTIS HC A02/MF A01

Selection methods and methods of behavior monitoring of subjects wintering in Antarctic bases are described. The psychological selection aims to predict the adaptability of the subject to the extreme environment. Procedures for carrying out objective studies in the field of individual and collective phenomena of maladjustment, and the factors which determine or promote them are discussed. Author (ESA)

N86-23279# Harvard Univ., Cambridge, Mass.
VISUAL HEMISPHERIC SPECIALIZATION: A COMPUTATIONAL THEORY Technical Report, 1 Apr. - 31 Oct. 1985
S. M. KOSSLYN 31 Oct. 1985 82 p
(Contract N00014-85-K-0291)
(AD-A161296; TR-7) Avail: NTIS HC A05/MF A01 CSCL 12A

Visual recognition, navigation, tracking and imagery are deposited to involve some of the same types of representations and processes. The first part of this paper develops a theory of some of the shared types of representations and processing modules. This theory is developed in light of computational, neuroanatomical, neurophysiological, and behavioral considerations. The second part of the paper develops a mechanism for the development of lateralization of visual function in the brain. This theory leads to predictions about the lateralization of the putative processing modules. The third part of the paper examines critical tests of these predictions, and reviews relevant empirical findings in the literature. Author (GRA)

N86-23280# Research Inst. of National Defence, Stockholm (Sweden). Dept. 5.
REPORT FROM A BEHAVIORAL SCIENCE STUDY GRIP TO AUSTRALIA, 23 AUG. - 10 SEP. 1985
G. LARSSON Oct. 1985 12 p refs In SWEDISH; ENGLISH summary
(FOA-C-50027-H3; ISSN-0347-7665) Avail: NTIS HC A02/MF A01

Mental stimulation and means to overcome stress are discussed. Practical techniques and measuring instruments for mental stimulation are commented on. A positive correlation between arousal level and performance, and negative correlation for anxiety and performance are considered. As both exist in variable proportions in practice, the total performance may be represented as an inverted U-curve. Decision making under stress conditions is analyzed. Author (ESA)

N86-24214# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision.
A METHODOLOGY FOR THE ANALYSIS AND DESIGN OF HUMAN INFORMATION PROCESSING ORGANIZATIONS Ph.D. Thesis
K. L. BOETTCHER Sep. 1985 199 p
(Contract N00014-77-C-0532; N00014-84-K-0519)
(AD-A162083; LIDS-TH-1501) Avail: NTIS HC A09/MF A01 CSCL 05J

The design of human organizations in which members perform routine tasks under the pressure of time is considered, particularly the problem of where and how in the design process to take into account human behavior and limitations. A three-phase design approach is suggested. In the first phase, the impact of human characteristics is neglected and attention is focused on aspects of organization structure that are external to individual members. In the second phase, implementations for these decision rules are devised and models of actual human behavior and induced workload for the tasks established for each member are developed. The descriptions are determined as a function of parameters that relate to features of the task set-up and to the options provided to the member for accomplishing his task. A final design phase places these parameters for best organization performance and in view of the workload limitations of individual members. The result is an organization design. The three-phase approach has been formalized as a multi-step methodology. Discussion and illustration is given for each design step. In addition, the methodology is exercised on a specific problem and the resulting organization design has been built. Operation of the organization has been tested under several conditions and experimentally observed results match those predicted for the design, which in turn supports the validity of the design approach. GRA

N86-24215# Navy Personnel Research and Development Center, San Diego, Calif.
DEVELOPMENT OF A COMPUTER-MANAGED READINESS ASSESSMENT SYSTEM Final Report, Jul. 1982 - Sep. 1984
W. F. THODE and P. G. BULETZA Dec. 1985 55 p
(AD-A162931; NPRDC-TR-86-8) Avail: NTIS HC A04/MF A01 CSCL 05I

Readiness of operational units, especially Fleet Air Reconnaissance Squadron TWO (VQ-2), is difficult to assess, particularly during operational cycles when the units are fulfilling their missions. This effort was conducted to develop a readiness training assessment system for VQ-2 to provide accurate, timely, and efficient assessments of the operational readiness of aircrew personnel while maintaining the highest possible state of readiness to perform the squadron's mission. The readiness training system for maintaining readiness and training data for VQ-2 aircrew personnel consists of: (1) a matrix for the EP-3E and the EA-3B aircraft of all the events that affect the readiness of the personnel assigned to the 10 crew positions in the EP-3E and the 5 crew positions in the EA-3B for each of the four VQ-2 mission area; (2) a computer-managed system to enter, process, store, and produce the readiness training manual that contains all VQ-2's references on training and readiness. Author (GRA)

N86-24546*# Lambuth Coll., Jackson, Tenn. Dept. of Physics, Mathematics and Computer Science.
A PRELIMINARY STUDY OF FLAT-PANEL DISPLAYS
K. E. YANCEY *In* NASA. Marshall Space Flight Center Research Reports: 1985 NASA/ASEE Summer Faculty Fellowship Program 16 p Jan. 1986 refs
Avail: NTIS HC A99/MF E04 CSCL 09C

Six display technologies that might be of future value in a spacelab workstation are discussed. Some have been developed to the point where they could be used as a computer display while others have not. The display technologies studied are electroluminescents, light-emitting didodes, gas plasma, liquid crystal, electrochromic, and electrophoretic. An explanation of each mechanism is provided along with the state-of-the-art development. Author

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

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

A86-29852#
LEVELS OF HELICOPTER CONTROL FORCE INPUTS DURING IN-FLIGHT EMERGENCY CONDITIONS AS A FUNCTION OF AVIATOR EXPERIENCE
A. W. SCHOPPER and J. H. WELLS (U.S. Army, Aeromedical Research Laboratory, Fort Rucker, AL) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 1-23. refs

Twelve helicopter pilots flew six normal and six simulated emergency (hydraulics off) condition approaches and landings in a U.S. Army utility helicopter to document the magnitude of force inputs required for emergency operations; the pilots differed widely in number of hours previously flown, in order to determine the effect of pilot experience. Cyclic, collective, and pedal controls were strain gage-instrumented, and attention was given to the outputs recorded during the last 60 sec of flight prior to each touchdown. Analyses of variance undertaken on the means of the forces recorded during successive 5-sec intervals revealed significant differences in the magnitude of the forces applied as a function of hydraulic system condition and time-to-touchdown. Significant interactions with pilot experience are noted. O.C.

A86-29854*# South Dakota Univ., Vermillion.
PILOT USAGE OF DECOUPLED FLIGHT PATH AND PITCH CONTROLS
J. BERKHOUT, R. OSGOOD (South Dakota, University, Vermillion), and D. BERRY (NASA, Flight Research Center, Edwards, CA) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 39-46.

Data from decoupled flight maneuvers have been collected and analyzed for four AFTI-F-16 pilots operating this aircraft's highly augmented fly-by-wire control system, in order to obtain spectral density, cross spectra, and Bode amplitude data, as well as coherences and phase angles for the two longitudinal axis control functions of each of 50 20-sec epochs. The analysis of each epoch yielded five distinct plotted parameters for the left hand twist grip and right hand sidestick controller output time series. These two control devices allow the left hand to generate vertical translation, direct lift, or pitch-pointing commands that are decoupled from those of the right hand. Attention is given to the control patterns obtained for decoupled normal flight, air-to-air gun engagement decoupled maneuvering, and decoupled air-to-surface bombing run maneuvering. O.C.

A86-29856#
COCKPIT INFORMATION REQUIREMENTS ANALYSIS - A MISSION ORIENTATION
D. D. RILEY (Essex Corp., Warminster, PA) and W. A. BREITMAIER (U.S. Navy, Naval Air Development Center, Warminster, PA) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 55-61. refs

A methodology has been developed to derive, on the basis of mission needs, the cockpit information requirements of A-6F and V-22 naval aircraft. After determining a representative mission scenario, the mission is broken down into segments and subjected to a function analysis. Functions are then allocated to either human operator or machine control, and cockpit task requirements for each mission segment are derived together with the cockpit information presentation capabilities necessary for operator performance of each task item. Operator task responsibilities are then assigned according to crew position or function for each mission segment. O.C.

A86-29857#
COCKPIT DESIGN AND EVALUATION DATA BASES
V. J. GAWRON (Calspan Corp., Buffalo, NY) and T. J. QUINN (McDonnell Douglas Corp., St. Louis, MO) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 63-68.
(Contract F33615-84-C-0500)

Three computerized data bases have been developed as part of a cockpit design program in order to advise designers as to the availability, source, and requirements of existing cockpit design and evaluation aids. The three data bases give attention to mission models, human performance models, and simulation utilities. Each data base includes information that directly affects design tool use and selection. The mission models encompass such military types as close air support, interdiction, counterair, and defense suppression, as well as environmental conditions, electronic conditions, and mission segments. O.C.

A86-29858*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
COGNITIVE NETWORK ORGANIZATION AND COCKPIT AUTOMATION
R. J. ROSKE-HOFSTRAND (NASA, Ames Research Center, Moffett Field, CA; New Mexico State University, Las Cruces) and K. R. PAAP (IBM Santa Teresa Laboratories, San Jose, CA; New Mexico State University, Las Cruces) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 71-78.

Attention is given to a technique for the derivation of pilot cognitive networks from empirical data, which has been successfully used to guide the redesign of the Control Display Unit that serves as the primary interface of the complex flight management system being developed by NASA's Advanced Concepts Flight Simulator program. The 'pathfinder' algorithm of Schvaneveldt et al. (1985) is used to obtain the conceptual organization of four pilots by generating a family of link-weighted networks from a set of psychological distance data derived through similarity ratings. The degree of conceptual agreement between pilots is assessed, and the means of translating a cognitive network into a menu structure are noted. O.C.

A86-29859#
A COMPARISON OF VOICE AND KEYBOARD DATA ENTRY FOR A HELICOPTER NAVIGATION SYSTEM
K. A. CHRIST and F. J. MALKIN (U.S. Army, Human Engineering Laboratory, Aberdeen Proving Ground, MD) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 79-86.

The entering of helicopter navigation data by voice command instead of keyboard punching promises to ease the visual and manual workloads currently experienced by US Army helicopter pilots when flying below treetop level to avoid detection. A comparative evaluation is made of voice and keyboard methods in the case of a Doppler navigation set furnishing worldwide navigation data in universal transverse Mercator coordinates, while the helicopter simulator is operating in level flight and in terrain-following flight. Speed of data entry is found to be greater overall with the keyboard than with the voice, although neither method disrupted flight performance. O.C.

A86-29860*# Psycho-Linguistic Research Associates, Menlo Park, Calif.
SPEECH VARIABILITY EFFECTS ON RECOGNITION ACCURACY ASSOCIATED WITH CONCURRENT TASK PERFORMANCE BY PILOTS
C. A. SIMPSON (Psycho-Linguistic Research Associates, Menlo Park, CA) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 87-102. refs
(Contract NAS2-11431)

In the present study of the responses of pairs of pilots to aircraft warning classification tasks using an isolated word, speaker-dependent speech recognition system, the induced stress was manipulated by means of different scoring procedures for the classification task and by the inclusion of a competitive manual control task. Both speech patterns and recognition accuracy were analyzed, and recognition errors were recorded by type for an isolated word speaker-dependent system and by an offline technique for a connected word speaker-dependent system. While errors increased with task loading for the isolated word system, there was no such effect for task loading in the case of the connected word system. O.C.

A86-29861#
DEVELOPMENT OF A COMPREHENSIVE VOICE MESSAGE VOCABULARY FOR TACTICAL AIRCRAFT
D. J. FOLDS (Georgia Institute of Technology, Atlanta) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 103-110. refs
(Contract F33615-83-D-0601)

Synthetic speech messages are currently implemented in some tactical aircraft and speech message systems have been proposed for others. The purpose of the present research was to obtain the judgments of tactical pilots and researchers in the field concerning the best uses of voice messages in near-term tactical aircraft, and to integrate those judgments into a comprehensive message ensemble for tactical aircraft. Results from the pilot survey are presented and unresolved issues are discussed. Author

A86-29866#
SELECTING COLOR CODES FOR A COMPUTER-GENERATED TOPOGRAPHIC MAP BASED ON PERCEPTION EXPERIMENTS AND FUNCTIONAL REQUIREMENTS
A. SPIKER, S. P. ROGERS, and J. CICINELLI (Anacapa Sciences, Inc., Santa Barbara, CA) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 151-158. refs

The development of computer-generated topographic displays (CGTDs) for Army helicopter and other tactical vehicles provides a number of advantages related to terrain-correlation navigation, mission planning, and enroute navigation. A selection of suitable color code displays based on a study of human factors and functional requirements, can be a great help in an efficient implementation of functions to be provided by the CGTD. Attention is given to the digital map system, the primary functional requirements with respect to color and symbology, color naming studies involving the employment of 40 subjects in four experiments, map search studies with 20 subjects, and color set recommendations. It is concluded that depending on the distribution of chromaticities and luminances in the color set, color contrast, brightness contrast, and Gaussian spread may either hinder or help performance. G.R.

A86-29869#
LUMINANCE CONTRAST REQUIREMENTS FOR LEGIBILITY OF SYMBOLS ON COMPUTER-GENERATED MAP DISPLAYS IN AIRCRAFT COCKPITS
S. P. ROGERS, A. SPIKER, and J. CICINELLI (Anacapa Sciences, Inc., Santa Barbara, CA) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 175-182. refs
(Contract DAAK80-81-C-0089)

Difficulties regarding the translation of research findings into design recommendations in the case of symbol luminance have been related to inconsistent results. The present paper is concerned with studies which have been conducted with the aim to avoid the shortcomings of earlier investigations. In the described experiments, luminance and luminance contrast effects in low, moderate, and high ambient illumination environments are examined. The obtained results confirm and extend previous findings in the visual adaptation area. Average response time decreased with increases in contrast ratio, decreases in adaptation luminance, and increases in display background luminance. The result of the current investigation underlines the importance of basing cockpit display design decisions on quantitative perceptual data. G.R.

A86-29871#
POTENTIAL CONTROLLER ERROR MODES IN AUTOMATED EN ROUTE ATC (AERA)
J. B. MCKINLEY and R. J. JAGO (Systems Control Technology, Inc., Washington, DC) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 189-197. Research sponsored by the Martin Marietta Corp. refs

A snapshot of an ongoing human factors evaluation for the FAA's Advanced Automation System program is presented. In particular, the anticipated Automated En Route Air Traffic Control (AERA) controller's functions and tasks are described. Potential error modes that may be attributable to system error causes such as attention, judgment, and communication are identified. Finally, AERA controller training implications are discussed and primary skill requirements are described for each of the AERA control processes. C.D.

A86-29873#
COPING WITH AUTOMATION - AN AIRLINE VIEW
R. G. BULEY (Republic Airlines, Inc., Minneapolis, MN) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 207-214.

The formation of a systematic approach to aircraft automation is examined. The need to have aircraft manufacturers develop a man-machine interface designed to airline specifications is discussed. The role of humans in present and future systems is described. Proper management of resources which extracts the maximum benefits from human and automated resources is required for the airlines to successfully utilize automation. I.F.

A86-29874*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CAN PILOTS TIME-SHARE BETTER THAN NON-PILOTS?
P. S. TSANG (NASA, Ames Research Center, Moffett Field, CA) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 215-222. refs

The time-sharing ability of 12 male pilots and 12 male college students ranging in age from 18-36 are evaluated and compared. The subjects performed five pairs of dual tasks with varying degrees of structural similarity; the test procedures are described. The time-sharing efficiency and resource allocation optimality of the subjects are analyzed. The data reveal that the pilots and students display similar time-sharing performance; the degree of time-sharing efficiency decreases and resource allocation optimality increases with an increasing degree of structural similarity between the time-shared tasks. I.F.

A86-29875*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CAUSES OF DISSOCIATION BETWEEN SUBJECTIVE WORKLOAD MEASURES AND PERFORMANCE - CAVEATS FOR THE USE OF SUBJECTIVE ASSESSMENTS
M. A. VIDULICH (NASA, Ames Research Center, Moffett Field, CA) and C. D. WICKENS (Illinois, University, Champaign) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 223-230. refs
(Contract N00014-79-C-0658)

Dissociations between subjective workload assessments and performance were investigated. The difficulty of a Sternberg memory search task was manipulated by varying stimulus presentation rate, stimulus discernibility, value of good performance, and automaticity of performance. All Sternberg task conditions were performed both alone and concurrently with a tracking task. Bipolar subjective workload assessments were collected. Dissociations between workload and performance were found related to automaticity, presentation rate, and motivation level. The results were interpreted as supporting the hypothesis that the specific cognitive processes responsible for subjective assessments can differ from those responsible for performance. The potential contamination these dissociations could inflict on operational workload assessments is discussed. Author

A86-29876#
RELATIVE CONTRIBUTIONS OF SWAT DIMENSIONS TO OVERALL SUBJECTIVE WORKLOAD RATINGS
S. S. POTTER and W. H. ACTON (Systems Research Laboratories, Inc., Dayton, OH) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 231-238. refs

The present study investigated several aspects of the Subjective Workload Assessment Technique (SWAT) using a recall task designed to place demands upon short term memory processing. Reaction time data, SWAT ratings, and ratings on overall task difficulty proved sensitive to demand manipulations, and the correlation between the two subjective scales was significant. The results also indicated differential sensitivity between the three SWAT subscales, which supports the assumption that the three dimensions in SWAT represent separate dimensions of subjective load. This finding has significant implications for the application of SWAT in operational settings. System designers are not only concerned with the overall degree of workload imposed by a system, but also need information about the specific aspects which are responsible for producing the high levels of workload. Author

A86-29877*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
TECHNIQUES OF SUBJECTIVE WORKLOAD ASSESSMENT - A COMPARISON OF TWO METHODOLOGIES
M. A. VIDULICH and P. S. TSANG (NASA, Ames Research Center, Moffett Field, CA) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 239-246. refs

With increasing complexity of systems, evaluation techniques based on close examination of an operator's performance become more and more difficult to perform, and it is much easier to base on evaluation of a workload on the opinion of the operator involved in performing the task. The present paper has the objective to compare two of the general subjective workload assessment techniques which have been developed. One of these techniques, the Subjective Workload Assessment Technique (SWAT), has been developed primarily at the USAF Aerospace Medical Research Laboratory for use in cockpit environments. The second technique, the NASA weighted-bipolar technique, is a development tool to examine the underlying relationships among many factors. One of the two goals of the study is concerned with the general validity of subjective workload assessments, while, according to the second goal, any particular strengths or weaknesses with respect to either of the two techniques are to be observed. It is concluded that both techniques appear to be worthwhile. G.R.

A86-29878#
SUBJECTIVE ASSESSMENT OF PILOT WORKLOAD IN THE ADVANCED FIGHTER COCKPIT
S. D. DETRO (BDM Corp., Brookville, OH) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 247-254.

In connection with the development of advanced cockpit design concepts, it is vital that the workload for the pilot in the context of human-machine interactions does not exceed inherent human limitations. On the basis of cost considerations, a validation of cockpit concepts at an early design stage is crucial. Two procedural variants of the Subjective Workload Assessment Technique (SWAT) have been developed for the evaluation of tentative cockpit designs. In a combination of the SWAT technique and another subjective technique, called Ground Attack Tactics Survey (GATS), quantitative data can be effectively derived from structured interviews with 'expert operators' of similar systems. The considered techniques were used to explore the workload implications of advanced crew system control and display concepts for an advanced fighter cockpit when prototype aircrew protection

equipment (Chemical, Biological, and Radiological /CBR/) was also in use. G.R.

A86-29880*# BITS, Inc., West Layfayette, Ind.
MEASURING PILOT WORKLOAD IN A MOTION BASE TRAINER - A COMPARISON OF FOUR TECHNIQUES
M. R. BORTOLUSSI, B. H. KANTOWITZ (BITS, Inc., West Lafayette, IN), and S. G. HART (NASA, Ames Research Center, Moffett Field, CA) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 263-270. refs
(Contract NCC2-228)

Various techniques have been developed to predict and measure pilot workload. This simulation was conducted in order to compare four widely used methods: A visual two- and four-choice reaction time task, time production, retrospective multi-dimensional subjective ratings and in-flight verbal workload estimates. Two scenarios with different levels of difficulty determined by preliminary research were designed to test these techniques. The insertion of the secondary tasks did not significantly affect flight performance. All four techniques were able to distinguish among levels of scenario complexity. In addition, the three secondary tasks and workload ratings obtained in-flight were generally able to distinguish among levels of difficulty for different segments within the scenarios. Author

A86-29881#
TIME-SHARING REVISED - TEST OF A COMPONENTIAL MODEL FOR THE ASSESSMENT OF INDIVIDUAL DIFFERENCES
R. BRAUNE and C. D. WICKENS (Illinois, University, Savoy) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 271-278. refs
(Contract N00204-82-C-0113)

In many systems, taking into account also nuclear power plants and modern-day aircraft, the human operator is required to control and/or monitor several tsks in parallel. Any differences in 'time-sharing efficiency' during the operation of some systems, such as those in a current fighter aircraft, can be crucial for the success. For this reason, it appears important to have information about individual differences occurring in people with respect to their ability for time-sharing performance. A componential model of time-sharing performance was, therefore, tested. It was found that the notion of a general time-sharing ability could not be rejected due to the high intercorrelations between the extracted factors. Preliminary results of a second-order factor analysis suggest the existence of a general time-sharing factor. This factor appears to represent a bipolar continuum related to attention switching and parallel processing of heterogeneous dynamics. G.R.

A86-29918#
AN INVESTIGATION REGARDING THE USE OF A DYNAMIC SEAT-PAN DISPLAY FOR TRAINING AND AS A DEVICE FOR COMMUNICATING ROLL-AXIS MOTION INFORMATION
E. A. MARTIN (USAF, Aeronautical Systems Div., Wright-Patterson AFB, OH) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 591-600. refs

This paper describes a research program conducted to determine the feasibility of providing useful angular onset-motion information via a broad-area tactual seat-pan display. The experiment was designed to permit the evaluation of the utility of the display as a training device as well as its efficacy for imparting motion information. The results indicate that - with proper attention given the drive law the tactual display can elicit both performance and control behavior indistinguishable from that observed in a whole-body motion environment. Unfortunately, the training transfer results were not so encouraging. These indicated that the seat-pan display as used in this study was not adequate for training naive subjects to properly interpret and use the motion information available in a whole-body motion environment. Author

A86-29920#
TACTUAL CUING CAN PRODUCE BETTER PERFORMANCE THAN VISUAL CUING
M. K. SNELL (Systems Research Laboratories, Inc., Dayton, OH), J. M. FLACH (Illinois, University, Urbana), G. R. MCMILLAN, and R. WARREN (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 609-616. refs

Three experiments were conducted to investigate the relative utility of g-seat tactual motion cuing (cuing imparted by a moving seat pan) and visual motion cuing (cuing imparted by a schematic attitude indicator) to subjects performing a compensatory roll-axis tracking task. The studies compared tracking performances with three motion cuing conditions: g-seat plus visual, g-seat alone, and visual alone. The lowest error scores occurred when the g-seat plus visual cuing conditions were used. When used separately, the g-seat produced significantly lower error scores than the visual condition. A whole-body motion plus visual condition was included for comparison. Author

A86-30149
ENVIRONMENTAL CONSIDERATIONS AND WASTE PLANNING ON THE LUNAR SURFACE
R. BRIGGS and A. SACCO, JR. (Worcester Polytechnic Institute, MA) IN: Lunar bases and space activities of the 21st century . Houston, TX, Lunar and Planetary Institute, 1985, p. 423-430. refs

Developments related to the establishment and maintenance of a lunar facility are examined, taking into account arising waste and environmental problems. Processes to obtain oxygen on the moon from lunar ilmenite for a transport to low earth orbit (LEO) are discussed along with questions of life support on the moon, the utilization of nuclear power for lunar needs, the transport of man and materials to low lunar orbit (LLO), and transportation between LLO and LEO. Waste and environmental problems are partly related to the desirability to preserve the present perfect environmental conditions for an astronomical observation post on the far side of the moon. In addition, it will be necessary to comply with an international treaty which stipulates, among other things, that harmful contamination of the moon is to be avoided. A summary of environmental considerations arising from lunar operations is presented. G.R.

A86-30164* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE EVOLUTION OF CELSS FOR LUNAR BASES
R. D. MACELROY, H. P. KLEIN (NASA, Ames Research Center, Moffett Field, CA), and M. M. AVERNER (New Hampshire, University, Durham) IN: Lunar bases and space activities of the 21st century . Houston, TX, Lunar and Planetary Institute, 1985, p. 623-633. refs

A bioregenerative life support system designed to address the fundamental requirements of a functioning independent lunar base is presented in full. Issues to be discussed are associated with CELSS weight, volume and cost of operation. The fundamental CELSS component is a small, highly automated module containing plants which photosynthesize and provide the crew with food, water and oxygen. Hydrogen, nitrogen and carbon dioxide will be initially brought in from earth, recycled and their waste products conserved. As the insufficiency of buffers necessitates stringent cybernetic control, a stable state will be maintained by computer control. Through genetic engineering and carbon dioxide, temperature, and nutrient manipulation, plant productivity can be increased, while the area necessary for growth and illumination energy decreased. In addition, photosynthetic efficiency can be enhanced through lamp design, fiber optics and the use of appropriate wavelengths. Crop maintenance will be performed by robotics, as a means of preventing plant ailments. K.K.

A86-30167* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
IMPLEMENTING SUPERCRITICAL WATER OXIDATION TECHNOLOGY IN A LUNAR BASE ENVIRONMENTAL CONTROL/LIFE SUPPORT SYSTEM
M. MEYER SEDEJ (NASA, Johnson Space Center, Houston, TX) IN: Lunar bases and space activities of the 21st century . Houston, TX, Lunar and Planetary Institute, 1985, p. 653-661. refs

A supercritical water oxidation system (SCWOS) offers several advantages for a lunar base environmental control/life support system (ECLSS) compared to an ECLSS based on Space Station technology. In supercritically heated water (630 K, 250 atm) organic materials mix freely with oxygen and undergo complete combustion. Inorganic salts lose solubility and precipitate out. Implementation of SCWOS can make an ECLSS more efficient and reliable by elimination of several subsystems and by reduction in potential losses of life support consumables. More complete closure of the total system reduces resupply requirements from the earth, a crucial cost item in maintaining a lunar base. Author

A86-32315
EFFECTS OF ADAPTATION AND DISPLAY LUMINANCE ON CRT SYMBOL RECOGNITION TIME
A. SPIKER, S. P. ROGERS, and J. CICINELLI (Anacapa Sciences, Inc., Santa Barbara, CA) IN: Advances in display technology V; Proceedings of the Meeting, Los Angeles, CA, January 24, 25, 1985 . Bellingham, WA, SPIE - The International Society for Optical Engineering, 1985, p. 13-20. refs
(Contract DAAK80-81-C-0089)

The inability of the human visual system to adapt quickly to a wide range of environmental luminances poses a stiff challenge to the design of airborne displays. Using a repeated measures factorial design, the present study investigated the independent and interactive effects of adaptation luminance, contrast ratio, and display background luminance on this 'eye adaptation mismatch' phenomenon. Adaptation luminances ranged from 1 fL to 10,000 fL, with legibility defined as the time required by observers to recognize CRT symbols. Overall, response time increased systematically with increases in adaptation luminance, and decreased with increases in contrast ratio and display background luminance. Additional analyses revealed that contrast ratio and display luminance influence response time multiplicatively, such that quests to maintain large contrast ratios under bright ambient light at the expense of lowered display luminance could exaggerate the mismatch between adaptation luminance and display luminance and thus degrade symbol legibility. Author

A86-32316
MINIMUM COLOUR DIFFERENCES REQUIRED TO RECOGNISE SMALL OBJECTS ON A COLOUR CRT
P. L. PHILLIPS (British Aerospace, PLC, Sowerby Research Centre, Bristol, England) IN: Advances in display technology V; Proceedings of the Meeting, Los Angeles, CA, January 24, 25, 1985 . Bellingham, WA, SPIE - The International Society for Optical Engineering, 1985, p. 21-34. Sponsorship: Ministry of Defence. refs
(Contract MOD RP42-3)

Data were obtained on the eye's sensitivity to irregular objects viewed at small subtense, to extend the current standards and methods available for both military and general use for evaluating the color and other displays. Computer-controlled CRT was employed on a variety of background and object colorings, to measure the threshold color difference that an observer requires between an object and background, so that he can discriminate a variety of similar objects. The results are presented in the CIE international colorimetric system. It was shown that larger color differences are required for object recognition than those assumed from conventional color discrimination data. A simple relationship to account for object size and background color is suggested to aid in visual performance assessments and mathematical modeling. I.S.

A86-32317
THE RASTERED EYE - VISION IN TELEVISION
R. E. CLAPP (Boeing Military Airplane Co., Wichita, KS) IN: Advances in display technology V; Proceedings of the Meeting, Los Angeles, CA, January 24, 25, 1985 . Bellingham, WA, SPIE - The International Society for Optical Engineering, 1985, p. 36-42.

Limiting resolution criteria for detection, orientation, recognition and identification of objects in the visual scene or display have been developed using static high contrast targets. Misconception or misapplication of these criteria to television systems has led to underspecification or underdesign of visual display systems by a factor of 3 to 4 times. Limiting resolution criteria for rastered visual display systems are presented, together with other visual parameter effects. These criteria are used to develop 'standard' sets of parameters for the specification of raster visual display systems. Author

A86-32451* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
WINDOW OF VISIBILITY - A PSYCHOPHYSICAL THEORY OF FIDELITY IN TIME-SAMPLED VISUAL MOTION DISPLAYS
A. B. WATSON, A. J. AHUMADA, JR., and J. E. FARRELL (NASA, Ames Research Center, Moffett Field, CA) Optical Society of America, Journal, A: Optics and Image Science (ISSN 0740-3232), vol. 3, March 1986, p. 300-307. refs

A film of an object in motion presents on the screen a sequence of static views, while the human observer sees the object moving smoothly across the screen. Questions related to the perceptual identity of continuous and stroboscopic displays are examined. Time-sampled moving images are considered along with the contrast distribution of continuous motion, the contrast distribution of stroboscopic motion, the frequency spectrum of continuous motion, the frequency spectrum of stroboscopic motion, the approximation of the limits of human visual sensitivity to spatial and temporal frequencies by a window of visibility, the critical sampling frequency, the contrast distribution of staircase motion and the frequency spectrum of this motion, and the spatial dependence of the critical sampling frequency. Attention is given to apparent motion, models of motion, image recording, and computer-generated imagery. G.R.

A86-33183* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ROBOTS AS MAN-EXTENSION SYSTEMS IN SPACE
A. K. BEJCZY (California Institute of Technology, Jet Propulsion Laboratory, Pasadena) IN: A bridge between control science and technology. Volume 5 . Oxford and New York, Pergamon Press, 1985, p. 2411-2416. NASA-supported research. refs

The main topic of the paper is sensing and computer based automation and man-machine interface devices and techniques which permit task-level and 'intelligent' two-way communication between human operator and remote robot in earth orbit. General considerations are presented on control and information problems in teleoperation and on the characteristics of earth orbital teleoperation. Specific control and information display devices and techniques are discussed and exemplified with development results obtained at the Jet Propulsion Laboratory (JPL) in recent years. Author

A86-33184
INTERACTION BETWEEN CONTROLLING, PLANNING, AND FAULT MANAGING IN COMPLEX MAN-MACHINE SYSTEMS
G. JOHANNSEN (Kassel, Gesamthochschule, West Germany) IN: A bridge between control science and technology. Volume 5 . Oxford and New York, Pergamon Press, 1985, p. 2541-2545. refs

The three main task categories in man-machine systems are controlling, planning, and fault managing which are briefly explained in the paper. Their interaction is illustrated schematically with a block diagram and further outlined using Rasmussen's cognitive levels of behaviour. Two paradigms, namely car driving and aircraft piloting, exemplify the nature of the interaction in more detail, partially based on experimental results. The state-of-the-art in

modelling these task categories and their interaction is discussed with an emphasis on qualitative vs. quantitative models using control theory, artificial intelligence techniques, and fuzzy set theory. Model-based support and expert systems are mentioned as an important future application. Author

A86-33186
MULTI-COMPONENT CHARACTERIZATION OF THE HUMAN OPERATOR'S CONTROL OUTPUT
T. YOSHIDA (Matsue Technical College, Japan) and H. TAMURA (Osaka University, Toyonaka, Japan) IN: A bridge between control science and technology. Volume 5 . Oxford and New York, Pergamon Press, 1985, p. 2603-2608. refs

In this paper the human control output in the manual control system is studied under the assumption that it consists of three components. The first is a input component which assumed to be a continuous function of time generated by the input model in operator's brain. The second is a system component which takes place, depending on the current state of the error. The third is the psychophysical noise of the operator. The existence of each component is experimentally ascertained. Next, the control output is subdivided into two phases based on remnant, and the roles of the input and the system component are clarified. These results support that the control logic is reflected on remnant and that the proposed conceptional model is valid. Author

A86-33187
A UNIFYING APPROACH TO HUMAN PILOT MODELLING
R. A. HESS (California, University, Davis) IN: A bridge between control science and technology. Volume 5 . Oxford and New York, Pergamon Press, 1985, p. 2609-2613. refs

The data base supporting models of the human pilot participating in well defined single-axis tracking tasks can be considered essentially complete as regards the effects of aircraft dynamics and disturbance characteristics. Despite this fact, certain fundamental and interesting questions have only recently been addressed or remain unanswered. Among these are the following: (1) By what mechanism does the human pilot generate the dynamic equalization required in tracking tasks? (2) How might the human utilize an 'internal model' of the environment in these tasks? (3) What causes nonlinear pilot behavior when controlling higher-order dynamics? (4) How do manipulator characteristics effect human pilot dynamics and performance? (5) How does the human organize his perceptions in pursuit as opposed to compensatory tracking? (6) How does the human quantify his subjective impressions of task difficulty or handling qualities? With these and related issues in mind, a 'structural model' of the human pilot is discussed. The model is shown to be descriptive rather than predictive in nature and is shown to have its basis in an hypothesized feedback structure involving the human neuromuscular system. Selecting pertinent examples from experimental results reported in the literature, the questions just raised are discussed and the potential of the structural model to answer them in a unified manner is demonstrated. Author

A86-33188
EXPERT COMPUTER AIDED DECISION IN SUPERVISORY CONTROL
A. BISSERET (Institut National de Recherche en Informatique et en Automatique, Le Chesnay, France) IN: A bridge between control science and technology. Volume 5 . Oxford and New York, Pergamon Press, 1985, p. 2621-2626. refs

Supervisory control is changing from surveillance on large classical control panels to a surveillance on computer displays with the use of man-computer dialogues. The displayed information of course can be sophisticated, and interesting efforts currently pursued in this direction are presented. But moreover it should become possible to have the computer participate directly to the decision activities. The concept of expert system might be promising but only for already expert activity. This paper insists on the non-expert but necessary problem solving activity of the supervisors facing unforeseen situations. The development of research towards computer aid specific to this activity is stressed. Examples of recent advances in cognitive psychology and artificial intelligence are suggested as directions for this development. Author

A86-33322
ELECTRONIC DISPLAYS [ELEKTRONNYE PRIBORY DLIA OTOBRAZHENIIA INFORMATSII]
IU. A. BYSTROV, I. I. LITVAK, and G. M. PERSIANOV Moscow, Izdatel'stvo Radio i Sviaz', 1985, 240 p. In Russian. refs

The design and principles of operation of electronic displays are reviewed, as are engineering and psychological problems associated with the use of such displays in ergodic systems. In particular, attention is given to the classification of electronic displays, their principal parameters, control systems for electronic displays, and applications. The types of displays discussed include cathode-ray tube displays, vacuum incandescent and luminescent displays, liquid-crystal displays, electrochromic displays, graphic fluorescent indicator panels, and laser displays. V.L.

A86-33324
INFORMATION DISPLAY COMPLEXES [KOMPLEKSY SREDSTV OTOBRAZHENIIA INFORMATSII]
V. N. REVENKO and V. M. SEGAL Moscow, Izdatel'stvo Radio i Sviaz', 1985, 217 p. In Russian. refs

An approach to the design and development of displays for automatic control systems operating in real time is presented. A classification of display systems is proposed, and interfacing of displays with the mainframe computer is discussed. An algorithm is proposed for determining the optimal distribution of functions between the hardware and the software of a display. The discussion also covers an analysis and modeling of CRT displays, general and special display software, evaluation of the performance and cost effectiveness of displays, and consideration of the human factor in designing display systems. V.L.

N86-23264# Joint Publications Research Service, Arlington, Va.
OXYGEN-LIBERATING MIXTURES FOR BREATHING APPARATUS Abstract Only
In its USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-004) p 131 12 Mar. 1986 Transl. into ENGLISH from Sovetskaya Belorussiya (Minsk, USSR), 10 Dec. 1985 p 4
Avail: NTIS HC A07/MF A01

Mixtures which are capable at any time of releasing their stored oxygen were prepared. When heated, 100 grams of a substance ground into powder releases more than 40 liters of gas. This is enough to sustain human respiration for several hours in extreme conditions. Such a need may arises in medical practice, in mines, under water, and high in the mountains. The development of these alloys is the result of theoretical and experimental work. Their components are mixtures of salts and inorganic peroxides.
E.A.K.

N86-23281# Lawrence Livermore National Lab., Calif.
DESIGN GUIDELINES FOR THE USE OF AUDIO CUES IN COMPUTER INTERFACES
D. A. SUMIKAWA, M. M. BLATTNER, K. I. JOY, and R. M. GREENBERG Jul. 1985 25 p Presented at the 19th Annual Hawaii International Conference on System Sciences, Honolulu, Hawaii, 8 Jan. 1986 Prepared in cooperation with California Univ., Davis, Calif.
(Contract W-7405-ENG-48)
(DE85-015176; UCRL-92925; CONF-860107-1) Avail: NTIS HC A02/MF A01

A logical next step in the evolution of the computer-user interface is the incorporation of sound thereby using our senses of hearing in our communication with the computer. This allows our visual and auditory capacities to work in unison leading to a more effective and efficient interpretation of information received from the computer than by sight alone. In this paper we examine earcons, which are audio cues, used in the computer-user interface to provide information and feedback to the user about computer entities (these include messages and functions, as well as states and labels). The material in this paper is part of a larger study

that recommends guidelines for the design and use of audio cues in the computer-user interface. The complete work examines the disciplines of music, psychology, communication theory, advertising, and psychoacoustics to discover how sound is utilized and analyzed in those areas. The resulting information is organized according to the theory of semiotics, the theory of signs, into the syntax, semantics, and pragmatics of communication by sound. Here we present design guidelines for the syntax of earcons. DOE

N86-24216 Kansas State Univ., Manhattan.
STOCHASTIC MODELS OF MAN-MACHINE SYSTEM EFFECTIVENESS Ph.D. Thesis
K. W. LEE 1985 360 p
Avail: Univ. Microfilms Order No. DA8528018

A human performance reliability model was developed to introduce the human operator effect into the system effectiveness model. The model can predict quantitatively how much the human aspects of the man-machine system contribute to the system unreliability. Mission effectiveness models that provide a realistic measurement of system effectiveness are presented. It depicts interrelationships between the components of the mission system and shows a way to properly integrate the human operator into mission effectiveness. For situations in which there are too many computational difficulties in developing the models, the simulation approach is more practical than the analytical approach. To demonstrate the sensitivity of the probabilistic assumptions for the system variables to the mission effectiveness, a robustness test is performed. To identify system variables sensitive to mission effectiveness can be obtained by allocating more effort to estimating these variables. The models developed will lead to a more valid effectiveness analysis output and provide a useful tool for consistent system evaluation. Dissert. Abstr.

N86-24217*# Essex Corp., Huntsville, Ala. Space Systems Group.
THE SYSTEM INTEGRATION AND VERIFICATION TESTING OF AN ORBITAL MANEUVERING VEHICLE FOR AN AIR BEARING FLOOR Final Report
N. L. SHIELDS, JR., M. F. MARTIN, K. R. PAULUKAITIS, J. W. HASLAM, JR., and D. E. HENDERSON 22 Feb. 1986 125 p refs
(Contract NAS8-35636)
(NASA-CR-178350; NAS 1.26:178350; H-86-02) Avail: NTIS HC A06/MF A01 CSCL 05H

The teleoperator and Robotics Evaluation Facility (TOREF) is composed of a 4,000 square foot precision air bearing floor, the Teleoperator Motion Base, the Target Motion and Support Simulator, the mock-ups of the Hubble Space Telescope, Multi-mission Modular Spacecraft, and the Orbital Maneuvering Vehicle (OMV). The TOREF and its general capabilities to support the OMV and other remote system simulations; the facility operating procedures and requirements; and the results of generic OMV investigations are summarized. B.G.

N86-24218# Army Research Inst. of Environmental Medicine, Natick, Mass.
EFFECT OF HEAT AND CHEMICAL PROTECTIVE CLOTHING ON COGNITIVE PERFORMANCE Final Report
B. J. FINE and J. L. KOBRICK Nov. 1985 27 p
(AD-A162001; USARIEM-M-4/86) Avail: NTIS HC A03/MF A01 CSCL 06Q

This study examined the effects of heat on the sustained cognitive performance of sedentary soldiers clad in chemical protective clothing, Twenty males trained for 2 weeks on selected military tasks. Then, they performed the tasks for 7-hour periods on 4 successive days in hot (32.8C.,61%rh) and normal (21.1C35%rh) conditions, with and without protective clothing. After 4 to 5 hours in the heat wearing protective clothing, the cognitive performance of the group began to deteriorate markedly. By the end of 7 hrs. of heat, increases in % group error on investigator-paced tasks ranged from 17% to 235 over control conditions. Virtually all of the decrements were due to increases in errors of omission. The productivity of the group on a self-paced task (map plotting) diminished by approximately 40% from control conditions after 6 hrs. in the heat in protective clothing; accuracy of plotting was not markedly affected. GRA

N86-24219# Army Research Inst. of Environmental Medicine, Natick, Mass.
EFFECTIVENESS OF AN AIR-COOLED VEST USING SELECTED AIR TEMPERATURE AND HUMIDITY COMBINATIONS
N. A. PRIMENTAL, H. M. COSIMINI, M. N. SAWKA, and C. B. WENGER Nov. 1985 25 p
(AD-A162026; USARIEM-M5/86) Avail: NTIS HC A02/MF A01 CSCL 06Q

We evaluated the effectiveness of an air-cooled vest in reducing thermal strain when supplied with five different dry bulb (db) and dew point (dp) temperature combinations. The combinations were selected to determine minimal air conditioning requirements for various military vehicles. Four male soldiers attempted twelve, 300-min heat exposures (49 C db, 20 C dp) at metabolic rates of 175 and 315 W. They wore chemical protective clothing over the combat vehicle crewman uniform; on ten of the test days, they also wore the air-cooled vest. Air supplied to the vest ranged from 20-27 C db, 7-18 C dp. Without the vest, endurance times were 118 min (175 W) and 73 min (315 W). Endurance times with the vest were 300 min (175 W) and 242-300 min (315 W). Rectal temperatures, heart rates and sweating rates were reduced dramatically with the air at the lower dry bulb temperature. We conclude that effective combinations of cooled and dehumidified air can be provided on military vehicles to reduce the crewmen's thermal strain, with minimized size and weight penalties. GRA

N86-24220# Naval Postgraduate School, Monterey, Calif.
THE DESIGN OF NATURAL LANGUAGE INTERFACES M.S. Thesis
I. KOTROZOS Sep. 1985 110 p
(AD-A162181) Avail: NTIS HC A06/MF A01 CSCL 05H

One of the possible solutions to the problem of designing effective man-machine interfaces seems to be the use of natural languages. This thesis examines the principles of design of effective man-machine interfaces, the role of natural languages in achieving effective man-machine communication and the implementation issues and techniques for their use as interfaces. GRA

N86-24221# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
AN EXAMINATION OF THE LIFE SUPPORT EQUIPMENT DEVELOPMENT AND ACQUISITION PROCESS M.S. Thesis
J. J. MOYER Sep. 1985 66 p
(AD-A162241; AFIT/GSM/XPX/85S-24) Avail: NTIS HC A04/MF A01 CSCL 15E

The process of life support equipment development and acquisition is examined. This research identified the how the present process works, and the problems of the process. The research was limited to the development and acquisition of life support equipment for tactical aircraft. However, most of the problems and steps of the process are shared by life support equipment programs for other users. The process was determined by referring to applicable regulations and interviewing people involved in the process. Problems were identified during interviews, and by examining the process as a whole. Seven problems are identified, of which five are considered correctable in the current defense acquisition framework. Four of the five problems deal with the management of the acquisition and development process, and combined indicate the lack of an integrated approach. Solutions were developed from suggestions obtained during the interviews and through qualitative analysis of the problems. An integrated solution is proposed in the recommendations. GRA

N86-24222# Naval Postgraduate School, Monterey, Calif.
HUMAN FACTORS ENGINEERING AND OPERABILITY IN THE DESIGN OF ELECTRONIC WARFARE SPACES ABOARD UNITED STATES NAVAL COMBATANTS M.S. Thesis
D. J. BLAUSER, JR. Sep. 1985 118 p
(AD-A162251) Avail: NTIS HC A06/MF A01 CSCL 17D

The purpose of this thesis is to present and discuss a a method of assessing the effectiveness of a work space layout. In addition, this method will provide the framework for pinpointing those areas of layout design where redesign will be most cost effective. The objective is to address inefficiencies in the layout of warfare modules on U.S. Navy combatants. In particular, the Electronic Warfare Module on aircraft carriers is assessed due to the highly time-critical nature of electronic warfare. The method chosen in this thesis is a modification of two techniques of assessment: Integration Analysis and Mission Operability Assessment Technique (MOAT). The portions of these techniques used are Link Analysis, Task Analysis, and Operability Analysis. The application herein concludes that the EW Module layout design on the latest NIMITZ-class aircraft carriers was less than 40% effective in promoting mission accomplishment. GRA

N86-24223# Essex Corp., Westlake Village, Calif. Human Factors and Training Systems Group.
PERSON COMPUTER DIALOGUE: A HUMAN ENGINEERING DATA BASE SUPPLEMENT
B. E. SHAW and M. E. MCCAULEY Jan. 1985 148 p
(Contract F33615-82-C-0513)
(AD-A163074; AFAMRL-TR-85-013) Avail: NTIS HC A07/MF A01 CSCL 09B

This report was prepared as a Human Engineering Data Base Supplement to the Integrated Information for Designers (IPID) Engineering Data Compendium. It was specifically written to aid computer system designers. The body of literature on person-computer dialogue has been gathered and organized into an integrated format. Major topic areas include conceptual comparisons of person-computer dialogue, models for evaluation of dialogue systems, unique considerations of specific user groups, and specific user-system dialogue design considerations. These major areas are subdivided into succinct discussions of highly focused design considerations. Each discussion of design considerations includes a general description, statement of applications, constraints, and key references in addition to the graphic/tabular formatted design guidelines. An extensive bibliography of literature on person-computer dialogue is included. GRA

N86-24527*# Mississippi State Univ., Mississippi State. Dept. of Chemical Engineering.
STANDARDIZATION OF CARBON-PHENOLIC COMPOSITE TEST METHODOLOGY
W. B. HALL *In* NASA. Marshall Space Flight Center Research Reports: 1985 NASA/ASEE Summer Faculty Fellowship Program 27 p Jan. 1986
Avail: NTIS HC A99/MF E04 CSCL 11D

The objective of this study was to evaluate the residual volatiles, filler content, and resin flow test procedures for carbon-phenolic prepreg materials. The residual volatile test procedure was rewritten with tighter procedure control which was then evaluated by round robin testing by four laboratories on the same rolls of prepreg. Results indicated that the residual volatiles test was too operator and equipment dependent to be reliable, and it was recommended that the test be discontinued. The resin flow test procedures were rewritten with tighter procedure control, and it is now considered to be an acceptable test. It was recommended that the filler content determination be made prior to prepregging. Author

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PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

A86-30453*# National Aeronautics and Space Administration, Washington, D.C.
EXOBIOLOGY EXPERIMENTS FOR SPACE STATION
D. L. DEVINCENZI (NASA, Washington, DC) and L. D. GRIFFITHS (GE Management and Technical Services Co., Washington DC) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-185, S-186.

The benefits the Space Station could provide to the study of the origin, evolution, and distribution of life throughout the universe are described. Space Station experiments relevant to the cosmic evolution of biogenic elements and compounds, prebiotic chemical evolution, early evolution of life, and the evolution of advanced life forms are examined. The application of astronomical and astrometric observations to be obtained from the Space Station to the origin of life research is discussed. I.F.

A86-30697* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PHOTOCHEMISTRY OF METHANE AND THE FORMATION OF HYDROCYANIC ACID (HCN) IN THE EARTH'S EARLY ATMOSPHERE
K. J. ZAHNLE (NASA, Ames Research Center, Moffett Field, CA; Michigan, University, Ann Arbor) Journal of Geophysical Research (ISSN 0148-0227), vol. 91, Feb. 20, 1986, p. 2819-2834. refs
(Contract NSF ATM-82-097960)

A one-dimensional photochemical model is used to analyze the photochemistries of CH4 and HCN in the primitive terrestrial atmosphere. CH4, N2, and HCN photolysis are examined. The background atmosphere and boundary conditions applied in the analysis are described. The formation of HCN as a by-product of N2 and CH4 photolysis is investigated; the effects of photodissociation and rainfall on HCN is discussed. The low and high CH4 mixing ratios and radical densities are studied. I.F.

A86-33390
INVESTIGATION ON THE CHIRALITY OF ELECTRONS FROM SR-90-Y-90 BETA-DECAY AND THEIR ASYMMETRICAL INTERACTIONS WITH D- AND L-ALANINES
E. CONTE (Bari, Universita, Italy) Nuovo Cimento, Lettere, Serie 2, vol. 44, Dec. 16, 1985, p. 641-647. refs

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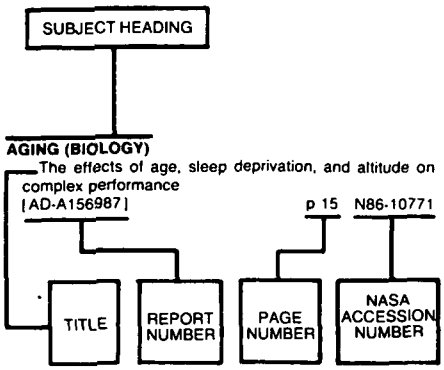

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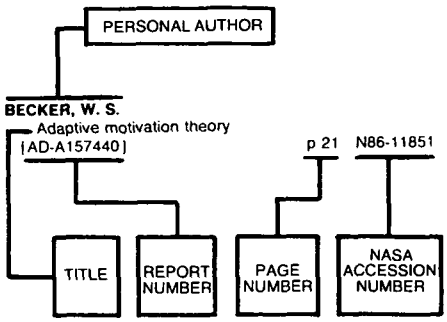

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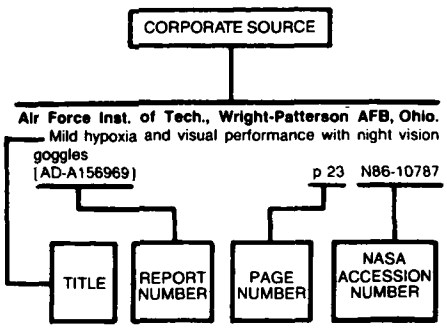

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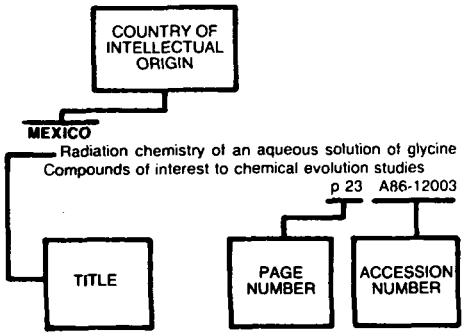

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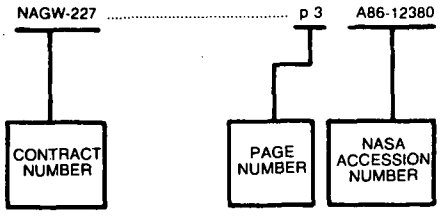

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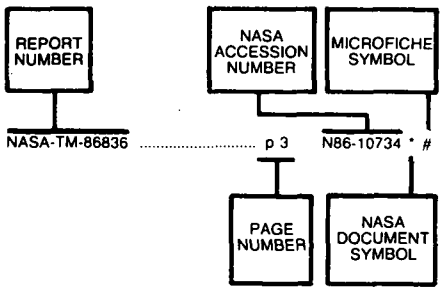

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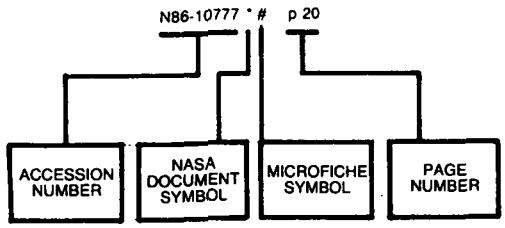

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15. Supplementary Notes

16. Abstract

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