NASA

Aerospace Medicine and Biology
A Continuing Bibliography with Indexes

NASA SP-7011(278)
December 1985

Aerospace Medicine & Biology

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NASA SP-7011(278)
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A Continuing Bibliography with Indexes
Pages 381–416
December 1985

ACCESSION NUMBER RANGES

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

STAR (N-10000 Series)	N85-32089 – N85-34112
IAA (A-10000 Series)	A85-43293 – A85-47054

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NASA SP-7011(278)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 278)

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

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

NASA Scientific and Technical Information Branch 1985
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INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* lists 237 reports, articles and other documents announced during November 1985 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA).* The first issue of the bibliography was published in July 1964.

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

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

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

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

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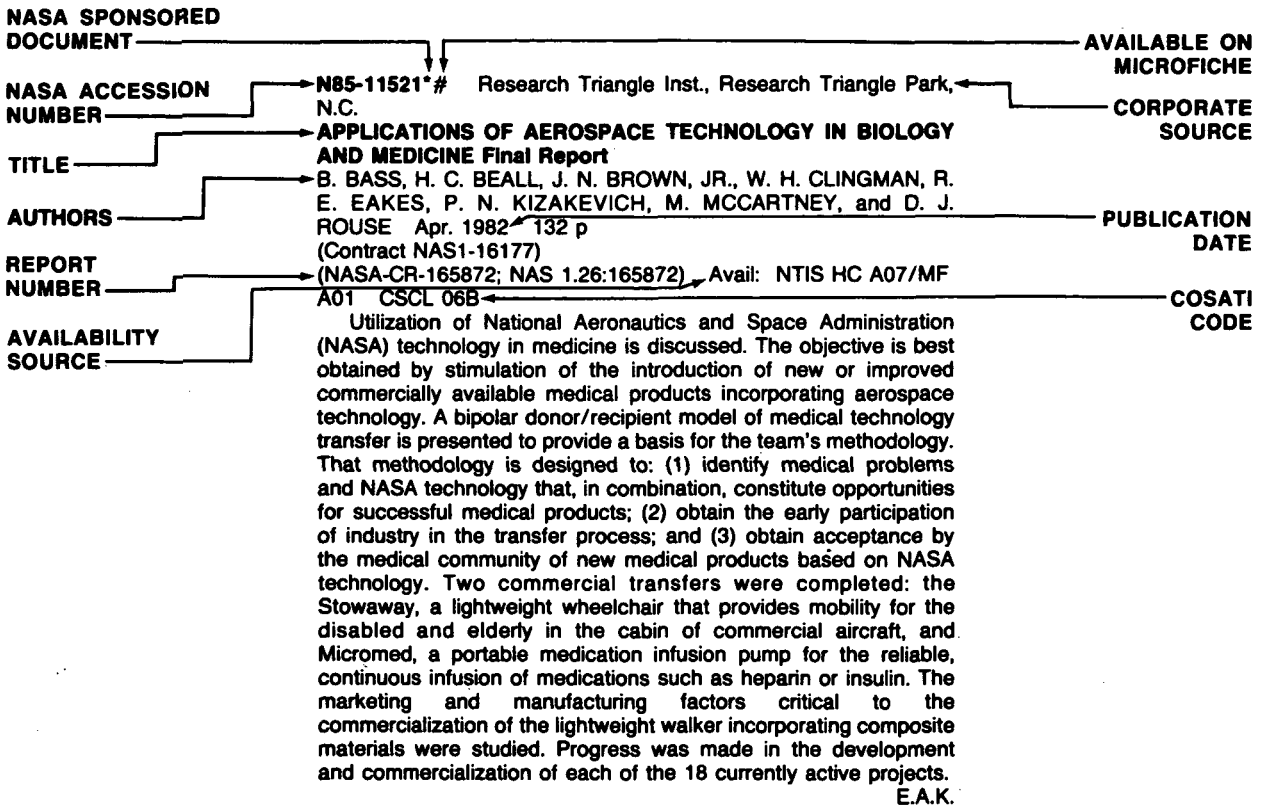

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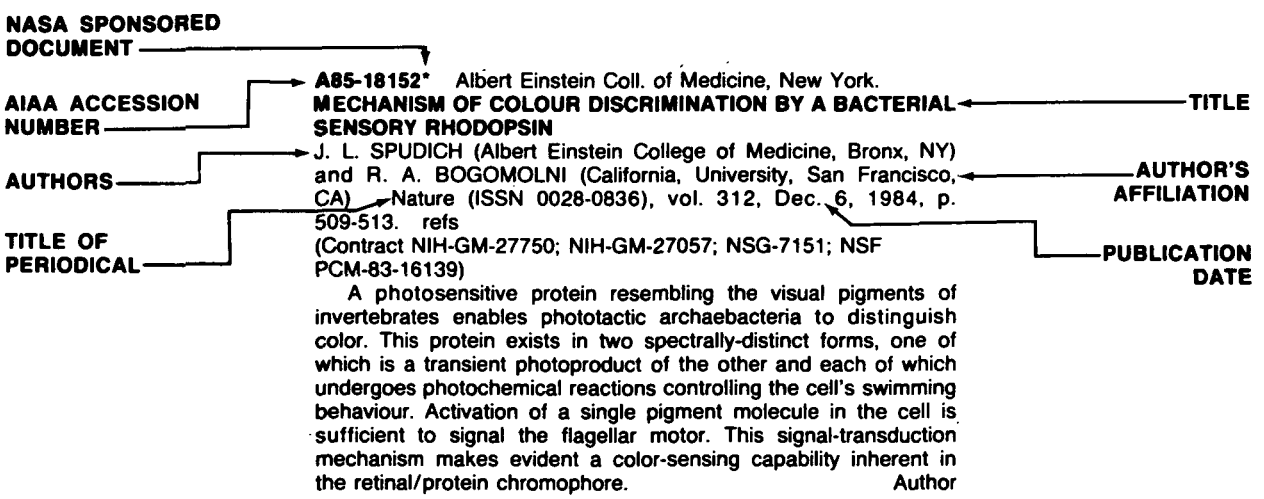

AEROSPACE MEDICINE AND BIOLOGY

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LIFE SCIENCES (GENERAL)

Includes genetics.

A85-43966
NYSTAGMOMETRY IN ASSESSING THE STATE OF THE VESTIBULAR FUNCTION [NISTAGMOMETRIIA V OTSENKE SOSTOIANIIA VESTIBULIARNOI FUNKTSII]
M. M. LEVASHOV Leningrad, Izdatel'stvo Nauka (Problemy Kosmicheskoi Biologii. Volume 50), 1984, 224 p. In Russian. refs

This monograph examines various aspects of nystagmometry, particularly those relating to the study of the vestibular function and the objective assessment of the state of the vestibular system. Particular consideration is given to: physiological mechanisms of the nystagmus; nystagmus characteristics under combined vestibular and optokinetic stimulation; the role of the asymmetry of vestibular afferentation in the asymmetry of responses to optokinetic stimuli; and the use of nystagmometry to study the hydrodynamic interaction between the semicircular canals. Also considered are nystagmus recording methods, the calibration of nystagmograms, and the quantitative analysis of nystagmographic data. A diagnostic model for obtaining information about the state of the vestibular system from vestibular tests is proposed. B.J.

A85-43986
OPTIMAL ARTERIAL-VENOUS DIFFERENCE IN OXYGEN CONCENTRATION DURING PHYSICAL EXERCISE [OPTIMAL'NAIA ARTERIOVENOZNAIA RAZNOST' KONTSENTRATSII KISLORODA PRI FIZICHESKOI NAGRUZKE]
I. F. OBRAZTSOV, M. A. KHANIN, and I. B. BUKHAROV (Moskovskii Aviatsionnyi Tekhnologicheskii Institut, Moscow, USSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 283, no. 1, 1985, p. 222-224. In Russian. refs

The dependence of the arterial-venous difference (AVD) in oxygen concentration on the mechanical power produced in the course of exercise by the skeletal muscles is modeled mathematically on the basis of an extermal energy criterion. The optimal value of the AVD is determined, and an explanation is given for the existence of an optimal oxygen concentration in venous blood. B.J.

A85-44367* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
FROM MARS TO MAN - BIOMEDICAL RESEARCH AT THE JET PROPULSION LABORATORY
E. S. BECKENBACH (California Institute of Technology, Jet Propulsion Laboratory, Pasadena) IN: Diagnostic imaging applications; Proceedings of the Meeting, Amsterdam, Netherlands, October 8, 9, 1984 . Bellingham, WA, SPIE - The International Society for Optical Engineering, 1984, p. 1-4.

In the course of the unmanned exploration of the solar system, which the California Institute of Technology's Jet Propulsion Laboratory has managed for NASA, major advances in computerized image processing, materials research, and miniature electronics design have been accomplished. This presentation shows some of the imaging results from space exploration missions, as well as biomedical research tasks based in these technologies. Among other topics, the use of polymeric microspheres in cancer therapy is discussed. Also included are ceramic applications to prosthesis development, laser applications in the treatment of coronary artery disease, multispectral imaging as used in the diagnosis of thermal burn injury, and some examples of telemetry systems as they can be involved in biological systems. Author

A85-44458
ACCLIMATION OF RATS FOLLOWING STEPWISE OR DIRECT EXPOSURE TO HEAT
A. R. GWOSDOW, E. L. BESCH, and C. L. CHEN (Florida, University, Gainesville) Journal of Applied Physiology (ISSN 0161-7567), vol. 59, Aug. 1985, p. 408-412. refs

To determine changes associated with acclimation to heat, physiological responses of rats exposed (for 10 days) to 32.5 C from 24.5 C directly were compared to the responses of rats exposed stepwise, via an intermediate temperature of 29.0 C. In the directly exposed rats, plasma corticosterone and metabolic rate (MR) increased significantly, with the elevated MR levels persisting after the return to 24.5 C; the body water pool decreased, while the body water turnover (BWT), measured by changes in the plasma tritiated water, increased; there was an increase in evaporative water (EWL), with an early (1-2 days) loss higher than the late (8-9 days); and abrupt changes in the intakes of food (decrease) and water (increase). By contrast, in the rats exposed to the stepwise heating routine, plasma corticosterone, MR, and body water pool remained at the control levels; the late EWL response was not different from the early response; and the changes in BWT and in the intakes of food and water were gradual. It is concluded that gradual adjustments to heat reduces the thermal stress on the rat, and that future studies on heat-induced physiological responses should account for the thermal history of the animal. I.S.

A85-44459
EFFECT OF THERMAL HISTORY ON THE RAT'S RESPONSE TO VARYING ENVIRONMENTAL TEMPERATURE
A. R. GWOSDOW and E. L. BESCH (Florida, University, Gainesville) Journal of Applied Physiology (ISSN 0161-7567), vol. 59, Aug. 1985, p. 413-419. refs

Effects of acclimating temperatures on rat's physiologic responses to temperature changes were determined in animals acclimated for 14 days at either 24.4 C or 29.2 C, and then acutely (3 h) exposed to each of the following temperatures of: 18.0, 20.0, 22.2, 24.5, 27.0, 29.2, 32.5, or 34.5 C, with 3-5 days between each exposure. The metabolic rate was relatively constant over the range of 22.2 to 27.0 C in the 24.5 C rats, and over the range of 20.0 to 29.2 C in the 29.2 C rats, but was elevated in both groups outside these ranges. The absolute rectal and tail skin temperatures were higher in the 29.2 C rats than in the 24.5 C rats at their respective acclimation temperatures. The evaporation water loss (EWL) was relatively constant in both groups between 18.0 and 27.0 C, but the 24.5 C rats displayed higher EWL changes of most temperatures above 27.0. Metabolic heat dissipation at 34.5 C was higher (by 26 percent) in the 29.2 C rats. It is suggested that acclimation temperatures affect the thermoneutral zone and

alter the set-point temperature around which thermal responses are regulated. I.S.

A85-44461
EFFECT OF BODY ORIENTATION ON REGIONAL LUNG EXPANSION - A COMPUTED TOMOGRAPHIC APPROACH
E. A. HOFFMAN (Mayo Medical School, Rochester, MN) Journal of Applied Physiology (ISSN 0161-7567), vol. 59, Aug. 1985, p. 468-480. Research supported by the American Heart Association and American Lung Association. refs
(Contract NIH-HL-04664; NIH-RR-02540; NIH-HL-29886)

A85-44462
EFFECT OF BODY ORIENTATION ON REGIONAL LUNG EXPANSION IN DOG AND SLOTH
E. A. HOFFMAN and E. L. RITMAN (Mayo Medical School, Rochester, MN) Journal of Applied Physiology (ISSN 0161-7567), vol. 59, Aug. 1985, p. 481-491. Research supported by the American Heart Association. refs
(Contract NIH-HL-04664; NIH-RR-00007; NIH-HL-29886)

A85-44463* Texas Univ., Houston.
TRANSPULMONARY PASSAGE OF VENOUS AIR EMBOLI
B. D. BUTLER and B. A. HILLS (Texas, University, Houston) Journal of Applied Physiology (ISSN 0161-7567), vol. 59, Aug. 1985, p. 543-547. refs
(Contract NAG9-23)

Twenty-seven paralyzed anesthetized dogs were embolized with venous air to determine the effectiveness of the pulmonary vasculature for bubble filtration or trapping. Air doses ranged from 0.05 to 0.40 ml/kg min in 0.05-ml increments with ultrasonic Doppler monitors placed over arterial vessels to detect any microbubbles that crossed the lungs. Pulmonary vascular filtration of the venous air infusions was complete for the lower air doses ranging from 0.05 to 0.30 ml/kg min. When the air doses were increased to 0.35 ml/kg min, the filtration threshold was exceeded with arterial spillover of bubbles occurring in 50 percent of the animals and reaching 71 percent for 0.40 ml/kg min. Significant elevations were observed in pulmonary arterial pressure and pulmonary vascular resistance. Systemic blood pressure and cardiac output decreased, whereas left ventricular end-diastolic pressure remained unchanged. The results indicate that the filtration of venous bubbles by the pulmonary vasculature was complete when the air infusion rates were kept below a threshold value of 0.30 ml/kg min.
Author

A85-44472
THE PREVENTION OF HEART CONTRACTILITY DISORDERS ASSOCIATED WITH MYOCARDIAL INFARCTION BY PRELIMINARY ADAPTATION TO SHORT-TERM STRESS [PREDUPREZHDENIE NARUSHENII SOKRATITEL'NOI FUNKTSII SERDTSA PRI INFARKTE MIOKARDA S POMOSHCH'IU PREDVARITEL'NOI ADAPTATSII K KOROTKIM STRESSORNYM VOZDEISTVIIAM]
F. Z. MEERSON, V. I. ZAIATS, and L. M. BELKINA (Akademiia Meditsinskikh Nauk SSSR, Institut Obshchei Patologii i Patologicheskoi Fiziologii, Moscow, USSR) Patologicheskaia Fiziologiia i Eksperimental'naia Terapiia (ISSN 0031-2991), May-June 1985, p. 9-13. In Russian. refs

It is shown that the adaptation of rats to short term immobilization stress produces a localized inotropic effect on contractile function of the left ventricle at rest and during myocardial infarction. Similar adaptation prevented disorders of the left ventricle contractility two days after myocardial infarction. Other cardiological indices, including developing pressure, the intensity of the work of heart structures, and the rate of myocardial contraction and relaxation were found to be 2-3 times higher in animals adapted to short term immobilization stress than in nonadapted animals. Additional analysis of the experimental data showed that the protective effect of adaptation was due to the prevention of contractility disorders in the nonischemic areas of the heart during infarction. I.H.

A85-44473
THE LEVEL OF LIPOLYSIS AND CONTRACTILE FUNCTION IN THE INTACT MYOCARDIUM [UROVEN' LIPOLIZA I SOKRATITEL'NAIA FUNKTSIIA INTAKTNOGO MIOKARDA]
V. A. FROLOV, S. M. CHIBISOV, T. A. KAZANSKAIA, and L. V. EFIMOVA (Universitet Druzhby Narodov, Moscow, USSR) Patologicheskaia Fiziologiia i Eksperimental'naia Terapiia (ISSN 0031-2991), May-June 1985, p. 24-28. In Russian. refs

Some indices of contractile function were studied in the hearts of intact rabbits for a period of 24 hours. The specific contractility parameters examined were the level of free fatty acids in the blood; and lipolytic enzyme activity in the myocardium and in fat tissue. A 24-hour cycle of change in the contractility parameters was observed. It is shown that the intensification of lipolysis processes exerted an initially inhibitory effect on contractile function in the myocardium, followed by increased contractile function a few hours later. I.H.

A85-44488
PHOSPHOLIPID METABOLISM IN THE ORGANS OF GAMMA-IRRADIATED RATS [OBMEN FOSFOLIPIDOV V ORGANAKH GAMMA-OBLUCHENNYKH KRYS]
E. G. NOVOSELOVA and I. K. KOLOMIITSEVA (AN SSSR, Institut *Biologicheskoi Fiziki, Pushchino, USSR) Radiobiologiia* (ISSN 0033-8192), vol. 25, May-June 1985, p. 328-332. In Russian. refs

A85-44489
A STUDY OF THE DISTRIBUTION OF DNA LESIONS IN CELLS IN COMPARISON WITH CYTOGENETIC DAMAGE [IZUCHENIE RASPREDELENIIA RADIATSIONNYKH POVREZHDENII DNK PO KLETKAM I EGO SOPOSTAVLENIE S TSITOGENETICHESKIM POVREZHDENIEM]
S. I. ZAICHKINA and E. E GANASSI (AN SSSR, Institut Biologicheskoi Fiziki, Pushchino, USSR) Radiobiologiia (ISSN 0033-8192), vol. 25, May-June 1985, p. 367-369. In Russian. refs

A85-44490
QUANTITATIVE AND QUALITATIVE CHANGES IN THE PERIPHERAL BLOOD CELLS OF CHRONICALLY IRRADIATED RATS [KOLICHESTVENNYE I KACHESTVENNYE IZMENENIIA KLETOK PERIFERICHESKOI KROVI KRYS PRI KHRONICHESKOM OBLUCHENII ZHIVOTNYKH]
V. V. IVANOV and V. N. STRELTSOVA (Institut Biofiziki, Moscow, USSR) Radiobiologiia (ISSN 0033-8192), vol. 25, May-June 1985, p. 372-375. In Russian. refs

A85-44491
THE CYTOGENETIC EFFECTS OF GAMMA-RAYS AND SECONDARY RADIATION FROM PROTONS WITH ENERGIES OF 70 GEV ON CHINESE HAMSTER FIBROBLASTS [TSITOGENETICHESKOE DEISTVIE GAMMA-KVANTOV I VTORICHNOGO IZLUCHENIIA, GENERIRUEMOGO PROTONAMI S ENERGIEI 70 GEV, NA FIBROBLASTY KITAISKOGO KHOMIACHKA]
A. KH. AKHMADIEVA, G. F. APTIKAEVA, I. A. LIVANOVA, A. V. ANTIPOV, E. N. SMIRNOVA (AN SSSR, Institut Biologicheskoi Fiziki, Pushchino, USSR) et al. Radiobiologiia (ISSN 0033-8192), vol. 25, May-June 1985, p. 375-378. In Russian. refs

The frequency of chromosomal aberration and micronucleus formation in chinese hamster cells was studied following irradiation by gamma-rays and by secondary radiation from protons of about 70 GeV. It is shown that the relative biological effectiveness (RBE) of the secondary radiation was about 3. The contribution of chromosomal rearrangement due to secondary radiation was different from that observed following irradiation by gamma-rays. No modifying effect of caffeine was found in cells exposed to proton radiation. It is suggested that the effectiveness of the proton radiation was mainly due to the inability of the cells to repair chromosomal damage following irradiation. I.H.

A85-44492
DNA DAMAGE AND REPAIR IN CHINESE HAMSTER FIBROBLASTS EXPOSED TO GAMMA-RAYS AND SECONDARY RADIATION OF PROTONS OF 70 GEV [POVREZHDEIE I REPARATSIIA DNK V FIBROBLASTAKH KITAISKOGO KHOMIACHKA PRI VOZDEISTVII GAMMA-GENERIRUEMYM PROTONAMI S ENERGIEI 70 GEV]
A. KH. AKHMADIEVA, S. I. ZAICHKINA, I. I. LIVANOVA, A. V. ANTIPOV, E. N. SMIRNOVA (AN SSSR, Institut Biologicheskoi Fiziki, Pushchino, USSR) et al. Radiobiologiia (ISSN 0033-8192), vol. 25, May-June 1985, p. 378-380. In Russian. refs

A85-44493
THE POSTIRRADIATION EFFECT OF CYSTAMINE IN RELATION TO THE DEGREE OF CHROMATIN CONDENSATION IN CELLS [POSTRADIATSIONNYI EFFEKT RADIOPROTEKTORA V ZAVISIMOSTI OT STEPENI KONDENSATSII KHROMATINA V KLETKAKH]
N. IA. GILIANO, O. V. MALINOVSKII, and E. I. LANDA (AN SSSR, Leningradskii Institut Iadernoi Fiziki, Gatchina, USSR) Radiobiologiia (ISSN 0033-8192), vol. 25, May-June 1985, p. 389-391. In Russian. refs

It is found that cystamine administered following exposure to gamma-radiation produced a radioprotective effect in HeLa cells synchronized in mitosis and in rat liver hepatocytes in the G(0) stage. No radioprotective effect was observed in rat liver hepatocytes in the G(1) stage. It is shown that the difference in the radioprotective effect of cystamine was due to the high degree of chromatin condensation in the G(0) stage of mitosis. I.H.

A85-44494
THE EFFECT OF BRANCHED CHAIN AMINO ACIDS ON AN IRRADIATED ORGANISM [VLIIANIE AMINOKISLOT S RAZVETVLENNOI TSEP'IU NA OBLUCHENNYI ORGANIZM]
T. A. LAPTEVA, T. IU. MIZINA, and G. A. DOKSHINA (Tomskii Gosudarstvennyi Universitet, Tomsk, USSR) Radiobiologiia (ISSN 0033-8192), vol. 25, May-June 1985, p. 391-394. In Russian. refs

The administration of amino acids (valine, leucine, and isoleucine) for a period of 10 days following exposure to X-rays was found to increase the survival rate and average life span of rats. The average radiation dosage was in the range 0.3096-0.774 KI/kg. Normalized carbohydrate and nitrogen metabolism was observed. The effect of amino acids on leucine absorption in the phrenic muscles was found to be similar to that of insulin. I.H.

A85-44495
THE EFFECT OF GAMMA-RADIATION ON ENKEPHALINHYDROLASE ACTIVITY IN THE RAT BRAIN [VLIIANIE GAMMA-OBLUCHENIIA NA AKTIVNOST' ENKEFALINGIDROLAZ MOZGA KRYS]
M. T. GENGIN and S. I. SHRAM (Dnepropetrovskii Gosudarstvennyi Universitet, Dnepropetrovsk, Ukrainian SSR) Radiobiologiia (ISSN 0033-8192), vol. 25, May-June 1985, p. 394-397. In Russian. refs

A85-44496
THE EFFECT OF SYNTHETIC POLYRIBONUCLEOTIDES ON THE IMMUNOLOGIC AND COLONY-FORMING ACTIVITY OF IRRADIATED BONE MARROW CELLS [VLIIANIE SINTETICHESKIKH POLIRIBONUKLEOTIDOV NA IMMUNOLOGICHESKUIU I KOLONIEOBRAZUIUSHCHUIU AKTIVNOST' KLETOK OBLUCHENNOGO KOSTNOGO MOZGA]
V. G. VLADIMIROV, B. P. LUKASHIN, I. N. MOROZOVA, and A. I. KOLOSOV (Voenno-Meditsinskaia Akademiia, Leningrad, USSR) Radiobiologiia (ISSN 0033-8192), vol. 25, May-June 1985, p. 405-407. In Russian. refs

A85-44497
THE STATE OF THE HEMOPOIETIC SYSTEM IN IRRADIATED ANIMALS FOLLOWING PROPHYLACTIC TREATMENT WITH 2-AMINO-2-THIAZOLINE [SOSTOIANIE KROVETVORNOI SISTEMY U OBLUCHENNYKH ZHIVOTNYKH PRI PROFILAKTICHESKOM VVEDENII 2-AMINO-2-TIAZOLINA]
M. I. IANUSHEVSKAIA, O. N. RAKHMANINA, M. M. KONSTANTINOVA, and A. A. MANDRUGIN (AN SSSR, Institut Biologii Razvitiia, Moscow, USSR) Radiobiologiia (ISSN 0033-8192), vol. 25, May-June 1985, p. 407-410. In Russian. refs

A85-44498
STATISTICAL ASPECTS OF THE CONNECTION BETWEEN THE ELECTRON PARAMETERS AND RADIOPROTECTIVE EFFECTS OF MERCAPTOETHYLAMINE DERIVATIVES AND THEIR ANALOGS [STATISTICHESKIE ASPEKTY SVIAZI RADIOZASHCHITNOGO DEISTVIIA PROIZVODNYKH MERKAPTOETILAMINA I EGO ANALOGOV S IKH ELEKTRONNYMI PARAMETRAMI]
V. K. MUKHOMOROV (Voenno-Meditsinskaia Akademiia, Leningrad, USSR) Radiobiologiia (ISSN 0033-8192), vol. 25, May-June 1985, p. 422-426. In Russian. refs

The relationship between the electron structure and radioprotective efficiency of mercaptoethylamine derivatives and their sulfur-containing analogs was studied on the basis of a statistical comparison. The energy parameters of the higher occupied and lower free orbitals of the mercaptoethylamine molecule were found to be the most informative parameters of electron structure. Variations in the orbital energies were correlated with physiochemical processes induced by ionizing radiation. Quantitative estimates of the effectiveness of the substances were made based on the variation of electron parameters. I.H.

A85-44499
THE EFFECT OF A MICROWAVE FIELD ON THE GABA-ERGIC AND ACETYLCHOLINERGIC SYNAPTIC TRANSMISSION SYSTEMS [DEISTVIE SVCH POLIA NA GAMKERGICHESKIE I ATSETILKHOLINERGICHESKIE SISTEMY SINAPTICHESKOI PEREDACHI]
I. G. AKOEV, M. V. KARANOVA, V. I. KUZNETSOV, and O. V. KOLOMYTKIN (AN SSSR, Institut Biologicheskoi Fiziki, Pushchino, USSR) Radiobiologiia (ISSN 0033-8192), vol. 25, May-June 1985, p. 426-428. In Russian. refs

It was found that exposure to microwaves of 1-3 mW/sq cm at a frequency of 800 MHz decreased muscimol binding with synaptic membranes in the rat brain. A reduction of cholinesterase activity was also observed. A detailed description of the experimental setup is provided. I.H.

A85-44500
CHANGES IN THE CONTENT OF NA/+/ AND K/+/ IN RAT SKELETAL MUSCLE DURING ADAPTATION TO COLD [IZMENENIE SODERZHANIIA NA/+/ I K/+/ V SKELETNYKH MYSHTSAKH KRYS PRI ADAPTATSII K KHOLODU]
L. N. MEDVEDEV (Krasnoiarskii Gosudarstvennyi Meditsinskii Institut, Krasnoyarsk, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 71, June 1985, p. 750-752. In Russian. refs

A85-44501
THE AMOUNT OF NUCLEOLAR NUCLEIN ACIDS IN THE NUCLEUS RAPHO DORSALIS AND SA3 HIPPOCAMPUS OF THE RAT BRAIN DURING SLEEP DEPRIVATION [SODERZHANIE IADRYSHKOVYKH NUKLEINOVYKH KISLOT V NUCLEUS RAPHE DORSALIS I SA3 HIPPOCAMPUS GOLOVNOGO MOZGA KRYS PRI LISHENII PARADOKSAL'NOI FAZY SNA]
V. A. KLENIKOVA, N. E. KRIVENKO, and L. D. MALINAUSKAITE (AN SSSR, Institut Fiziologii, Leningrad, USSR; Kaunasskii Gosudarstvennyi Meditsinskii Institut, Kaunas, Lithuanian SSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 71, June 1985, p. 753-756. In Russian. refs

A85-44502
THE THERMOREGULATORY EFFECT OF A BETA-ADRENORECEPTOR BLOCKADE IN RATS ADAPTED TO COLD AT REST AND DURING EXERCISE [TERMOREGULIATSIONNYI EFFEKT BLOKADY BETA-ADRENORETSEPTOROV U ADAPTIROVANNYKH K KHOLODU KRYS V POKOE I PRI RABOTE]
V. E. DIVERT, E. IA. TKACHENKO, and M. A. IAKIMENKO (Institut Klinicheskoi i Eksperimental'noi Meditsiny, Novosibirsk, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 71, June 1985, p. 777-781. In Russian. refs

A85-44620* Santa Clara Univ., Calif.
EFFECTS OF DECELERATION ON THE HUMORAL ANTIBODY RESPONSE IN RATS
R. P. BARONE, L. D. CAREN (Santa Clara, University, CA), and J. OYAMA (NASA, Ames Research Center, Moffett Field, CA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, July 1985, p. 690-694. refs

Effects of hypergravity, simulated by chronic centrifugation, followed by a return to normal G (deceleration) on the immune system of rats were investigated. Two groups of male rats (28 days at 2.1 G, and 3.1 G) were compared to the control group (1.0 G). The animals were immunized by i.p. injections of sheep red blood cells on days 29, 42, and 57, and bled on days 36, 47, and 62. While the centrifuged rats ate and gainedsignificantly less than the control rats, the antibody titers and the organ/body mass ratios for the adrenal glands, kidneys, lungs, heart, and thymus were unaffected by gravity exposures, as were the values of the hematocrit and the white blood cell counts. It is concluded that deceleration does not adversely affect these particular aspects of the immune system. I.S.

A85-44768* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
DENITRIFICATION BY EXTREMELY HALOPHILIC BACTERIA
L. I. HOCHSTEIN (NASA, Ames Research Center, Moffett Field, CA) and G. A. TOMLINSON (Santa Clara, University, CA) FEMS Microbiology Letters (ISSN 0378-1097), vol. 27, 1985, p. 329-331. refs
(Contract NCA2-IR-685-401)

Extremely halophilic bacteria were isolated from widely separated sites by anaerobic enrichment in the presence of nitrate. The anaerobic growth of several of these isolates was accompanied by the production of nitrite, nitrous oxide, and dinitrogen. These results are a direct confirmation of the existence of extremely halophilic denitrifying bacteria, and suggest that such bacteria may be common inhabitants of hypersaline environments. Author

A85-44801
SEASONAL CHANGES IN THE ULTRASTRUCTURE OF ADRENOCORTICAL CELLS IN THE HIBERNATING GROUND SQUIRREL (CITELLUS SUSLICUS) [SEZONNYE IZMENENIIA UL'TRASTRUKTURY KLETOK KORY NADPOCHECHNIKOV U ZIMOSPIASHCHEGO SUSLIKA /CITELLUS SUSLICUS/]
E. N. ILIASOVA (AN SSSR, Institut Biologicheskoi Fiziki, Krasnoyarsk, USSR) Kriobiologiia i Kriomeditsina (ISSN 0130-2663), no. 14, 1984, p. 54-64. In Russian. refs

A85-44802
A HISTOCHEMICAL STUDY OF THE DISTRIBUTION AND CONTENT OF BIOGENIC MONOAMINES IN THE BRAIN OF A HIBERNATING GROUND SQUIRREL (CITELLUS PARRYI RICH., 1827) [GISTOKHIMICHESKOE IZUCHENIE RASPREDELENIIA I SODERZHANIIA BIOGENNYKH MONOAMINOV V GOLOVNOM MOZGU DLINNOKHVOSTOGO SUSLIKA /CITELLUS PARRYI RICH., 1827/]
L. I. MURAVEVA and A. IU. BUDANTSEV (AN SSSR, Institut Biofiziki, Pushchino, USSR) Kriobiologiia i Kriomeditsina (ISSN 0130-2663), no. 14, 1984, p. 64-66. In Russian. refs

On the basis of a fluorescent-histochemical analysis carried out according to the method of Falck and Owman (1965), it is shown that catecholamine levels in the dopamine and noradrenergic systems of the ground squirrel Citellus parryi Rich. increase during hibernation in comparison with the active state. It is suggested that the increase of catecholamines may act as a 'deposit' to the supply of mediators which are used in the process of awakening. I.H.

A85-44803
THE POSITIVE EFFECT OF BURN CRYOTHERAPY ON THE SYSTEM OF BLOOD COAGULATION AND PROTEOLYTIC ACTIVITY [O POLOZHITEL'NOM VLIIANII KRIOTERAPII OZHOGOV NA SISTEMU SVERTYVANIIA I PROTEOLITICHESKUIU AKTIVNOST' KROVI]
V. G. TIMCHENKO, L. I. SIMONOVA, V. Z. GERTMAN, and N. V. CHUBIAK (Khar'kovskii Nauchno-Issledovatel'skii Institut Meditsinskii Radiologii, Kharkov, Ukrainian SSR) Kriobiologiia i Kriomeditsina (ISSN 0130-2663), no. 14, 1984, p. 82-86. In Russian. refs

The condition of the system of blood coagulation and proteolytic activity during burn cryotherapy has been investigated experimentally in rats. The extent of the burns was 7-8 percent of the total body surface, and the burn severity was between degree 3B and the fourth degree. It is shown that cryotherapy reduced the hypercoagulation of blood following 1-3 hours of daily treatment over a period of 7-21 days. Equilibrium of enzyme activity was also observed. It is suggested that the activation of blood protease may be the physiological mechanism for the observed enzyme balance. I.H.

A85-44804
THE CONTENT OF BIOGENIC AMINES (SEROTONIN, HISTAMINE) IN RAT BLOOD FOLLOWING TEMPERATURE TREATMENTS OF THE SKIN [SODERZHANIE BIOGENNYKH AMINOV /SEROTONINA, GISTAMINA/ V KROVI KRYS POSLE TEMPERATURNYKH VOZDEISTVII NA KOZHU]
L. F. ZHURIKHINA, S. G. KHVOSTOVA, N. E. GUSAKOVA, and B. P. SANDOMIRSKII (AN USSR, Institut Problem Kriobiologii i Kriomeditsiny, Kharkov, Ukrainian SSR) Kriobiologiia i Kriomeditsina (ISSN 0130-2663), no. 14, 1984, p. 87-89. In Russian. refs

The dynamics of serotonin and histamine content in rat blood was studied experimentally following burning and cryotherapy, and after a combined treatment of burning and cryotherapy. An increase in serotonin content was observed during the first five minutes after injury. The maximum concentrations of monoamines was observed following the combined burning and freezing treatment. No significant changes in histamine content were found in comparison with control animals. The content of histamine in the blood of animals receiving cooling treatments was higher than in the burned animals. The experimental results are listed in a table. I.H.

A85-44805
FUNCTIONAL MORPHOLOGY OF THE GOMORI-POSITIVE HYPOTHALAMOPHYSEAL NEUROSECRETORY SYSTEM (HHNS) IN THE PERIOD OF WINTER TORPOR IN POIKIOTHERMS AND HIBERNATION IN HOMOIOTHERMAL VERTEBRATES [FUNKTSIONAL'NAIA MORFOLOGIIA GOMORI-POLOZHITEL'NOI GIPOTALAMO-GIPOFIZARNOI NEIROSEKRETORNOI SISTEMY (GGNS) V PERIOD ZIMNEGO OTSEPENENIIA U POIKILOTERMNYKH I GIBERNATSII U GOMOIOTERMNYKH POZVONOCHNYKH]
A. L. POLENOV (AN SSSR, Institut Evoliutsionnoi Fiziologii i Biokhimii, Leningrad, USSR) Kriobiologiia i Kriomeditsina (ISSN 0130-2663), no. 15, 1984, p. 42-47. In Russian. refs

A85-44806
INHIBITION OF MITOCHONDRIAL RESPIRATION AND K(+) TRANSPORT DURING HIBERNATION [INGIBIROVANIE DYKHANIIA I K/+/-TRANSPORTIRUIUSHCHEI SISTEMY MITOKHONDRII PRI ZIMNEI SPIACHKE]
N. I. FEDOTCHEVA, G. D. MIRONOVA, and M. N. KONDRASHOVA (AN SSSR, Institut Biologicheskoi Fiziki, Pushchino, USSR) Kriobiologiia i Kriomeditsina (ISSN 0130-2663), no. 15, 1984, p. 50-54. In Russian. refs

A85-44807
REGULATION OF NONSAPONIFIABLE LIPID CONTENT IN HIBERNATING ANIMALS [REGULIATSIIA OBMENA NEOMYLIAEMYKH LIPIDOV U ZIMOSPIASHCHIKH ZHIVOTNYKH]
V. V. FEDUROV and V. I. MIRONENKO (Kievskii Meditsinskii Institut, Kiev, Ukrainian SSR) Kriobiologiia i Kriomeditsina (ISSN 0130-2663), no. 15, 1984, p. 54-56. In Russian. refs

The incorporation of 1-C-14-acetate and 2-C-14-mevalonate labels into ubiquinone and sterols in the liver of 4 hibernating ground squirrels has been investigated experimentally. Cross sections of ground squirrel liver were obtained during hibernation, in an aroused state, and just before hibernation. The effect of a protein synthesis inhibitor, cycloheximide, on the rate of label incorporation into ubiquinone and sterols was examined. It is shown that sterol synthesis in the livers of the hibernating squirrels was reduced in comparison with the other groups. Biochemical analysis of the liver cross sections demonstrated that the decrease in sterol synthesis was caused by a decrease in the rate of enzyme synthesis. I.H.

A85-44808
THE CONTENT OF AMINO ACID NEUROTRANSMITTERS IN THE BRAIN DURING SEVERE HYPOTHERMIA [SODERZHANIE AMINOKISLOT-NEIROMEDIATOROV V MOZGU PRI GLUBOKOI GIPOTERMII]
E. Z. EMIRBEKOV, R. A. ABDULLAEV, and N. K. KLICHKHANOV (Dagestanskii Gosudarstvennyi Universitet, Makhachkala, USSR) Kriobiologiia i Kriomeditsina (ISSN 0130-2663), no. 15, 1984, p. 56-59. In Russian. refs

A85-44922
A SEQUENCE OF EVENTS ACROSS THE CRETACEOUS-TERTIARY BOUNDARY
J. SMIT (California, University, Los Angeles) and A. J. T. ROMEIN (Utrecht, Rijksuniversiteit, Netherlands) Earth and Planetary Science Letters (ISSN 0012-821X), vol. 74, no. 2-3, July 1985, p. 155-170. refs
(Contract NSF OCE-82-08197)

DSDP cores from numerous sites throughout the globe exhibit the lithological and biological sequence of events across the Cretaceous-Tertiary (K/T). Microtektite-like spherules, which are excellent indicators of the K/T boundary level, have been found in almost every core or outcrop with an Ir anomaly, forming a world-wide strewn field. The basal Paleocene 'Globigerina' eugubina Zone has been established in all major ocean basins. Planktonic foraminifera and nannoplankton appear to show a different extinction-recovery pattern at the K/T boundary which suggests that the nannoplankton underwent final extinction later, and recovered later, than planktonic foraminifera; these patterns may be useful in the evaluation of the type and range of environmental stress resulting from the hypothesized impact(s) at the K/T boundary. While dustcloud blocking of sunlight may still account for the clear class-mortality at the K/T boundary, it seems less likely an explanation for the final nannoplankton extinction, since this class appears to survive 1000-10,000 years into the Tertiary. O.C.

A85-45813* Illinois Univ., Urbana.
WHAT ARE MYCOPLASMAS - THE RELATIONSHIP OF TEMPO AND MODE IN BACTERIAL EVOLUTION
C. R. WOESE (Illinois, University, Urbana), E. STACKEBRAND (Kiel, Universitaet, West Germany), and W. LUDWIG (Muenchen, Technische Universitaet, Munich, West Germany) Journal of Molecular Evolution (ISSN 0022-2844), vol. 21, no. 4, 1984-1985, p. 305-316. Research supported by the Gesellschaft fuer Biotechnologie, NSF, and NASA. refs

In phenotype the mycoplasmas are very different from ordinary bacteria. However, genotypically (i.e., phylogenetically) they are not. On the basis of ribosomal RNA homologies the mycoplasmas belong with the clostridia, and indeed have specific clostridial relatives. Mycoplasmas are, however, unlike almost all other bacteria in the evolutionary characteristics of their ribosomal RNAs. These RNAs contain relatively few of the highly conserved oligonucleotide sequences characteristic of normal eubacterial ribosomal RNAs. This is interpreted to be a reflection of an elevated mutation rate in mycoplasma lines of descent. A general consequence of this would be that the variation associated with a mycoplasma population is augmented both in number and kind, which in turn would lead to an unusual evolutionary course, one unique in all respects. Mycoplasmas, then, are actually tachytelic bacteria. The unusual evolutionary characteristics of their ribosomal RNAs are the imprints of their rapid evolution. Author

A85-46022
IMPORTANCE OF LIPOPHILIC METAL COMPOUNDS IN THE EVOLUTION OF PHOTOSYNTHESIS [ZNACHENIE LIPOFIL'NYKH SOEDINENII METALLOV V EVOLIUTSII FOTOSINTEZA]
E. A. BOICHENKO (AN SSSR, Institut Geokhimii i Analiticheskoi Khimii, Moscow, USSR) Akademiia Nauk SSSR, Izvestiia, Seriia Biologicheskaia (ISSN 0002-3329), July-Aug. 1985, p. 500-507. In Russian. refs

Development of iron-containing compounds of increasing complexity and the development of Mn-complexes during evolution of the CO2 assimilation processes are discussed. The evolution progressed from metal-catalyzed chemosynthesis in heterotrophs to photoreduction in presence of nonheme-iron-containing complexes with flavines, and, eventually, to a photosynthetic process with liberation of O2. The evolution process was accompanied by increasing bonding of Fe to acetone-soluble lipophilic complexes, and by association of the Fe-complexes with the membranes of intracellular organelles; by gradually increasing catalytic power of the Fe-complexes; and, finally, by increasing replacement of Fe with Mn in these complexes. Evolution of photosynthesis has led to increasing synthesis of organic compounds formed in its reactions and, consequently, to acceleration of all other evolution processes of the biosphere. I.S.

A85-46023
ADAPTATIONAL POSSIBILITIES OF OXIDATIVE METABOLISM IN TISSUES AND BLOOD SYSTEM OF UPLAND ANIMALS [ADAPTATSIONNYE VOZMOZHNOSTI OKISLITEL'NOGO METABOLIZMA TKANEI I SISTEMY KROVI GORNYKH ZHIVOTNYKH]
V. N. BOLSHAKOV, L. A. KOVALCHUK, and A. I. IASTREBOV (AN SSSR, Institut Ekologii Rastenii i Zhivotnykh, Sverdlovsk, USSR) Akademiia Nauk SSSR, Izvestiia, Seriia Biologicheskaia (ISSN 0002-3329), July-Aug. 1985, p. 572-580. In Russian. refs

A85-46024
THE CONTRIBUTION OF ANTIOXIDANTS AND ENDOGENOUS THIOLS IN ASSURING THE RADIORESISTANCE OF AN ORGANISM [VKLAD ANTIOKSIDANTOV I ENDOGENNYKH TIOLOV V OBESPECHENIE RADIOREZISTENTNOSTI ORGANIZMA]
E. B. BURLAKOVA, G. F. IVANENKO, and L. N. SHISHKINA (AN SSSR, Institut Khimicheskoi Fiziki, Moscow, USSR) Akademiia Nauk SSSR, Izvestiia, Seriia Biologicheskaia (ISSN 0002-3329), July-Aug. 1985, p. 588-593. In Russian. refs

Correlations were revealed between lipid antioxidizing activity (LAA) or the levels of endogenous thiols and resistance to X-rays of various animal species. Mice, rats, golden hamsters, and guinea pigs were exposed to radiation doses ranging from LD10/30 to LD100/30. The degree of correlation between LDn/30 and the content of antioxidants depended on the type of the antioxidant (LAA, nonprotein thiols, or total thiols), and the severity of radiation damage. Thus, at the low radiation doses, resistance appears to be proportional to the contents of LAA and nonprotein thiols, whereas at the high doses close to the lethal dose, it appears to be mainly proportional to the content of total (protein) thiols. Levels of LAA and endogenous thiols reflect different aspects of cellular metabolism responsible for an organism's radioresistance. I.S.

A85-46030
THE POSSIBILITY OF INCREASING THE RESISTANCE OF LIVING ORGANISMS TO HYPOBARIC HYPOXIA [O VOZMOZHNOSTI POVYSHENIIA USTOICHIVOSTI ZHIVYKH ORGANIZMOV K GIPOBARICHESKOI GIPOKSII]
S. S. GRIGORIAN, M. V. KAMENEVA, L. V. PLATONOVA, I. M. RODIONOV, and I. A. SOKOLOVA (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 283, no. 2, 1985, p. 339, 340. In Russian. refs

Experiments were performed on nonlinear white female rats with a weight of 120-150 g. It is shown that the resistance of the animals to hypobaric hypoxia increased as the result of the injection into the blood of polymers that lower the hemodynamic resistance. The incidence of mortality among animals injected with a physiological solution was twice that of animals whose blood contained polyethylene oxide. V.L.

A85-46142
THE THERMODYNAMICS AND REGULATION OF BIOLOGICAL PROCESSES INFORMATION THEORY, THE CONTROL OF LIVE SYSTEMS, PROBLEMS OF SELF-ORGANIZATION, EVOLUTION, AND ONTOGENESIS [TERMODINAMIKA I REGULIATSIIA BIOLOGICHESKIKH PROTSESSOV TEORIIA INFORMATSII, UPRAVLENIE V ZHIVYKH SISTEMAKH, PROBLEMY SAMOORGANIZATSII, EVOLIUTSIIA I ONTOGENEZ]
A. I. ZOTIN, ED. (AN SSSR, Institut Biologii Razvitiia, Moscow, USSR) Moscow, Izdatel'stvo Nauka, 1984, 336 p. In Russian. No individual items are abstracted in this volume.

Consideration is given to some thermodynamic aspects of control and regulation processes in biological systems, including the thermodynamics of irreversible processes; thermodynamic analogies in statistical theories of ecological systems; and relativistic information and biological systems. Among other topics discussed are: the thermodynamics of chemical reactions in biological systems; stochastic theories of light perception; and a dynamic model of the origin of bioenergetic processes. Consideration is also given to: continuous phase transition and morphogenesis; the stability of ontogenetic processes; and the thermodynamic aspects of plant ontogenesis. I.H.

A85-46250
NEW METHANE-PRODUCING BACTERIA [NOVYE METANOOBRAZUIUSHCHIE BAKTERII]
T. N. ZHILINA and G. A. ZAVARZIN (AN SSSR, Institut Mikrobiologii, Moscow, USSR) Priroda (ISSN 0032-874X), July 1985, p. 103-105. In Russian.

A new species of methane-producing halophile was discovered in drying out salt-saturated lagoons and lakes of Crimea near the village of Solianoe. The organism grows at temperatures up to 55 C and optimal NaCl concentrations of 20-25 percent. It utilizes (CH3)3N exclusively, producing CH4 and NH3. The flat cells (0.5 x 2-3 microns) of triangular or polygon form propagate by multiple divisions in one plane, leading to the formation of flat aggregates. The new species along with the other methanogens that utilize methylamines provide an example of the exclusive utilization of an otherwise minor route in the biogenesis of methane, which usually proceeds (in fresh water reservoirs) through reduction of acetates of CO2. I.S.

A85-46318
EFFECTS OF ELEVATED EXTERNAL TEMPERATURE ON THE OXYGEN CONSUMPTION IN THE ORGANISMS OF MAN AND OTHER ANIMALS [VLIIANIE VYSOKOI VNESHNEI TEMPERATURY NA POTREBLENIE KISLORODA ORGANIZMOM CHELOVEKA I ZHIVOTNYKH]
K. M. KARLYEV (AN TSSR, Institut Fiziologii i Eksperimental'noi Patologii Aridnoi Zony, Ashkabad, Turkmen SSR) Uspekhi Fiziologicheskikh Nauk (ISSN 0301-1798), vol. 16, July-Sept. 1985, p. 109-121. In Russian. refs

The mechanisms underlying changes in oxygen consumption (OC) during acute and chronic exposure to heat are discussed. It is suggested that during the acute exposure the observed initial drop in OC is caused by redistribution of blood flow: dilation of the skin-supplying vessels and the concomitant vasoconstriction in the organs such as liver and kidney that normally display high metabolic rate. The hypoxia in these organs causes activation of glycolisis and uncoupling of oxidation-phosphorylation processes, leading to the elevation of the intercellular temperature. The generated heat in turn activates the oxidation-reduction processes leading to elevated OC observed in the second stage of the response. The longtime effect of chronically elevated temperature is determined by the adaptational changes of activity and food intake, and the resulting metabolic changes occurring in individual organs are due to the reduced load. I.S.

A85-46574
MOLECULAR MECHANISMS OF RADIATION SICKNESS [MOLEKULIARNYE MEKHANIZMY LUCHEVOI BOLEZNI]
E. F. ROMANTSEV, V. D. BLOKHINA, Z. I. ZHULANOVA, N. N. KOSHCHEENKO, A. V. NIKOLSKII et al. Moscow, Izdatel'stvo Meditsina, 1984, 208 p. In Russian. refs

A comprehensive analysis of the mechanisms of cell damage due to exposure to ionizing radiation is carried out. Attention is given to disruptions in protein synthesis and the formation of nuclei acids; changes in the levels of cyclic nucleotides; and the biochemical mechanisms of interphase cell death. The effects of radiation in different doses on metabolic processes in the cell is also examined. I.H.

N85-32708*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE EVOLUTION OF COMPLEX AND HIGHER ORGANISMS
D. SMILNE, ed. (Evergreen State Coll.), D. RAUP, ed. (Chicago Univ.), J. BILLINGHAM, ed., K. NIKLAUS, ed. (Cornell Univ., Ithaca, N.Y.), and K. PADIAN, ed. (California Univ., Berkeley) 1985 113 p refs Original contains color illustrations
(NASA-SP-478; A-9363; NAS 1.21:478; LC-85-7159) Avail: NTIS HC A06/MF A01; SOD HC $8.50 as 033-000-00951-8 CSCL 06C

The evolution of Phanerozoic life has probably been influenced by extraterrestrial events and properties of the Earth-Moon system that have not, until now, been widely recognized. Tide range, gravitational strength, the Earth's axial tilt, and other planetary properties provide background conditions whose effects on evolution may be difficult to distinguish. Solar flares, asteroid impacts, supernovae, and passage of the solar system through galactic clouds can provide catastrophic changes on the Earth with consequent characteristic extinctions. Study of the fossil record and the evolution of complex Phanerozoic life can reveal evidence of past disturbances in space near the Earth. Conversely, better understanding of environmental influences caused by

extraterrestrial factors and properties of the solar system can clarify aspects of evolution, and may aid in visualizing life on other planets with different properties. Author

N85-32709*# Management and Technical Services Co., Washington, D.C.
USSR SPACE LIFE SCIENCES DIGEST
L. R. HOOKE, M. RADTKE, and J. E. ROWE NASA Aug. 1985 85 p
(Contract NASW-3676)
(NASA-CR-3922; NAS 1.26:3922) Avail: NTIS HC A05/MF A01 CSCL 06B

The first issue of the bimonthly digest of USSR Space Life Sciences is presented. Abstracts are included for 49 Soviet periodical articles in 19 areas of aerospace medicine and space biology, published in Russian during the first quarter of 1985. Translated introductions and table of contents for nine Russian books on topics related to NASA's life science concerns are presented. Areas covered include: botany, cardiovascular and respiratory systems, cybernetics and biomedical data processing, endocrinology, gastrointestinal system, genetics, group dynamics, habitability and environmental effects, health and medicine, hematology, immunology, life support systems, man machine systems, metabolism, musculoskeletal system, neurophysiology, perception, personnel selection, psychology, radiobiology, reproductive system, and space biology. This issue concentrates on aerospace medicine and space biology. E.A.K.

N85-32710*# National Aeronautics and Space Administration, Washington, D. C.
THE GLOBAL SULFUR CYCLE
D. SAGAN, ed. Jul. 1985 305 p refs Proc. of the Planetary Biol. Microbial Ecology's 1984 Summer Res. Prog., San Jose, Calif., 24 Jun. - 4 Aug. 1984
(NASA-TM-87570; NAS 1.15:87570) Avail: NTIS HC A14/MF A01 CSCL 13B

The results of the planetary biology microbial ecology's 1984 Summer Research Program, which examined various aspects of the global sulfur cycle are summarized. Ways in which sulfur flows through the many living and chemical species that inhabit the surface of the Earth were investigated. Major topics studied include: (1) sulfur cycling and metabolism of phototropic and filamentous sulfur bacteria; (2) sulfur reduction in sediments of marine and evaporite environments; (3) recent cyanobacterial mats; (4) microanalysis of community metabolism in proximity to the photic zone in potential stromatolites; and (5) formation and activity of microbial biofilms on metal sulfides and other mineral surfaces. Relationships between the global sulfur cycle and the understanding of the early evolution of the Earth and biosphere and current processes that affect global habitability are stressed.

N85-32712*# Saskatchewan Univ., Saskatoon. Dept. of Applied Microbiology and Food Science.
AEROBIC SULFUR-OXIDIZING BACTERIA: ENVIRONMENTAL SELECTION AND DIVERSIFICATION Abstract Only
D. CALDWELL *In* NASA, Washington The Global Sulfur Cycle p 9-10 Jul. 1985 refs
Avail: NTIS HC A14/MF A01 CSCL 06C

Sulfur-oxidizing bacteria oxidize reduced inorganic compounds to sulfuric acid. Lithotrophic sulfur oxidizer use the energy obtained from oxidation for microbial growth. Heterotrophic sulfur oxidizers obtain energy from the oxidation of organic compounds. In sulfur-oxidizing mixotrophs energy are derived either from the oxidation of inorganic or organic compounds. Sulfur-oxidizing bacteria are usually located within the sulfide/oxygen interfaces of springs, sediments, soil microenvironments, and the hypolimnion. Colonization of the interface is necessary since sulfide auto-oxidizes and because both oxygen and sulfide are needed for growth. The environmental stresses associated with the colonization of these interfaces resulted in the evolution of morphologically diverse and unique aerobic sulfur oxidizers. E.A.K.

N85-32713*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ORIGIN OF LIFE
S. CHANG *In* NASA, Washington The Global Sulfur Cycle p 11-13 Jul. 1985 refs
Avail: NTIS HC A14/MF A01 CSCL 06C

The pathways of organic chemical synthesis, the chemical evolution on the early Earth leading to life was constrained by the development of the planet by accretion and core formation. The accretion and differentiation into the core-mantle-crust-atmosphere system strongly influenced the temperature and composition of the atmosphere, surface, and interior; but large gaps persist in our understanding of these processes. The time-span over which Earth acquired its volatiles, the composition of these volatiles, and the conditions under which outgassing of volatiles occurred to form the atmosphere, are unknown. Uncertainties in existing models for Earth accretion and early planetary development allows a wide range of possible prebiotic atmospheric compositions at the time and temperature when liquid water appeared and thermally-labile organic compounds could survive. These compositions range from strongly reducing atmospheres to mildly reducing ones. Author

N85-32714*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PROTOCYANOBACTERIA: OXYGENIC AND ANOXYGENIC PHOTOSYNTHESIS IN MAT-FORMING BACTERIA
Y. COHEN *In* NASA, Washington The Global Sulfur Cycle p 14-15 Jul. 1985 refs Prepared in cooperation with Hebrew Univ.
Avail: NTIS HC A14/MF A01 CSCL 06C

The oldest record of life is preserved in prePhanerozoic stromatolites dated 3500 million years old and is most likely of filamentous mat-forming cyanobacteria. The sedimentary records of cyanobacterial mats in stromatolites are the most abundant record of life throughout the prePhanerozoic. Stromatolites persisted into the Phanerozoic Eon, yet they become much less pronounced relative to earlier ones. The abundance and persistence of cyanobacterial mats throughout most of geological time point to the evolutionary success of these kinds of microbial communities and their possible role in the evolution of the earth and atmosphere. E.A.K.

N85-32715*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SULFUR TRANSFORMATIONS AT THE HYDROGEN SULFIDE/OXYGEN INTERFACE IN STRATIFIED WATERS AND IN CYANOBACTERIAL MATS
Y. COHEN *In* NASA, Washington The Global Sulfur Cycle p 16-18 Jul. 1985 refs Prepared in cooperation with Hebrew Univ.
Avail: NTIS HC A14/MF A01 CSCL 06C

Stratified water bodies allow the development of several microbial plates along the water column. The microbial plates develop in relation to nutrient availability, light penetration, and the distribution of oxygen and sulfide. Sulfide is initially produced in the sediment by sulfate-reducing bacteria. It diffuses along the water column creating a zone of hydrogen sulfide/oxygen interface. In the chemocline of Solar Lake oxygen and sulfide coexist in a 0 to 10 cm layer that moves up and down during a diurnal cycle. The microbial plate at the chemocline is exposed to oxygen and hydrogen sulfide, alternating on a diurnal basis. The cyanobacteria occupying the interface switch from anoxygenic photosynthesis in the morning to oxygenic photosynthesis during the rest of the day which results in a temporal build up of elemental sulfur during the day and disappears at night due to both oxidation to thiosulfate and sulfate by thiobacilli, and reduction to hydrogen sulfide by Desulfuromonas sp. and anaerobically respiring cyanobacteria. Sulfate reduction was enhanced in the light at the surface of the cyanobacterial mats. Microsulfate reduction measurements showed enhanced activity of sulfate reduction even under high oxygen concentrations of 300 to 800 micrometer. Apparent aerobic SO sub 4 reduction activity is explained by the co-occurrence of H

sub 2. The physiology of this apparent sulfate reduction activity is studied. E.A.K.

N85-32717*# California Univ., San Diego, La Jolla. Dept. of Chemistry.
DISTRIBUTION AND ABUNDANCE OF ORGANIC THIOLS Abstract Only
R. FAHEY *In* NASA, Washington The Global Sulfur Cycle p 26 Jul. 1985 refs
Avail: NTIS HC A14/MF A01 CSCL 06C

The role of glutathione (GSH) in protecting against the toxicity of oxygen and oxygen by products is well established for all eukaryotes studied except Entamoeba histolytica which lacks mitochrondria, chloroplasts, and microtubules. The GSH is not universal among prokaryotes. Entamoeba histolytica does not produce GSH or key enzymes of GSH metabolism. A general method of thiol analysis based upon fluorescent labeling with monobromobimane and HPLC separation of the resulting thiol derivatives was developed to determine the occurrence of GSH and other low molecular weight thiols in bacteria. Glutathione is the major thiol in cyanobacteria and in most bacteria closely related to the purple photosynthetic bacteria, but GSH was not found in archaebacteria, green bacteria, or GRAM positive bacteria. It suggested that glutathione metabolism was incorporated into eukaryotes at the time that mitochondria and chloroplasts were acquired by endosymbiosis. In Gram positive aerobes, coenzyme A occurs at millimolar levels and CoA disulfide reductases are identified. The CoA, rather than glutathione, may function in the oxygen detoxification processes of these organisms. E.A.K.

N85-32718*# *Oldenburg Univ. (West Germany). Dept. of* Geomicrobiology.
CYTOCHROMES AND IRON SULFUR PROTEINS IN SULFUR METABOLISM OF PHOTOTROPHIC BACTERIA
U. FISCHER *In* NASA, Washington The Global Sulfur Cycle p 27-29 Jul. 1985 refs
Avail: NTIS HC A14/MF A01 CSCL 06C

Dissimilatory sulfur metabolism in phototrophic sulfur bacteria provides the bacteria with electrons for photosynthetic electron transport chain and, with energy. Assimilatory sulfate reduction is necessary for the biosynthesis of sulfur-containing cell components. Sulfide, thiosulfate, and elemental sulfur are the sulfur compounds most commonly used by phototrophic bacteria as electron donors for anoxygenic photosynthesis. Cytochromes or other electron transfer proteins, like high-potential-iron-sulfur protein (HIPIP) function as electron acceptors or donors for most enzymatic steps during the oxidation pathways of sulfide or thiosulfate. Yet, heme- or siroheme-containing proteins themselves undergo enzymatic activities in sulfur metabolism. Sirohemes comprise a porphyrin-like prosthetic group of sulfate reductase. eenzymatic reactions involve electron transfer. Electron donors or acceptors are necessary for each reaction. Cytochromes and iron sulfur problems, are able to transfer electrons. E.A.K.

N85-32719*# Houston Univ., Tex. Dept. of Biochemistry and Biophysical Science.
INSIGHTS INTO THE PHYLOGENETIC POSITIONS OF PHOTOSYNTHETIC BACTERIA OBTAINED FROM 5S RRNA AND 16S RRNA SEQUENCE DATA
G. E. FOX *In* NASA, Washington The Global Sulfur Cycle p 30-39 Jul. 1985 refs
Avail: NTIS HC A14/MF A01 CSCL 06C

Comparisons of complete 16S ribosomal ribonucleic acid (rRNA) sequences established that the secondary structure of these molecules is highly conserved. Earlier work with 5S rRNA secondary structure revealed that when structural conservation exists the alignment of sequences is straightforward. The constancy of structure implies minimal functional change. Under these conditions a uniform evolutionary rate can be expected so that conditions are favorable for phylogenetic tree construction. E.A.K.

N85-32722*# Barcelona Univ. (Spain). Dept. of Microbiology.
ECOPHYSIOLOGY OF PHOTOTROPHIC SULFUR BACTERIA IN LAKES: VERTICAL DISTRIBUTION OF PLANKTONIC POPULATIONS
R. GUERRERO *In* NASA, Washington The Global Sulfur Cycle p 45-49 Jul. 1985 refs
Avail: NTIS HC A14/MF A01 CSCL 16C

The study of purple and green sulfur bacterial populations in nature is of interest for the following reasons: (1) high quantities of biomass, with low species diversity can be collected; (2) study of planktonic life permits one to understand the mechanisms, structural as well as physiological, used to maintain their vertical position without sinking; and (3) they are capable of sulfur oxidations and reductions that act as important intermediates in the global sulfur cycle. Purple and green photosynthetic bacteria, moreover, may be responsible for certain geological deposits. Planktonic phototrophic sulfur bacteria were analyzed in relation to their vertical distribution in the water column. Factors, including competition for light, that determine their sedimentation rates and the numerical changes in species and populations were assessed. B.W.

N85-32724*# California Univ., San Diego, La Jolla.
MICROBIOLOGY OF SOLAR SALT PONDS Abstract Only
B. JAVOR *In* NASA, Washington The Global Sulfur Cycle p 55-56 Jul. 1985 refs
Avail: NTIS HC A14/MF A01 CSCL 06C

Solar salt ponds are shallow ponds of brines that range in salinity from that of normal seawater (3.4 percent) through NaCl saturation. Some salterns evaporate brines to the potash stage of concentration (bitterns). All the brines (except the bitterns, which are devoid of life) harbor high concentrations of microorganisms. The high concentrations of microorganisms and their adaptation to life in the salt pond are discussed. B.W.

N85-32728*# Boston Univ., Mass. Dept. of Biology.
FROM MICROBIAL COMMUNITIES TO CELLS Abstract Only
L. MARGULIS *In* NASA, Washington The Global Sulfur Cycle p 64-65 Jul. 1985 refs
Avail: NTIS HC A14/MF A01 CSCL 06C

The eukraotic cell, the unit of structure of protoctists, plants, fungi, and animals, is not at all homologous to prokaryotic cells. Instead the eukaryotic cell is homologous to communities of microorganisms such as those of the sulfuretum. This research is based on the hypothesis that at least four different interacting community members entered the original associations that, when stabilized, led to the emergence of eukaryotic cells. These are: (1) host nucleocytoplasm (thermoplasma like archaebacteria); (2) mitochrondria (paracoccus or bdellovibryo like respiring bacteria; and (3) plastids (cyanobacteria) and undulipodia. Tubulin like protein was found in the free living spirochete Spirochaeta bajacaliforniensis and in several other spirochetes. The amino acid sequence was to see if the spirochete protein is homologous to the tubulin of undulipodial and mitotic spindle microtubules. B.W.

N85-32730*# Stanford Univ., Palo Alto, Calif. Dept. of Microbiology.
CHEMOLITHOTROPHY AND PHYSIOLOGY OF BACTERIAL NUTRIENT LIMITATION Abstract Only
A. MATIN *In* NASA, Washington The Global Sulfur Cycle p 68 Jul. 1985 refs
Avail: NTIS HC A14/MF A01 CSCL 06C

An overview of the physiology of chemolithotrophic bacteria, particularly the thiobacilli, was presented. In these bacteria unique physiological traits are expressed during nutrient limited growth. Different physiological types of chemolithotrophs, pathways of sulfur oxidation, and electron transport in the thiobacilli, problems encountered by chemolithotrophs in the generation of reducing power, and some explanations of the phenomenon of obligate chemolithotrophy were considered. Mixotrophy in the thiobacilli has been studied extensively both under nutrient excess and limitation. In nature, bacteria usually grow under nutrient limitation. Yet the bulk of our knowledge of microbial metabolic function is derived

from bacteria grown in laboratory batch cultures containing a great abundance of nutrients. Microbial behavior in these two types of environments can be very different, indicating the need for basing an understanding of microbial ecology on studies that rely on cultivation of microorganisms under nutrient limitation. Nutrient limited bacteria differ in several ways from those growing in large quantities of nutrients. They have different surface structures and make a much fuller use of their metabolic potential, especially by the synthesis of unique pathways of catabolic enzymes. Author

N85-32732*# Georgia Univ., Athens. Dept. of Biochemistry.
SULFATE-REDUCING BACTERIA: MICROBIOLOGY AND PHYSIOLOGY Abstract Only
H. D. PECK *In* NASA, Washington The Global Sulfur Cycle p 70-71 Jul. 1985 refs
Avail: NTIS HC A14/MF A01 CSCL 06C

The sulfate reducing bacteria, the first nonphotosynthetic anaerobic bacteria demonstrated to contain c type cytochromes, perform electron transfer coupled to phosphorylation. A new bioenergetic scheme for the formation of a proton gradient for growth of Desulfovibrio on organic substrates and sulfate involving vectors electron transfer and consistent with the cellular localization of enzymes and electron transfer components was proposed. Hydrogen is produced in the cytoplasm from organic substrates and, as a permease molecule diffuses rapidly across the cytoplasmic membrane, it is oxidized to protons and electrons by the periplasmic hydrogenase. The electrons only are transferred across the cytoplasmic membrane to the cytoplasm where they are used to reduce sulfate to sulfide. The protons are used for transport or to drive a reversible ATPOSE. The net effect is the transfer of protons across the cytoplasmic membrane with the intervention of a proton pump. This type of H2 cycling is relevant to the bioenergetics of other types of anaerobic microorganisms. R.J.F.

N85-32734*# Ohio State Univ., Columbus. Dept. of Microbiology.
STRUCTURE AND PHYSIOLOGY OF BEGGIATOA AND THIOTHRIX
T. M. SCHMIDT *In* NASA, Washington The Global Sulfur Cycle p 77-78 Jul. 1985 refs
Avail: NTIS HC A14/MF A01 CSCL 06C

Reggiatoa and Thiothrix are genera of filamentous, colorless, sulfide oxidizing bacteria. These organisms are microaerophilic, oxidizing sulfide to sulfur in the presence of oxygen. The sulfur accumulates in intracellular sulfur globules - the outstanding morphological feature of these bacteria. Some strains are able to further oxidize the sulfur to sulfate aerobically or reduce the sulfur to sulfide anaerobically. This metabolic versatility makes these bacteria important links in aquatic sulfur cycles. Author

N85-32735*# Bonn Univ. (West Germany). Inst. of Microbiology.
PHOTOTROPHIC BACTERIA AND THEIR ROLE IN THE BIOGEOCHEMICAL SULFUR CYCLE
H. G. TRUEPER *In* NASA, Washington The Global Sulfur Cycle p 79-82 Jul. 1985 refs
Avail: NTIS HC A14/MF A01 CSCL 06C

An essential step that cannot be bypassed in the biogeochemical cycle of sulfur today is dissimilatory sulfate reduction by anaerobic bacteria. The enormous amounts of sulfides produced by these are oxidized again either anaerobically by phototrophic bacteria or aerobically by thiobacilli and large chemotrophic bacteria (Beggiatoa, Thiovulum, etc.). Phototrophic bacteria use sulfide, sulfur, thiosulfate, and sulfite as electron donors for photosynthesis. The most obvious intermediate in their oxidative sulfur metabolism is a long chain polysulfide that appears as so called sulfur globules either inside (Chromatiaceae) or outside (Ectothiorhodospiraceae, Chlorobiaceae, and some of the Rhodospirillaceae) the cells. The assimilation of sulfur compounds in phototrophic bacteria is in principle identical with that of nonphototrophic bacteria. However, the Chlorobiaceae and some of the Chromatiaceae and Rhodospirillaceae, unable to reduce sulfate, rely upon reduced sulfur for biosynthetic purposes. R.J.F.

N85-32736*# University of Southern Illinois, Carbondale. Dept. of Botany.
THE ROLE OF SULFUR IN OSMOREGULATION AND SALINITY TOLERANCE IN CYANOBACTERIA, ALGAE, AND PLANTS Abstract Only
J. H. YOPP *In* NASA, Washington The Global Sulfur Cycle p 83-86 Jul. 1985 refs
Avail: NTIS HC A14/MF A01 CSCL 06C

Organosulfur compounds are involved in osmoregulation and salinity tolerance in some cyanobacteria and photosynthetic eukaryotes. Glycinebetaine, the osmolyte of the halotolerant cyanobacterium, Aphanothece halophytica, requires the sulfonium compound. S-adenosyl-methionine (SAM) for its synthesis. Glutamate is the nitrogen source, SAM is the methyl carbon and serine the carbon backbone source of this unique osmolyte. Inhibitor studies suggest that photorespiration interacts with sulfur metabolism to control betaine synthesis in cyanobacteria. The limiting factor for SAM synthesis is formate from photorespiration. SAM is, in turn, the methyl donor for betaine synthesis from serine. The nitrogen component of serine is from glutamate. Betaine synthesis is hypothesized to be regulated via potassium. The biosynthesis of dimethyl-B-propiothetin (DMPT, which is the same as beta-dimethyl sulfonioprpionate) and diacylsulfoquinovosylglycerol were elucidated as having their roles in osmoregulation and salinity tolerance. The relation between these sulfolipids and the sulfur cycle was discussed. R.J.F.

N85-32737*# Barcelona Univ. (Spain). Dept. of Microbiology.
SULFUR CYCLING AND METABOLISM OF PHOTOTROPHIC AND FILAMENTOUS SULFUR BACTERIA
R. GUERRERO, D. BRUNE (Bonn Univ.), R. POPLAWSKI (Hebrew Univ., Jerusalem), and T. M. SCHMIDT (Ohio State Univ., Columbus) *In* NASA, Washington The Global Sulfur Cycle p 87-89 Jul. 1985 refs
Avail: NTIS HC A14/MF A01 CSCL 06C

Phototrophic sulfur bacteria taken from different habitate (Alum Rock State Park, Palo Alto salt marsh, and Big Soda Lake) were grown on selective media, characterized by morphological and pigment analysis, and compared with bacteria maintained in pure culture. A study was made of the anaerobic reduction of intracellular sulfur globules by a phototrophic sulfur bacterium (Chromatium vinosum) and a filamentous aerobic sulfur bacterium (Beggiatoa alba). Buoyant densities of different bacteria were measured in Percoll gradients. This method was also used to separate different chlorobia in mixed cultures and to assess the relative homogeneity of cultures taken directly or enriched from natural samples (including the purple bacterial layer found at a depth of 20 meters at Big Soda Lake.) Interactions between sulfide oxidizing bacteria were studied. R.J.F.

N85-32738*# Bonn Univ. (West Germany). Inst. of Microbiology.
ENRICHMENTS FOR PHOTOTROPHIC BACTERIA AND CHARACTERIZATION BY MORPHOLOGY AND PIGMENT ANALYSIS
D. BRUNE *In* NASA, Washington The Global Sulfur Cycle p 90-107 Jul. 1985 refs
Avail: NTIS HC A14/MF A01 CSCL 06C

The purpose of this investigation was to examine several sulfide containing environments for the presence of phototrophic bacteria and to obtain enriched cultures of some of the bacteria present. The field sites were Alum Rock State Park, the Palo Alto salt marsh, the bay area salt ponds, and Big Soda Lake (near Fallon, Nevada). Bacteria from these sites were characterized by microscopic examination, measurement of in vitro absorption spectra, and analysis of carotenoid pigments. Field observations at one of the bay area salt ponds, in which the salt concentration was saturating (about 30 percent NaCl) and the sediments along the shore of the pond covered with a gypsum crust, revealed a layer of purple photosynthetic bacteria under a green layer in the

gypsum crust. Samples of this gypsum crust were taken to the laboratory to measure light transmission through the crust and to try to identify the purple photosynthetic bacteria present in this extremely saline environment. R.J.F.

N85-32739*# Ohio State Univ., Columbus. Dept. of Microbiology.
ANAEROBIC REDUCTION OF ELEMENTAL SULFUR BY CHROMATIUM VINOSUM AND BEGGIATOA ALBA
T. M. SCHMIDT *In* NASA, Washington The Global Sulfur Cycle p 108-113 Jul. 1985 refs
Avail: NTIS HC A14/MF A01 CSCL 06C

The effect of sulfur globules on the buoyant density of Chromatium vinosum and Beggiatoa alba was examined. The potential use of sulfur as a terminal electron acceptor in the anaerobic metabolism of Beggiatoa alba is also examined. The effect of the reduction of intracellular sulfur was investigated during dark metabolism on the buoyant density of C. vinosum. It is hypothesized from the results that the sulfur reduction to sulfide is part of an anaerobic energy operating system. Carbon stored as PHB can be oxidized with the concomitant reduction of sulfur to sulfide. E.R.

N85-32740*# Barcelona Univ. (Spain). Dept. of Microbiology.
BUOYANT DENSITIES OF PHOTOTROPHIC SULFUR BACTERIA AND CYANOBACTERIA
R. GUERRERO *In* NASA, Washington The Global Sulfur Cycle p 114-116 Jul. 1985
Avail: NTIS HC A14/MF A01 CSCL 06C

The buoyant densities of bacterial cells are greatly influenced by the accumulation of intracellular reserve material. The buoyant density of phototrophic bacteria that are planktonic is of particular interest, since these organisms must remain in the photic zone of the water column for optimal growth. Separation of cells by their buoyant density may also be of use in separating and identifying organisms from a natural population. The bacteria used were obtained from pure cultures, enrichments, or samples taken directly from the environment. Author

N85-32741*# Hebrew Univ., Jerusalem (Israel). Dept. of Biochemistry.
INTERACTIONS AMONG SULFIDE-OXIDIZING BACTERIA
R. POPLAWSKI *In* NASA, Washington The Global Sulfur Cycle p 117-127 Jul. 1985 refs
Avail: NTIS HC A14/MF A01 CSCL 06C

The responses of different phototrophic bacteria in a competitive experimental system are studied, one in which primary factors such as H2S or light limited photometabolism. Two different types of bacteria shared one limited source of sulfide under specific conditions of light. The selection of a purple and a green sulfur bacteria and the cyanobacterium was based on their physiological similarity and also on the fact that they occur together in microbial mats. They all share anoxygenic photosynthesis, and are thus probably part of an evolutionary continuum of phototrophic organisms that runs from, strictly anaerobic physiology to the ability of some cyanobacteria to shift between anoxygenic bacterial style photosynthesis and the oxygenic kind typical of eukaryotes. Author

N85-32743*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CYANOBACTERIAL MATS: MICROANALYSIS OF COMMUNITY METABOLISM
Y. COHEN, D. BERMUDES (Boston Univ.), U. FISCHER (Oldenburg Univ.), R. HADDAD (North Carolina Univ., Chapel Hill), L. PRUFERT (North Carolina Univ., Chapel Hill), T. SCHEULDERMAN-SUYLEN (Technische Hogeschool, Delft, Netherlands), and T. SHAW (Scripps Inst. of Oceanography, La Jolla, Calif.) *In* NASA, Washington The Global Sulfur Cycle p 158-182 Jul. 1985
Avail: NTIS HC A14/MF A01 CSCL 06C

The microbial communities in two sites were studied using several approaches: (1) light microscopy; (2) the measurement of microprofiles of oxygen and sulfide at the surface of the microbial mat; (3) the study of diurnal variation of oxygen and sulfides; (4) in situ measurement of photosynthesis and sulfate reduction and study of the coupling of these two processes; (5) measurement of glutathione in the upper layers of the microbial mat as a possible oxygen quencher; (6) measurement of reduced iron as a possible intermediate electron donor along the established redoxcline in the mats; (7) measurement of dissolved phosphate as an indicator of processes of break down of organic matter in these systems; and (8) measurement of carbon dioxide in the interstitial water and its delta C-13 in an attempt to understand the flow of CO2 through the systems. Microbial processes of primary production and initial degradation at the most active zone of the microbial mat were analyzed. Author

N85-32745*# Boston Univ., Mass. Dept. of Biology.
GLUTATHIONE IN CYANOBACTERIA
D. BERMUDES *In* NASA, Washington The Global Sulfur Cycle p 194-199 Jul. 1985
Avail: NTIS HC A14/MF A01 CSCL 06C

The effects of light and O2 on glutathione production were determined. Results of light and dark studies under normal and reduced oxygen tensions were compared to determine the effect of reduction in oxygen tension on glutathione levels. The growth rate of Anacystis nidulans and concurrent production of glutathione is presented. The generation of time of Anacystis nidulans was approximately 12 hours. Results of light and dark incubation of Aphanothece halophytica dominated planktonic microbial community from Pond 4 and Anacystis nidulans under high and low oxygen tension is also presented. It appears that light grown Anacystis nidulans cells have equal amounts of glutathione while dark grown cells produce more glutathione in the presence of increased O2. E.R.

N85-32746*# Oldenburg Univ. (West Germany). Dept. of Geomicrobiology.
MICROBIAL COMMUNITIES AND MICROPROFILES OF SULFIDE AND OXYGEN OF ALUM ROCK SULFUR SPRINGS
U. FISCHER *In* NASA, Washington The Global Sulfur Cycle p 200-217 Jul. 1985 refs
Avail: NTIS HC A14/MF A01 CSCL 06C

The microbial community of Alum Rock sulfur spring Site. 3 was studied along one branch of the main stream and between the two branches, 150 cm distant from the source. The community at the source was dominated by green sulfur photosynthetic bacteria of the genus Chlorobium. At 15 cm to 35 cm from the source dominance in the community shifted to the genus Flexibacter at the surface of the mat and purple bacteria of the genus Chromatium underneath. At 50 cm to 80 cm colorless sulfur oxidizing bacteria of the genus Thiothrix began to appear. At 100 cm to 150 cm, the surface of the mat was still dominated by Flexibacter, but underneath dominance shifted to purple sulfur bacteria as above, as well as cyanobacteria of the genus Oscillatoria and Pseudonabaena. The measurements of temperature along the stream showed no significant gradient. Community variations appear to be controlled more by sulfide than temperature. Ten ml of the overlying water were taken and fixed immediately to determine the sulfide concentration by the methylene blue method. A sulfide concentration of 106 micro-m was calculated for the overlying water. Author

N85-32747*# Saskatchewan Univ., Saskatoon. Dept. of Applied Microbiology and Food Science.
MICROBIAL COLONIZATION AND GROWTH ON METAL SULFIDES AND OTHER MINERAL SURFACES
D. CALDWELL, A. R. SUNDQUIST (California Univ., San Diego, La Jolla), J. LAWRENCE, and A. P. DOYLE (Alaska Univ.) *In* NASA, Washington The Global Sulfur Cycle p 218-233 Jul. 1985 refs
Avail: NTIS HC A14/MF A01 CSCL 06C

To determine whether a bacterial film forms on sulfur minerals in situ, various sulfur containing and other minerals were incubated in Penitencia Creek. The rate of cell growth and attachment within the surface microenvironment of mineral surfaces was also

determined. To determine whether surfaces enriched with soluble sulfur substrates (cysteine, glutathione, thioglycolate, sulfite, and thiosulfate) increased the rate of growth or attachment of natural communities, membrane enrichments were incubated. These rates were determined as described by Caldwell et al. (1981, 1983). The growth of Pseudomonas fluorescens, a heterotrophic sulfur oxidizer, was studied in batch cell suspensions and in continuous culture. In batch culture the cells were oxygen limited (growth rate 0.33 per hour under oxygen limitations and 0.52 per hour when vigorously aerated). Growth within the film was glucose limited. Several behavioral phenomena were observed for cells growing within the hydrodynamic boundary layer. Despite a flow of 10 cm per second in the environment, the bacteria were able to move freely in both directions within the hydrodynamic boundary layer. E.R.

N85-32749# Baylor Coll. of Medicine, Houston, Tex. Dept. of Physiology.

PHYSICAL CHEMICAL STATE OF WATER IN LIVING CELLS Final Progress Report, period ending 1982

C. F. HAZLEWOOD, D. C. CHANG, and R. L. VICK May 1985 22 p

(Contract N00014-76-C-0100)

(AD-A154566) Avail: NTIS HC A02/MF A01 CSCL 06C

Overall Research Program (specific work tasks) outlined in the proposal include: physical properties of water in tissues, cells and subcellular organelles; physical properties of water in the brine shrimp artemia; effects of hemorrhagic shock on the physical properties of tissue water. Relaxation times and diffusion coefficients for water protons, hydrogen and isotopes of water were determined. The progress 1983 to 1984 pertains to: mechanisms of NMR relaxation; hypothesis of proteins dynamics and hemorrhagic shock. A biophysical study of cellular water and Ions in excitable cells - functional role of ion-water-protein interactions in excitable cells is summarized. Scientific findings include: (1) effects of the ionic environment on the gating properties of the excitable ionic channels; effect of internal Cs(+) ions on the early and late conductance in squid axon. The effect of internal sodium ions on the action potential and reversal potential in squid axons; (2) structure and function of the membrane proteins and the submembrane (cortical) protein network (a) structure of the squid axon membrane as seen after freeze-fracture, (b) possible role of cytoplasmic microtubule structure in the excitation properties of nerve axon; (3) Ionic mechanisms involved in the regulation of the resting potential; (a) Effects of ionic concentration on the resting potential in squid axons: evidence supporting a modification of the constant field equation, (b) differentiation between the excitable sodium channel and the major pathway for the resting sodium current; (4) Intracellular transport of Na(+) ions inside the nerve cell. GRA

N85-32750# Army Medical Research Inst. of Infectious Diseases, Fort Detrick, Md.

DIFFERENCES IN SUSCEPTIBILITY OF INBRED MICE TO BACILLUS ANTHRACIS

S. L. WELKOS, T. J. KEENER, and P. H. GIBBS 26 Apr. 1985 33 p

(AD-A155646) Avail: NTIS HC A03/MF A01 CSCL 06E

Animal species differ in their resistance both to infection by B. anthracis and to anthrax toxin. A mouse model was developed to study the basis of these host differences and the pathogenesis of infection. When infected with the virulent B. anthracis strain Volume 1B, all eight strains of inbred mice tested had low LD50 values (5 to 30 spores). However, analysis of time-to-death (TTD) data revealed significant differences between the strains, which could be divided into three groups: most susceptible (A/J, DBA/2J, and C3H/HeN); intermediate (C57BL/6J, C57L/J, and C58/J); and least susceptible (CBA/J and C57BR/cdJ). In contrast, the mice were distinctly susceptible or resistant to lethal infection by Sterne vaccine strain. The LD50 of the susceptible A/J and DBA/2J mice was approximately 1,000 Sterne spores; whereas the remaining six relatively resistant strains were killed only by 0.2 to 2 x 10,000,000 spores. Mice lethally infected with B. anthracis had an acute course, characterized by extensive gelatinous edema and large concentrations of bacilli in the blood and organs (e.g., 1,000,000,000 CFU/g spleen). To study susceptibility to anthrax toxin, the protective antigen (PA) and lethal factor (LF) components of the toxin were injected i.v. into A/J and CBA/J mice. As reported earlier for various animal species, susceptibilities of the mice to anthrax toxin appeared to be independent of that to infection. The toxin LD50 values for both strains were about 12 micrograms PA combined with 2.4 micrograms LF. GRA

N85-32751# Argonne National Lab., Ill.

INFLUENCE OF CHEMICAL FORM, FEEDING REGIMEN, AND ANIMAL SPECIES ON THE GASTROINTESTINAL ABSORPTION OF PLUTONIUM

M. H. BHATTACHARYYA, R. P. LARSEN, N. COHEN, L. G. RALSTON, R. D. OLDHAM, E. S. MORETTI, and L. AYRES 1985 9 p refs Presented at the Seminar on the Speciation of Fission Products in the Environment, Oxford, 16 Apr. 1985 Prepared in cooperation with New York Univ., New York.

(Contract W-31-109-ENG-38)

(DE85-010291; CONF-850473-1) Avail: NTIS HC A02/MF A01

The effect of chemical form and feeding regimen on the gastrointestinal (GI) absorption of plutonium in adult mice at plutonium concentrations relevant to the establishment of drinking water standards was evaluated. Mean fractional GI absorption values in fasted and fed adult mice are given. To assess the validity of extrapolating data from mice to humans, the GI absorption of Pu(VI) bicarbonate in adult baboons was also determined with a dual isotope method that does not require animal sacrifice. Fractional GI absorption values obtained by this method are also given. This method was validated in one baboon and are currently completing validation in two additional animals. At low plutonium concentrations, plutonium oxidation state Pu(VI) vs Pu(IV) and administration medium (bicarbonate vs nitrate vs citrate) had little effect on the GI absorption of plutonium in mice. Formation of Pu(IV) polymers and animal feeding decreased the GI absorption of plutonium 5- to 10-fold. The GI absorption of Pu(VI) bicarbonate in both fed and fasted adult baboons appeared to be the same as in fed and fasted adult mice, respectively. DOE

N85-32752# Joint Publications Research Service, Arlington, Va.

USSR REPORT: LIFE SCIENCES. BIOMEDICAL AND BEHAVIORAL SCIENCES

25 Jul. 1985 117 p Transl. into ENGLISH from various Russian articles

(JPRS-UBB-85-020) Avail: NTIS HC A06/MF A01

Progress in the life sciences, biomedical, and behavioral sciences is reported. Topics discussed include: aerospace medicine, aerotechnology, biochemistry, bionics, biophysics, biotechnology, environmental issues, epidemiology, genetics, human factors engineering, immunology, laser effects, microbiology, military medicine, nonionizing electromagnetic radiation effects, pharmacology and toxicology, physiology, public health, and radiation biology.

N85-32754# Joint Publications Research Service, Arlington, Va.

HYDROPONICS DEVELOPMENTS FOR SPACESHIP GARDEN

Y. MESHKOV *In its* USSR Rept.: Life Sci. Biomed. and JPRS-UBB-85-020 p 3 25 Jul. 1985 Transl. into ENGLISH from Probl. i Resheniya, 5 Feb. 1985 p 6

Avail: NTIS HC A06/MF A01

Developments in hydroponics aimed at developing kitchen gardens for spaceships are reported. Spacing of plants at various stages of development in hydroponic units to realize optimum use of area and to maximize the effectiveness of light from natural and artificial sources falling on plant was studied. It is found that if the efficiency of utilization of light energy is increased by 20 to 30 times, a comparable increase in the yield of biomass from square meter of area can be realized. A compact unit, the Samorod-Arktika for hydroponic cultivation of plants at outposts in Arctic regions was developed. The unit serves the same dual role for workers at polar outposts as in a spaceship garden: furnishes vitamins for the diet, and provides the psychological effect of

greenery. Prospects for development of this technology to help solve worldwide problems of limited land, water and energy resources for agriculture are discussed. E.A.K.

N85-33654# John B. Pierce Foundation of Connecticut, New Haven.
MICROWAVE RADIATION AND THERMOREGULATION Final Report, 1 Oct. 1982 - 30 Sep. 1984
E. R. ADAIR May 1985 57 p
(Contract F33615-82-K-0600)
(AD-A155718; USAFSAM-TR-85-3) Avail: NTIS HC A04/MF A01 CSCL 06C

Adult male squirrel monkeys were equilibrated to one of three ambient temperatures (Ta-20, 26 and 32 C) and then re-equilibrated for a 90-min period in the presence of a 2450-MHz CW microwave field. Power densities of 10, 15, 20, and 25 mW/sq cm were explored (SAR=1.5, 2.25, 3.0, and 3.75 W/kg, respectively) at each T sub a=32 C. In accordance with the method of partitional calorimetry, the following autonomic responses of heat production and heat loss were measured during the experiments: metabolic heat production, respiratory evaporative heat loss, total evaporative heat loss, skin and deep body temperatures that allowed determination of heat flows within the body, and from the body to the environment. The monkeys achieved thermal balance by the mobilization of appropriate thermoregulatory responses. These included a reduction of metabolic heat production when cool vasodilation of tail and foot when thermoneutral T sub a, and initiation of thermoregulatory sweating when warm. The coefficient of heat transfer to the environment, derived from these measures, was the same as that determined directly in the test environment. GRA

N85-33655# Oak Ridge National Lab., Tenn. Biology Div.
CARCINOGENESIS OF NITRATED TOLUENES AND BENZENES SKIN AND LUNG TUMOR ASSAYS IN MICE Final Report, Nov. 1979 - Mar. 1983
T. J. SLAGA, L. L. TRIPLETT, L. H. SMITH, and H. P. WITSCHI May 1985 34 p
(Contract DOE-IAG-40-1016-79; DA PROJ. 3E6-1102-BS-08)
(AD-A155723; ORNL-TOX-82-1; ORNL-TM-9645; DE85-012081)
Avail: NTIS HC A03/MF A01 CSCL 06T

A series of nitrated toluenes and benzene were tested for their capability to act as initiators, promoters or complete carcinogens in mouse skin. 2,6-dinitrotoluenes and 2-nitrotoluene were found to have weak skin tumor initiating activity. 2,4-dinitrotoluene, 2,6-dinitrotoluenes and 1,3,5-trinitrobenzene produced historical changes in skin which usually are produced by promoting agents; this finding suggests that the three compounds could have skin tumor promoting activity. However, a firm conclusion can only be reached following appropriate in vivo tests. In the lung tumor assay, none of the chemicals tested gave an unequivocal positive response. A borderline positive result for unpurified 2,6-dinitrotoluene could not be repeated when the purified compound was reassayed in the same assay. GRA

N85-33656# Department of Energy, Washington, D. C.
ANTIHYPERTENSIVE NEUTRAL LIPID Patent Application
F. L. SNYDER and M. L. BLANK, inventor (to DOE) 26 Oct. 1984 12 p
(Contract DE-AC05-76CR-00033)
(DE85-011625; US-PATENT-APPL-SN-665214) Avail: NTIS HC A02/MF A01

The invention relates to the discovery of a class of neutral acetylated either-linked glycerolipids having the capacity to lower blood pressure in warm-blooded animals. This physiological effect is structure sensitive requiring a long chain alkyl group at the sn-1 position and a short carbon chain acyl group (acetyl or propionyl) at the sn-2 position, and a hydroxyl group at the sn-3 position. DOE

N85-33657# Brookhaven National Lab., Upton, N. Y.
HIT-SIZE EFFECTIVENESS THEORY APPLIED TO HIGH DOSES OF LOW LET RADIATION FOR PINK MUTATIONS IN TRADESCANTIA
M. N. VARMA, V. P. BOND, and G. MATTHEWS 1985 15 p refs Presented at the 9th Symp. on Microdosimetry, Toulouse, 20 May 1985
(Contract DE-AC02-76CH-00016)
(DE85-011835; BNL-36434; CONF-850506-3) Avail: NTIS HC A02/MF A01

A hit-size effectiveness function which represents the probability of inducing a pink mutation in Tradescantia as a function of linear energy density has been obtained using observed pink mutation data for several different radiation qualities and their respective single event microdosimetric spectra. In obtaining this function only the linear portions of dose-response curves were used. A significant improvement of the concepts embodied in the proposed hit-size effectiveness theory would be the demonstration of its applicability at high doses (where multiple hits are produced) and high dose rates (at which no significant biological repair takes place). In this article details are given on preliminary calculations of the pink mutation frequency in Tradescantia at 1, 5, 10, 20, and 60 rads for 250 kVp X rays, using the multi-hit spectra and the hit-size effectiveness function obtained on the basis of single hit microdosimetric spectra as outlined. A comparison of the calculated and observed pink mutation frequencies indicate excellent agreement and suggests the possibility of obtaining the hit-size effectiveness function from high dose biological-effect data obtained using low-LET radiations. DOE

N85-33658# Microbial Products, Inc., Fairfield, Calif.
PRODUCTION OF LIQUID FUELS AND CHEMICALS BY MICROALGAE Final Report
J. C. WEISSMAN and R. P. GOEBEL Golden, Colo. Midwest Research Inst. Mar. 1985 115 p refs Prepared for Midwest Research Inst., Golden, Colo.
(Contract DE-AC02-83CH-10093)
(DE85-008780; SERI/STR-231-2649) Avail: NTIS HC A06/MF A01

It was determined whether simple open pond systems have application for the production of fuels from microalgae. Work concentrated on showing the potential microalgal yields that are possible from an open pond system on a sustained basis. Operational costs were documented to permit preliminary economic analysis of the system. Using two wildtype species in northern California a yearly average productivity of 15 gm/sq m/day, or 24 tons/acre/yr was obtained in water with TDS = 4 to 8 ppt. This can probably be increased to 20 to 25 gm/sq m/day or 32 to 40 tons/acre/y in southern California. Productivity can probably be further increased by using competitive strains screened for low respiration rates, tolerances to high levels of dissolved oxygen, broad temperature optima, and resistance to photoinhibition. In systems with randomized, turbulent mixing, productivity was independent of channel velocity at least for productivities up to 25 to 30 gm/sq m/day and velocities from 1 to 30 cm/sec. Storage product induction requires one to three days of growth in batch mode under n-depleted conditions. DOE

N85-33659# Pennsylvania State Univ., University Park. Dept. of Agronomy.
ANAEROBIC MICROBIAL TRANSFORMATIONS IN SUBSURFACE ENVIRONMENTS
J. M. BOLLAG, D. F. BERRY, and P. CHANMUGATHAS Apr. 1985 14 p refs Prepared in cooperation with BNL
(Contract DE-AC02-76CH-00016)
(DE85-012790; DOE/CH-00016/T7) Avail: NTIS HC A02/MF A01

The first draft of a literature review article entitled, Metabolism of Homocyclic (Benzenoid) and Heterocyclic Aromatic Compounds by Microorganisms Under Anaerobic Conditions, is completed. The article covers biodegradation of both heterocyclic and homocyclic aromatic compounds under a variety of conditions including nitrate reducing, fermentation, sulfate reducing, and methanogensis.

Laboratory experiments were designed to study the anaerobic biotransformation processes involving organic substance derived from energy residual wastes. The test compounds selected for the initial anaerobic biodegradation experiments include aniline, indole, and pyridine. A Hungate apparatus is presently in operation. DOE

N85-33660# Joint Publications Research Service, Arlington, Va.
USSR REPORT: LIFE SCIENCES. BIOMEDICAL AND BEHAVIORAL SCIENCES Abstracts Only
28 Jun. 1985 142 p Transl. into ENGLISH from various Russian articles
(JPRS-UBB-85-018) Avail: NTIS HC A07/MF A01

Progress and research results in the areas of life science, biomedical, and behavioral sciences are reported. Topics discussed include: agrotechnology, biochemistry, biophysics, biotechnology, ecology, environment, epidemiology, genetics, food technology, human factors, immunology, laser effects, medicine, microbiology, nonionizing radiation effects, pharmacology and toxicology, physiology, radiation biology, and virology.

N85-33662# Joint Publications Research Service, Arlington, Va.
FORMATION OF NEW MICROVESSELS IN SKELETAL MUSCLES OF RATS EXPOSED TO HYPOBARIC HYPOXIA FOR ONE WEEK Abstract Only
M. V. KONDASHEVSKAYA, V. B. KOSHELEV, and I. M. RODIONOV *In its* USSR Rept.: Life Sci. (JPRS-UBB-85-018) p 102 28 Jun. 1985 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 277, no. 3, Jul. 1984 p 748-751
Avail: NTIS HC A07/MF A01

The growth possibility of new microvessels in skeletal muscles under the influence of short-term hypoxia was studied. Experiments were performed on mongrel white rats 5 months in age. Inclusion of 3H-thymidine in the walls of microvessels was studied following its administration 1.5 hours before the animals were sacrificed. Angiogenesis occurred, beginning with rapid proliferation of the endothelial walls of the vessels either directly, or by extraction from the tissues of factor inducing angiogenesis. Hypoxia stimulates division of the vascular endothelial walls. The immediate functional changes in hemodynamics stimulate further structural changes in the vascular tree and angiogenesis. E.A.K.

N85-33663# Joint Publications Research Service, Arlington, Va.
EFFECTS OF IMMOBILIZATION AND HIGH-ALTITUDE ADAPTATION ON ENERGY METABOLISM IN RATS Abstract Only
D. A. SUTKOVOY and V. A. BARABOY *In* USSR Rept.: Life Sci. (JPRS-UBB-85-018) p 102-103 28 Jun. 1985 Transl. into ENGLISH from Dokl. Akad. Nauk SSR, Ser. B: Geol. Khim i Biol. Nauki (Kiev), no. 2, Feb. 1985 p 76-78
Avail: NTIS HC A07/MF A01

High-altitude adapted and unadapted rats were subjected to stress by immobilization or hyperbaric oxygenation to assess the effects on lipid peroxidation in hepatic mitochondria and serum. Immobilization significantly enhanced peroxidation, as indicated by mitochondrial and serum levels of malonic dialdehyde. Concomitantly, oxidative phosphorylation was depressed to a statistically significant degree. In the altitude-adapted rats, the corresponding changes were far less pronounced. In the unadapted rats hyperbaric oxygenation elicited qualitatively and quantitatively analogous changes. However, adaptation potentiated the increase in lipid peroxidation induced by hyperbaric oxygenation and depression of oxidative phosphorylation. The correlation between activation of lipid peroxidation and inhibition of oxidative phosphorylation was ascribed to the damaging effects of the products of peroxidation on membrane systems. Alleviations of the effects of immobilization in the adapted rats was ascribed to enhancement of antioxidant systems in that group of animals. E.A.K.

N85-33692# Joint Publications Research Service, Arlington, Va.
EFFECT OF SUBSTRATE MOISTURE ON GROWTH AND STRUCTURE OF CORN LEAF
A. F. SAFONKIN *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) p 140-144 12 Aug. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 94-96
Avail: NTIS HC A07

Experiments with higher plants aboard space vehicles were conducted in instruments with artificial substrates. Normal plant growth under such conditions depends on many environmental parameters. Water is one of the principal parameters that determines many vital functions. G.L.C.

52

AEROSPACE MEDICINE

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

A85-43320
SPATIAL-FREQUENCY MECHANISMS OF COLOR PERCEPTION [PROSTRANSTVENNO-CHASTOTNYE MEKHANIZMY VOSPRIIATIIA TSVETA]
A. V. BERTULIS and S. A. IAKUBENENE (Kaunasskii Meditsinskii Institut, Kaunas, Lithuanian SSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 11, May-June 1985, p. 355-359. In Russian. refs

Results of psychophysiological experiments with color gratings point to the existence of different adaptation processes at the level of receptors and neuron mechanisms, transmitting information about the spatial distribution of color. Specifically, it is shown that the threshold presentation time (TPT) necessary for the perception of a red and green (RG) grating increases after adaptation to an RG grating (of the same orientation and spatial frequency as the test grating) in comparison with the TPT after adaptation to a homogeneous red, green, or yellow field equivalent in terms of the subjective brightness of the adapted grating. In addition, it is demonstrated that the TPT of a black and white grating does not increase after adaptation to an RG grating in comparison with the TPT after adaptation to a homogeneous yellow field. B.J.

A85-43321
BINOCULAR RIVALRY DURING THE MONOCULAR OBSERVATION OF A HOMOGENEOUS FIELD AND STABILIZED IMAGES [BINOKULIARNAIA BOR'BA PRI MONOKULIARNOM NABLIUDENII ODNORODNOGO POLIA I STABILIZIROVANNYKH IZOBRAZHENII]
G. I. ROZHKOVA, P. P. NIKOLAEV (AN SSSR, Institut Problem Peredachi Informatsii, Moscow, USSR), and A. M. DIMENTMAN Fiziologiia Cheloveka (ISSN 0131-1646), vol. 11, May-June 1985, p. 360-367. In Russian. refs

Experiments were conducted to assess the role of binocular rivalry in the monocular perception of a homogeneous light field (HIF) and stabilized images. Visual sensations arising in the monocular and binocular perception of an HIF with a brightness of 50 cd/sq m differ significantly. The number of observed darkenings, the magnitude of the darkening part of the visual field, and the degree of darkening for various subjects were found to vary in a wide range. Results obtained in HIF experiments correlate with data obtained in experiments with stabilized images and with the dichoptic presentation of unstabilized but contradictory images. B.J.

A85-43322
INTERACTION OF THE PARASYMPATHETIC AND SYMPATHETIC PARTS OF THE VEGETATIVE NERVOUS SYSTEMS IN THE REGULATION OF HEART RHYTHM [VZAIMODEISTVIE PARASIMPATICHESKOGO I SIMPATICHESKOGO OTDELOV VEGETATIVNOI NERVNOI SISTEMY V REGULIATSII SERDECHNOGO RITMA]
D. I. ZHEMAITITE, G. A. VARONETSKAS, and E. N. SOKOLOV (Kaunasskii Meditsinskii Institut, Palanga, Lithuanian SSR; Moskovskii Gosudarstvennyi Universitet, Moscow, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 11, May-June 1985, p. 448-456. In Russian. refs

The hypothesis of the interaction of the sympathetic and system (SS) and parasympathetic systems (PS) as a factor in the regulation of heart rhythm (HR) is evaluated on the basis of the model of Cavero et al. (1976). The selective blocking of the effects of SS and PS on HR was investigated in three healthy young males, and it was found that the degree of the interaction of these systems is an independent feature that cannot be reduced to the contribution of each of the parts. A high level of SS-PS interaction in a state of wakefulness and the absence of such interaction in sleep point to a central mechanism for the control of the interaction. B.J.

A85-43323
EFFECT OF METEOROLOGICAL FACTORS ON HUMAN PSYCHOPHYSIOLOGICAL RESPONSES [VLIIANIE METEOFAKTOROV NA PSIKHOFIZIOLOGICHESKIE REAKTSII CHELOVEKA]
E. G. SUCHKINA (Gor'kovskii Meditsinskii Institut, Gorki, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 11, May-June 1985, p. 470-473. In Russian. refs

The temporal features of the influence of meteorological factors (especially the effects of solar activity) on psychophysiological responses in healthy persons and in patients with cerebrovascular disease are examined. It is noted that not only periods directly preceding and following the day on which experiments were performed must be taken into account in evaluating this influence. Short-term memory and voluntary attention were found to be more subject to the effect of external factors than reaction time, critical flicker fusion frequency, or the vegetative index. It is also shown that patients with cerebrovascular disease are more affected than healthy persons with respect to memory, attention, and vegetative index. B.J.

A85-43324
CHANGES IN WATER-SALT METABOLISM DURING THE FIRST HOURS OF IMMERSION IN THE CASE OF IMMERSION AT DIFFERENT TIMES OF THE DAY [IZMENENIIA VODNO-SOLEVOGO OBMENA V PERVYE CHASY IMMERSII PRI POGRUZHENII V RAZLICHNOE VREMIA SUTOK]
V. IU. SEMENOV and E. A. ALEKSANDROVA Fiziologiia Cheloveka (ISSN 0131-1646), vol. 11, May-June 1985, p. 499-503. In Russian. refs

Experiments were conducted to assess the dependence of changes in the excretion of water and ions by the kidneys on the time of day of immersion. It is shown that immersion by the 'dry' method (Shul'zhenko and Vil'-Vil'iams, 1976) leads, irrespective of the time of immersion, to an increase in the excretion by the kidneys of water, osmotically active substances, sodium, and potassium that is most pronounced in the first half of the day. A change in the circadian rhythm of the excretion of water, osmotically active substances, and sodium was observed in conditions of immersion. B.J.

A85-43934
VELOCITY STEP RESPONSES OF THE HUMAN GAZE PURSUIT SYSTEM EXPERIMENTS WITH SIGMA-MOVEMENT
F. BEHRENS, O.-J. GRUESSER (Freie Universitaet, Berlin, West Germany), and H. COLLEWIJN (Erasmus Universiteit, Rotterdam, Netherlands) Vision Research (ISSN 0042-6989), vol. 25, no. 7, 1985, p. 893-905. Research supported by the European Science Foundation and DFG. refs

By means of dc-electrooculography or the electromagnetic search coil technique, horizontal and vertical eye position signals were recorded in subjects (head fixed) attentively pursuing a rotating dot circle (dot distance P sub s = 0.8 or 1.0 deg). In addition, circular eye pursuit movements were evoked by sigma-movement seen when the stationary dot circle was illuminated stroboscopically (flash frequency f sub s). The rotation velocity V sub s or the velocity of sigma-movement (P sub s x f sub s) was changed in positive or negative steps, leading to acceleration or deceleration of pursuit eye velocity. This step response of eye velocity could be well described by a linear second-order differential equation with an additional dead time of about 80-100 msec. When gaze position error signals were larger than 0.3-0.5 deg, correcting saccades were superimposed on the step response of the smooth pursuit system. Voluntary saccades across the rotating or apparently rotating circle did not lead to any impairment in successive pursuit eye movements or an interruption in the sigma-movement. The gaze tracking command signals (smooth pursuit and saccadic responses) are evidently related to the stimulus movement in the extrapersonal space and not to retinal movement signals. Author

A85-44454
ENDURANCE TRAINING IN HUMANS - AEROBIC CAPACITY AND STRUCTURE OF SKELETAL MUSCLE
H. HOPPELER, H. HOWALD, K. CONLEY, S. L. LINDSTEDT, H. CLAASSEN (Bern, Universitaet; Swiss School for Physical Education and Sports, Magglingen, Switzerland) et al. Journal of Applied Physiology (ISSN 0161-7567), vol. 59, Aug. 1985, p. 320-327. Research supported by the CILO Bicycles Romanel. refs
(Contract SNSF-3,332,78; SNSF-3,128,0,81)

The adaptation of the muscle structure, power output and aerobic capacity was studied in untrained male and female subjects exercised on bicycle ergometers at a heart rate exceeding the maximal value by 85 percent. At the end of 6 weeks of 30 min daily, 5 days a week exercises, the mean body mass (Mb), tomographic thigh measurements and maximal heart rate remained unchanged. Increases were recorded in the mass-specific rate of O2 consumption (VO2/Mb, 14 percent); the maximal maintained power (33 percent); and in the capillary density (29 percent), volume density of total mitochondria (40 percent), and intracellular lipid deposits (100 percent), in the muscle biopsy samples. It is proposed that the observed preferential proliferation of subsarcolemmal vs interfibillar mitochondria and the increase in the lipid deposits are two possible mechanisms by which muscle cells adapt to an increased use of fat as a fuel. I.S.

A85-44455
EFFECT OF BETA-ADRENOCEPTOR BLOCKADE ON H(+) AND K(+) FLUX IN EXERCISING HUMANS
A. KATZ, K. SAHLIN, and A. JUHLIN-DANNFELT (Karolinska Institutet; Huddinge University, Hospital, Sweden) Journal of Applied Physiology (ISSN 0161-7567), vol. 59, Aug. 1985, p. 336-341. Research supported by the Swedish Research Council of Sports Medicine. refs

A85-44456
SERUM ERYTHROPOIETIN IN HUMANS AT HIGH ALTITUDE AND ITS RELATION TO PLASMA RESIN
J. S. MILLEDGE and P. M. COTES (Medical Research Council, Clinical Research Centre, Harrow, England) Journal of Applied Physiology (ISSN 0161-7567), vol. 59, Aug. 1985, p. 360-364. Research supported by the American Alpine Club, Servier Laboratories, Explorers Club, U.S. Army, and NSF. refs
(Contract NIH-HL-24335; PHS-3-HR-6-2915)

Serum immunoreactive erythropoietin (siEp) was estimated in samples collected from members of two scientific and mountaineering expeditions, to Mount Kongur in Western China and to Mount Everest in Nepal. SiEp was increased above sea-level control values 1 and 2 days after arrival at 3,500 m and remained high on ascent to 4,500 m. Thereafter, while subjects remained at or above 4,500 m, siEp declined, and by 22 days after the ascent to 4,500 m was at control values but increased on ascent to higher altitude. Thus siEp was at a normal level during the maintenance of secondary polycythemia from high-altitude exposure. On descent, with removal of altitude hypoxia, siEp decreased, but despite secondary polycythemia levels remained measurable and in the range found in subjects normally resident at sea level. On Mount Everest, siEp was significantly (P less than 0.01) elevated above preexpedition sea-level controls after 2-4 wk at or above 6,300 m. There was no correlation between estimates of siEp and plasma renin activity in samples collected before and during both expeditions. Author

A85-44457
HUMAN ESOPHAGEAL PRESSURES AND CHEST WALL CONFIGURATION IN UPRIGHT AND HEAD-DOWN POSTURE
I. CLARYSSE and M. DEMEDTS (Leuven, Katholieke Universiteit, Louvain, Belgium) Journal of Applied Physiology (ISSN 0161-7567), vol. 59, Aug. 1985, p. 401-407. Research supported by the Fonds de la Recherche Scientifique Medical. refs

A85-44460
EFFECT OF EXERCISE ON PLASMA INTERFERON LEVELS
A. VITI, M. MUSCETTOLA, L. PAULESU, V. BOCCI, and A. ALMI (Siena, Universita, Italy) Journal of Applied Physiology (ISSN 0161-7567), vol. 59, Aug. 1985, p. 426-428. refs
(Contract CNR-83,00629,52)

The effect of exercise on plasma interferon activity was studied on eight male subjects before and after exercise on a bicycle ergometer for 1 h at 70 percent of their maximal O2 consumption (V dot sub O2max). Acid-labile interferon, alpha-type according to immunological characterization, rose significantly from a preexercise value of 3 + or - 1 to 7 + or - 2 IU/ml postexercise. Negligible changes were recorded for plasma protein, lipid, and glucose concentrations, whereas blood lactate slightly increased only at the end of exercise. According to hematocrit and plasma protein values before and after exercise, hemoconcentration did not occur. These data provide evidence that plasma interferon activity increased following a bout of submaximal exercise.
Author

A85-44464
PLASMA VOLUME CHANGES IN MIDDLE-AGED MALE AND FEMALE SUBJECTS DURING MARATHON RUNNING
L. G. MYHRE, G. H. HARTUNG, S. A. NUNNELEY, and D. M. TUCKER (USAF, School of Aerospace Medicine, Brooks AFB, TX) Journal of Applied Physiology (ISSN 0161-7567), vol. 59, Aug. 1985, p. 559-563. refs

Periodic changes in plasma volume (PV) were examined during severe prolonged exercise: 42.2 km race, run in moderate environment (17.5-20.4 C) by middle aged (32-58 yr) subjects in 3:34 (male) to 4:10 hr (female) mean time. Changes in values of PV were estimated from measured hemoglobin and hematocrit at the distances of 0, 6, 27, and 42.2 km. At 6 km, when the body weight loss was less than 1 percent, PV was decreased by 6.5 (males) to 8.6 (females) percent; however, PV remained stable throughout the remainder of the race, in spite of the fact that hypohydration at the end of the race reached 3 percent levels. Minor increase in total plasma protein reflected lower PV. The results evidence a resistance of vascular compartment to volume depletion once, after initial exercise (6 km) a new equilibrium is established between the capillary filtration and the tissue osmotic forces. I.S.

A85-44465
REFLEX COMPENSATION OF VOLUNTARY INSPIRATION WHEN IMMERSION CHANGES DIAPHRAGM LENGTH
R. B. BANZETT, R. W. LANSING, and M. B. REID (Harvard University, Boston, MA) Journal of Applied Physiology (ISSN 0161-7567), vol. 59, Aug. 1985, p. 611-618. refs
(Contract NIH-HL-19170)

The compensatory reflexes involved in adjustment of constant tidal lung volume to changes in the operating lengths of the inspiratory muscles were studied in subjects trained to perform voluntary respiratory maneuvers. The results were compared with previous studies performed on spontaneously breathing subjects. Operational lengths of diaphragm and intercostal muscles were altered in partly immersed subjects by periodically changing the water levels between the iliac crest and the xiphisternum. The surface electromyograms (EMGs) of the respective muscles were measured by means of water-proof adhesive surface electrodes, and the peak EMGs estimated from the base line established during relaxation. The tidal volume was measured by means of a flowmeter connected to the mouthpiece. The compensational reflexes were indicated by the fall in the diaphragm and intercostal EMGs and by the regulations in the inspiratory flow and the tidal volume. The similarity between the compensatory reflex in the voluntary and the spontaneous breathing points to similar of organization at the brain-stem or the spinal level, in spite of the different control centers (cerebral cortex in the voluntary and medulla in the spontaneous) of the two manners of inspiration.
I.S.

A85-44612
THE ENDOCRINOLOGY OF STRESS
F. J. MILLS (Janssen Pharmaceutical, Ltd., Wantage, England) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, July 1985, p. 642-650. refs

With the advance in hormone assay techniques it has been demonstrated that stress may be characterized by a number of endocrinological changes which are not limited solely to the secretion of catecholamines and adrenal steroids. This article reviews the effects of various stressors on these and other hormones. Aviation is a source of a wide range of stressors including radial acceleration (+Gz). Since its magnitude and duration may be controlled experimentally by using the human centrifuge, it is possible to quantify such a stressor when investigating endocrinological markers of stress. Sustained +Gz acceleration results in a 'dose-dependent' secretion of cortisol, i.e., the higher the acceleration, the greater the cortisol secretion. In addition, increases in the concentrations of arginine vasopressin and catecholamines occur but these are not accompanied by changes in prolactin or growth hormone. Author

A85-44613
STRESS, CATECHOLAMINES, AND SLEEP
G. A. HARRISON (Oxford University, England) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, July 1985, p. 651-653.

Difficulties in defining stress stem from its subjective nature. Measurements of stress based on its effects on physical and mental morbidity tend to be speculative because of the multifactorial causation of stress-related disease, and the characteristically long time-lag between stress states and morbidity. In this study catecholamine output was measured in a group of adult Oxfordshire villagers and the observed variations were related to their lifestyle and health perceptions. A marked circadian variation was observed with adrenaline showing the most marked associations with lifestyle. In men it was possible to account for a relatively high proportion of the variation in adrenaline excretion by relating values to certain factors associated with stress. In women there appears to be a

similar association between adrenaline output and the social class of the husband. Data were also obtained on sleep characteristics, which were assessed with regard to lifestyle. Very broadly, sleep duration is related to the level of waking activity, while sleep latency and quality are correlated with people's self-perception of health.
Author

A85-44614
FACTORS PREDICTIVE OF STRESS, ORGANIZATIONAL EFFECTIVENESS, AND CORONARY HEART DISEASE POTENTIAL
W. H. HENDRIX (Clemson University, SC) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, July 1985, p. 654-659. refs

Research to predict stress, organizational effectiveness, and potential for developing coronary heart disease (CHD) is presented based on two samples (n = 357 and n = 225). Results indicate that perceived stress is predicted by a combination of individual and job related characteristics. The data suggest that stress, in turn, affects individual and organizational health and effectiveness, by causing increases in cold/flu episodes, somatic symptoms, while decreasing job satisfaction. In addition, stress has an indirect effect on job performance and absenteeism. Models for predicting the ratio of total serum cholesterol divided by HDL cholesterol as an indicator of CHD potential are provided and a CHD screening model is proposed. Author

A85-44615
CHOLESTEROL, STRESS, LIFESTYLE, AND CORONARY HEART DISEASE
R. G. TROXLER (Texas, University, San Antonio) and H. A. SCHWERTNER (USAF, School of Aerospace Medicine, Brooks AFB, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, July 1985, p. 660-665. refs

Studies investigating the relationships between coronary heart disease (CHD) and serum very low (VLDL) and low density lipoprotein (LDL) cholesterol levels, as well as such secondary risk factors as body weight, diet, stress, and exercise, are presented. Metabolic origins of various lipoproteins, and the relationship between the secondary risk factors to LDL, VLDL and CHD are discussed. The evidence is cited relating levels of high density lipoprotein (HDL) cholesterol/cholesterol ratios to exercise and to atherosclerosis. The particular enzymes and metabolic steps in cholesterol biosynthesis affected by the stress-related hormones epinephrine and glucocorticoids are identified. On the basis of this evidence, preventive measures for control of CHD are suggested. These include control of body fat, diet fat, and emotional stress, initiation of an exercise program, as well as medication for cases of elevated cholesterol not responsive to lifestyle changes.
I.S.

A85-44616
CHANGES OF POSTURE DURING TRANSIENT PERTURBATIONS IN MICROGRAVITY
G. CLEMENT, F. LESTIENNE (CNRS, Laboratoire de Physiologie Neurosensorielle, Paris, France), V. S. GURFINKEL, M. I. LIPSHITS, and K. E. POPOV (AN SSSR, Institut Problem Peredachi Informatsii, Moscow, USSR) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, July 1985, p. 666-671. refs
(Contract CNES-507761; CNES-509903)

The control of goal-directed arm movement and of body stability before, during, and 3 d after a 7-d spaceflight has been investigated. The findings show that the anticipatory and compensatory activities of the postural muscles were highly reproducible during the first days of the space mission. The sequence of these activities, studied in two situations - in which the platform either was fixed or could rotate about near the rotation axis of the ankle - was similar to a ground-based situation. The trajectory of various body segments demonstrates that a 7-d exposure to microgravity did not result in major changes in posture. Furthermore, vision seemed to play an important role in the control of standing posture at the beginning of the flight. Postural perturbations, elicited by unexpected displacements of the foot support, involved leg muscle reflexes whose amplitudes were greatly reduced compared to those on earth. Author

A85-44618
DIFFERENCES IN HEALTH RISKS BY AIRCRAFT MODEL AMONG U.S. NAVY PILOTS
A. HOIBERG (U.S. Navy, Naval Health Research Center, San Diego, CA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, July 1985, p. 676-682. Navy-supported research. refs

The purpose of this study was to identify health risks associated with eight aircraft models in a population of U.S. Navy pilots (n = 22,245) during a 12.5-year time period. Results showed that pilots in the trainer/miscellaneous group (not greater than 35 years of age) had significantly higher hospitalization rates than other pilot groups for almost all diagnoses whereas reconnaissance pilots were distinguished from others by lower total hospitalization rates. Younger helicopter pilots had significantly higher hospitalization rates for joint diseases than four other groups and significantly higher rates for nervous system disorders than attack and patrol/antisubmarine groups. Explanations for these and mortality rate results were provided by examining the influence of selection and retention criteria; age, experience, and exposure; pilot population characteristics; and aircraft model assignments.
Author

A85-44619* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EFFECTS OF EXERCISE-HEAT ACCLIMATION ON FLUID, ELECTROLYTE, AND ENDOCRINE RESPONSES DURING TILT AND +GZ ACCELERATION IN WOMEN AND MEN
J. E. GREENLEAF, P. J. BROCK, D. SCIARAFFA, A. POLESE, and R. ELIZONDO (NASA, Ames Research Center, Moffett Field, CA; Indiana University, Bloomington) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, July 1985, p. 683-689. refs

Two aspects of prolonged endurance training were investigated: (1) the effects of exercise-heat acclimation (on a cycle ergometer at 40 C, 42 rh) on orthostatic tolerance (70 deg head-up tilt) and on a +Gz (head-to-foot) acceleration tolerance of male and female subjects; and (2) comparison of their fluid-electrolyte shifts and hormonal (plasma epinephdrine, norepinephrine, renin, and vasopressin) responses during tilting and centrifugation. The adaptive responses during the 12 d, 2-h acclimation did not alter acceleration tolerance of either men or women, or the women's tilt tolerance, but did increase men's tilt tolerance from 30.4 min before to 58.3 min after acclimation. The patterns of fluid, electrolyte, and protein shifts at tolerance in acceleration and tilting tests were virtually the same in men and women. On the other hand, the hormonal plasma epinephrine, norepinephrine, renin, and vasopressin resonses displayed different shift patterns during acceleration and tilting. It is concluded that the responses to tilting cannot be used to predict responses to acceleration. Future experiments for relating the orthostatic and the acceleration tolerances, and the practical questions of the training regimens for future astronauts are discussed. I.S.

A85-44621
THE EFFECTS OF ETHANOL ON VISUAL-VESTIBULAR INTERACTION DURING ACTIVE AND PASSIVE HEAD MOVEMENTS
G. R. BARNES, J. W. CROMBIE, and A. EDGE (RAF, Institute of Aviation Medicine, Farnborough, England) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, July 1985, p. 695-701. refs

The effects on visual-vestibular interaction of a moderate dose of ethyl alcohol (blood alcohol 80 mg/100 ml) have been investigated in two experiments. In the first, alcohol was shown to degrade both visual pursuit and suppression of the vestibulo-ocular reflex (VOR) in a simular manner when the vestibular response was induced by passive oscillation on a turnable at frequencies of 0.11-1.2 Hz. In the second experiment a similar degradation in VOR suppression was observed when subjects made volitional

head movements at frequencies of 0.5-3 Hz. In addition, the effectiveness of vestibulo-ocular compensation was shown to be significantly reduced by alcohol when viewing an earth-fixed target during voluntary head movements. Although alcohol induced small changes in the vestibolo-ocular respone recorded in darkness, the main effect on oculomotor performance was reduced effectiveness in the visual feedback of retinal error information. Author

A85-44622
WILL THEY FLY AGAIN? - THE PROBABILITY OF WOUNDED MILITARY AVIATORS RETURNING TO FLYING DUTY - A STUDY OF 70 CASES
U. Y. DREYFUSS, M. ORTHOP, Y. G. CAINE, and S. Z. MARGALIOT (Israel Air Force Aeromedical Centre, Ramat Gan) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, July 1985, p. 702-708.

A85-44623
HDL-CHOLESTEROL RELATED TO WEIGHT, SMOKING, AND PHYSICAL FITNESS IN GERMAN AIR FORCE PILOTS
K. REICHENBACH-KLINKE, S. KOCH, and E. C. BURCHARD (Luftwaffe, Flugmedizinisches Institut, Fuerstenfeldbruck, West Germany) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, July 1985, p. 709-713. refs

A85-44624
AGE AND SPACE FLIGHT
S. R. MOHLER (Wright State University, Dayton, OH) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, July 1985, p. 714-717. refs

Criteria for space flight crew and passenger selection should be based on the following three considerations: (1) freedom from impairing disease, (2) ability to perform mission requirements and (3) motivation to undertake the mission. Chronologic age of itself is not a valid criterion. Forecast life expectancy and vitality relative to mission duration are valid criteria and can be applied on an individual basis using modern assessment techniques. The good health and vitality characterizing the upper ages of today's population widens the opportunity to utilize increasingly broad fields of experience and skills in future space flights, further enhancing the odds for total mission accomplishment. Author

A85-44771* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EFFECT OF HAND-ARM EXERCISE ON VENOUS BLOOD CONSTITUENTS DURING LEG EXERCISE
N. WONG, J. E. SILVER, S. GREENAWALT, S. E. KRAVIK, G. GEELEN (NASA, Ames Research Center, Moffett Field, CA) et al. International Journal of Sports Medicine (ISSN 0172-4622), vol. 6, April 1985, p. 86-89. refs
(Contract NCA2-OR-660-103)

Contributions by ancillary hand and arm actions to the changes in blood constituents effected by leg exercises on cycle ergometer were assessed. Static or dynamic hand-arm exercises were added to the leg exercise (50 percent VO2 peak)-only control regimens for the subjects (19-27 yr old men) in the two experimental groups. Antecubital venous blood was analyzed at times 0, 15, and 30 min (T0, T15, and T30) for serum Na(+), K(+), osmolality, albumin, total CA(2+), and glucose; blood hemoglobin, hematocrit, and lactic acid; and change in plasma volume. Only glucose and lactate values were affected by additional arm exercise. Glucose decreased 4 percent at T15 and T30 after static exercise, and by 2 percent at T15 (with no change at T30) after dynamic arm exercise. Conversely, lactic acid increased by 20 percent at T30 after static exercise, and by 14 percent by T15 and 6 percent at T30 after dynamic arm exercise. It is concluded that additional arm movements, performed usually when gripping the handle-bar on the cycle ergometer, could introduce significant errors in measured venous concentrations of glucose and lactate in the leg-exercised subjects. I.S.

A85-45108
SUSTAINED ISOMETRIC MUSCLE CONTRACTIONS - INTERACTION OF PHYSIOLOGICAL RESPONSES AND TASK PERFORMANCE
R. L. WILEY (Miami University, Oxford, OH) IN: NAECON 1984; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 21-25, 1984. Volume 2 . New York, IEEE, 1984, p. 954-957.

In combination with standard 'G-suit' positive acceleration tolerance-enhancing methods for the pilots of high performance aircraft, significant increases in tolerance have been demonstrated for the pilot's performance of simple hand-grip contractions. These positive results are noted in both slow and rapid onset G-maneuver profiles simulated in centrifuge tests. G-force tolerance enhancements of about 1 G have been obtained. O.C.

A85-45632#
HUMAN REACTIONS TO THREE STAGE LAUNCHING ACCELERATION
B.-S. XIE, G.-Y. LIU, X.-Y. CHENG, and Y.-Y. XUE (Institute of Space Medico-Engineering, People's Republic of China) Chinese Journal of Space Science, vol. 4, Jan. 1984, p. 51-57. In Chinese, with abstract in English. refs

Ten healthy young adults were exposed to a three-stage acceleration profile on a human centrifuge with a back angle of 15 deg. The three stages lasted 150 sec each, with successive peaks of 4.6 and 5 G. Electrocardiogram, blood pressure vibrocardiogram, rheo-encephalogram, and respiration were recorded, and the changes in some important physiological parameters were analyzed. The subjective feelings of the subjects were fairly good, and changes in the physiological parameters were within the range of compensatory regulation. All subjects successfully tolerated the acceleration profile. C.D.

A85-46033
EVALUATION OF THE INTENSITY OF ENDOGENIC LIPID PEROXIDATION IN HUMANS UNDER HYPERBARIC OXYGENATION [OTSENKA INTENSIVNOSTI ENDOGENNOGO PEREKISNOGO OKISLENIIA LIPIDOV U LIUDEI PRI GIPERBARICHESKOI OKSIGENATSII]
O. N. ORLOV, L. L. PRILIPKO, V. V. RODIONOV, E. A. DEMUROV, and V. E. KAGAN (Vsesoiuznyi Nauchnyi Tsentr Khirurgii, Moscow, USSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 283, no. 2, 1985, p. 493-496. In Russian. refs

Experiments were conducted in an effort to study: (1) the variability of the level of endogenic lipid peroxidation (LP) in healthy persons during prolonged dynamic observation; (2) changes in the content of LP products in inhaled air in healthy persons subjected to a single application of hyperbaric oxygenation (HO); and (3) changes in the content of gaseous products of LP in persons subjected to repeated HO. The results indicate the drastic activation of LP processes (evaluated according to pentane content in the inhaled air) in response to a chosen regime of HO. It is concluded that these results can be used for choosing an optimal regime of HO for a given patient. B.J.

A85-46039
POSSIBILITY OF CONTROLLING THE HEART RHYTHM BY MEANS OF VOLUNTARY ALTERATIONS IN RESPIRATION RATE [VOZMOZHNOST' UPRAVLENIIA RITMOM SERDTSA POSREDSTVOM PROIZVOL'NOGO IZMENENIIA CHASTOTY DYKHANIIA]
V. M. POKROVSKII, V. G. ABUSHKEVICH, A. I. DASHKOVSKII, and S. V. SHAPIRO (Kubanskii Meditsinskii Institut, Krasnodar, USSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 283, no. 3, 1985, p. 738-740. In Russian. refs

The relationship between respiration rate (RR) and heart rate (HR) was studied in 10 females 19-22 years of age. It is shown that the HR can be controlled by voluntary alterations of the RR to values exceeding the initial HR. It is suggested that this control has a central nervous mechanism, and is effected through irradiation of excitation from respiratory neurons to cardiac neurons

of the medulla oblongata, whose effect on the heart is mediated by centrifugal extracardial nerves. B. J.

A85-46117
HYPOXIA AND CARBOHYDRATE METABOLISM [GIPOKSIIA I UGLEVODNYI OBMEN]
V. A. GALENOK and V. E. DIKKER Novosibirsk, Izdatel'stvo Nauka, 1985, 194 p. In Russian. refs

Clinical and experimental studies of disruptions in oxygen metabolism in living tissue are reviewed. A theory concerning the origin of tissue hypoxia in diabetic patients is proposed, and the role of diabetes in the pathogenic disruption of carbohydrate metabolism is discussed. Changes in oxygen content due to the reduction of transcapillary diffusion are also examined. I.H.

A85-46175
EFFECT OF PHYSICAL-EXERCISE REGIMEN ON THE PHYSICAL WORK CAPACITY OF SEAMEN DURING POST-VOYAGE REST [VLIIANIE DVIGATEL'NOGO REZHIMA NA FIZICHESKUIU RABOTOSPOSOBNOST' MORIAKOV VO VREMIA POSLEPOKHODOVOGO OTDYKHA]
IU. M. BOBROV, V. S. SHCHEGOLEV, S. G. TERESHCHENKO, K. A. ARAKELIAN, and O. V. GLADCHENKO Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), June 1985, p. 68-71. In Russian.

A85-46316
DIAGNOSTIC INFORMATION CONTENT OF SOME INDICATORS OF ROTATARY NYSTAGMUS [DIAGNOSTICHESKAIA INFORMATIVNOST' NEKOTORYKH POKAZATELEI VRASHCHATEL'NOGO NISTAGMA]
E. A. KUPRIASHKIN and B. V. PERMIAKOV (Cheliabinskii Meditsinskii Institut, Chelyabinsk, USSR) Vestnik Otorinolaringologii (ISSN 0042-4668), July-Aug. 1985, p. 17-19. In Russian. refs

The diagnostic value of information content obtained from recordings of rotatory nystagmus, with respect to the amplitude (A), frequency (F), latent period (LP), and nystagmus duration (ND) was investigated. The respective characteristics obtained for 55 patients with peripheral type of vestibular dysfunction (Pathol. group) were compared to those of healthy subjects (Norm. group) on the basis of the statistical analysis of the numerical values yielded by their electronystagmograms. The results showed a clear difference between Pathol. and Norm. groups in the time-course function of nystagmus, A(t) x F(t), in which the maximum of the statistically determined curve for the Pathol. group was significantly shifted to the right of the Norm. graph. The differences in the individual characteristics A, F, LP, and ND were of little diagnostic value. The belated development of the nystagmic reaction is caused by functional disorders of the cupola-endolymphatic system. I.S.

A85-46317
FACTORS DETERMINING THE RESPIRATORY PATTERN [FAKTORY, OPREDELIAIUSHCHIE PATTERN DYKHANIIA]
I. S. BRESLAV (AN SSSR, Institut Fiziologii, Leningrad, USSR) Uspekhi Fiziologicheskikh Nauk (ISSN 0301-1798), vol. 16, July-Sept. 1985, p. 32-51. In Russian. refs

Interrelationships between various temporal and volumetric parameters which determine the respiratory pattern (RP) are analyzed. These factors include the duration of the inspiratory and the expiratory phases, and of the total breathing cycle; rate of breathing; the respiratory volume; and the minute ventilation. The isoventilatory and the stenoventilatory changes caused by various biomechanical factors (thorax anatomy, pathological alterations of respiratory organs, as well as externally applied restrictions); by chemoreceptor stimulation (hypoxia, hypercapnia, effects of muscular activity); and by the levels and variations of temperature, are discussed in connection with the accompanying changes in the individual parameters of RP. Brain centers and the mechanisms regulating these parameters are analyzed. The practical significance of evaluating RP and its changes caused by psychological stress, and by pathological disorders, is noted. I.S.

N85-32753# Joint Publications Research Service, Arlington, Va.
REMOTE MEDICAL DIAGNOSIS
V. K. YEMELYANOV *In its* USSR Rept.: Life Sci. Biomed. and JPRS-UBB-85-020 p 1-2 25 Jul. 1985 Transl. into ENGLISH from Sov. Litva (Vilnius, USSR), 12 Apr. 1985 p 4
Avail: NTIS HC A06/MF A01

The use of aerospace medicine achievements to solve medical problems on Earth is discussed. Man's abilities, methods of controlling the organism's adaptation to changing and often harsh conditions of outer space are monitored. Special methods and the proper apparatus give recording and transmission of various physiological parameters that indicate the status of all of a cosmonaut's vitally important body systems. Remote diagnosis can be effectively applied to use on Earth. A well-developed network of satellites is available. The possibility to use this network to allow a hospital in remote region of the country to communicate and exchange information with leading centers of medicine is outlined. E.A.K.

N85-32755* National Aeronautics and Space Administration, Washington, D. C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 273
Jul. 1985 87 p
(NASA-SP-7011(273); NAS 1.21:7011(273)) Avail: NTIS HC $7.00 CSCL 06E

This bibliography lists 265 reports, articles, and other documents introduced into the NASA scientific and technical information system in June 1985. Topics in aerospace medicine and biology, metabolism, human behavior, man machine systems, and injuries are included. R.J.F.

N85-32756# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
STUDIES OF CIRCULATORY AND METABOLIC CHANGES DURING KETAMINE NARCOSIS
I. HENSEL, U. BRAUN, D. KETTLER, D. KNOLL, and J. MARTEL 13 Mar. 1985 16 p Transl. into ENGLISH from Der Anaesthesist, (West Germany), v. 21, no. 2, 1972 p 44-49
(AD-A154512; FTD-ID(RS)T-0079-85) Avail: NTIS HC A02/MF A01 CSCL 06O

Among commonly used anesthetics, ketamine obviously occupies an unusual position. While most anesthetics exert a retarding effect on circulation and metabolism, ketamine clearly has the opposite effect. Figure 1 shows the synopsis of the most important circulatory characteristics after a representative individual test. The injection of ketamine in the animal test causes an increases in heart frequency (HF), HZV (lower curve), coronary blood supply (Vcor) and the myocardial O2 consumption, together with a reduction in coronary venous saturation (upper falling curve). The pressures and the rate of decrease are higher. Eight mongrel dogs weighing between 19 and 27 kg were pre-medicated with 1 mg of scopalamine and 30 minutes later received intravenously on average 20 mg/kg body weight of ketamine which produced in them a condition similar to narcosis. The behavior of PCO2, pH bases excess and the average arterial pressure, heart beat and the central venous pressure during ketamine is discussed. The change in heart beat and the plasma concentration of noradrenaline, adrenaline, glucose and free fatty acids during ketamine narcosis is reported. Oxygen consumption during ketamine narcosis after administration of a muscle relaxant and a morphine derivative is also reported. GRA

N85-32757# Dayton Univ., Ohio.
VISUAL PHENOMENA PRODUCED BY BINOCULARLY DISPARATE DYNAMIC VISUAL NOISE Final Technical Paper, Aug. 1981 - Sep. 1984
G. A. GERI and Y. Y. ZEEVI May 1985 39 p Prepared in cooperation with Massachusetts Inst. of Tech.,
(Contract F33615-81-C-0005)
(AD-A154758; AFHRL-TP-85-4) Avail: NTIS HC A03/MF A01 CSCL 06P

The use of helmet mounted displays in flight simulation requires that different visual stimuli be presented to the two eyes. Such disparate stimulation may result in perceptual problems which could adversely affect simulator training. A series of four experiments addressed several perceptual problems associated with the use of binocularly disparate stimuli. The stimulus used in all four experiments was the dynamic visual noise (DVN) stereophenomenon produced by viewing a detuned television receiver with the input to one eye attenuated by a light filter. The result is the percept of several counterdirectional dot-planes separated in depth. The purpose of the basic visual research reported here is to further elucidate the visual mechanisms underlying movement aftereffects (Experiment 1), binocular rivalry (Experiment 2), perceived visual acceleration (Experiment 3), and vergence and accommodation to perceived depth (Experiment 4). Each of these phenomena was induced by a form free texture stimulus perceived as moving in planes located at various distances from the observer. GRA

N85-32758# Hahnemann Medical Coll. and Hospital, Philadelphia, Pa. Dept. of Anatomy.
ANALYSIS OF LONG BONE AND VERTEBRAL FAILURE PATTERNS Final Scientific Report
J. A. C. EURELL 14 Feb. 1985 223 p
(Contract AF-AFOSR-0044-84)
(AD-A154796; AFOSR-85-0454TR) Avail: NTIS HC A10/MF A01 CSCL 06E

This report documents five years of work on the normal anatomy of the rhesus monkey vertebral column, the vertebral column response to compressive loading, and the response of bone to hypokinesia. The surface of fractures of long bones were also examined. The rhesus monkey vertebral column was similar to the human spine anatomically, with the exception of the cartilaginous end plates which had unique islands of calcification. The primate vertebral column responded to compressive loading by bending or fracture of bone within individual vertebral bodies, burst injuries in spinal units, and stimulation of osteophyte formation in in vivo impacted spines. Bone formation appeared to be inhibited by hypokinesia in the femur, rib, and vertebral body of exposed rhesus monkeys. Torsional and straight fractures of long bones had varied surface texture due to different angles of fracture planes across the bone matrix. GRA

N85-32759# National Jewish Hospital and Research Center, Denver, Colo.
RESOURCE ALLOCATION IN CEREBRAL SPECIALIZATION OF FUNCTION: BEHAVIORAL AND ELECTROPHYSIOLOGICAL STUDIES Final Progress Report, 15 Mar. 1983 - 30 Sep. 1984
9 Apr. 1985 5 p
(Contract N00014-83-C-0318)
(AD-A155092) Avail: NTIS HC A02/MF A01 CSCL 05J

The purpose of this project was to study, using both cognitive and electrophysiological methods the relationship between resource allocation theory and functional cerebral lateralization. A number of cognitive experiments have been completed during the period of this project. Two experiments were completed and analyzed that addressed the question of whether hemispheric differences in information processing may be characterized by differences in the way information is represented or the relative speed and accuracy with which the processes within a hemisphere can operate on a representational system. According to Anderson (1983) there are at least three types of representations of information which are qualitatively different: spatial images, temporal strings and abstract propositions. Theoretically, these representations differ in the way the information is encoded, the processes by which matches of incoming information are made against the current representation, and how new structures within a representational system are constructed. The unity of the concept of cerebral specialization with the allocation of resources model has proven useful in accounting for otherwise disparate research findings involving perception, cognition, and motor performance. Moreover, this approach suggests explanations for patterns of task interference that are not readily interpretable within the information processing framework. GRA

N85-32760# SRI International Corp., Menlo Park, Calif.
USAFSAM REVIEW AND ANALYSIS OF RADIOFREQUENCY RADIATION BIOEFFECTS LITERATURE Interim Report, 17 Mar. - 31 Dec. 1984
L. N. HEYNICK and P. POLSON Mar. 1985 332 p
(Contract F33615-82-C-0610)
(AD-A155113; USAFSAM-TR-85-7; IR-5) Avail: NTIS HC A15/MF A01 CSCL 06R

The objectives of this project are to acquire, review, and analyze on an ongoing bases, information on research pertaining to the biological effects of radiofrequency radiation (RFR) for the preparation of a computer data base of analyses at the USAF School of Aerospace Medicine (USAFSAM). The method in use is to: (1) select documents judged to be representative of prior and current research on various RFR-bioeffects topics, (2) analyze in detail the contents of each such document, and (3) assess the validity and significance of the results presented. In this fifth report, the major RFR-bioeffects topics are listed and the format used for analyzing each selected document is described. During the period covered by this report, 40 additional analyses were completed, for a total of 200 analyses. The texts of the additional analyses are presented in Appendix A. In addition to the text, each analysis includes information for computer retrieval by authors, key words, year of publication, and RFR parameters. Appendixes B and C are two cumulative indexes to reference citations for all of the analyses completed thus far. In Appendix B, each citation is listed under each pertinent major topic. Appendix C comprises a cumulative list of citations in alphabetical order by first author and without regard to topic. GRA

N85-32761# New York State Coll. of Agriculture and Life Sciences, Ithaca.
INTERACTION OF OPIATE AND PHENCYCLIDINE DERIVATIVES WITH THE ACETYLCHOLINE RECEPTOR Contractor Report, Jun. 1983 - Oct. 1984
R. E. OSWALD Mar. 1985 32 p
(Contract DAAK11-83-C-0049)
(AD-A155119; CRDC-CR-85004) Avail: NTIS HC A03/MF A01 CSCL 06O

The purpose of this work was to define the structural and biochemical environment of the AChR/I and the relationship of drug structure to the resultant pharmacological response. A number of drugs were tested using both biochemical and electrophysiological tests. For the most part, compounds consisted of benzomorphan and phencyclidine analogs, with the benzomorphans being the more thoroughly tested. Several important portions of the benzomorphan structure were identified, and the results of varying substitutents suggested that hydrophobicity parameters were the most important determinants of binding affinity. GRA

N85-32762# Aerospace Medical Div., Brooks AFB, Tex.
AIR FORCE TECHNICAL OBJECTIVE DOCUMENT, AEROSPACE MEDICAL DIVISION, FISCAL YEAR 1986 Annual Report
B. PHELPS Jan. 1985 23 p
(AD-A155195; AMD-TR-85-4) Avail: NTIS HC A02/MF A01 CSCL 06E

This TOD (Technical Objective Document) describes the planning method used within two of the Aerospace Medical Div.'s (AMD) laboratories to achieve our technical goals. Specifically, efforts are directed in the biotechnology program to man's adaptability, survivability, and performance capabilities within his

operational environment. This research and development of AMD's functions is accomplished as interdisciplinary work by teams of biomedical scientists, engineers, and physical scientists within the Air Force laboratories and the industrial and academic communities. GRA

N85-32763# School of Aerospace Medicine, Brooks AFB, Tex.
PREDICTIVE MODEL OF ELECTRON BEAM INDUCED FLASHBLINDNESS Final Report, Nov. 1983 - Oct. 1984
N. MILLER and T. G. WHEELER Mar. 1985 22 p
(Contract AF PROJ. 7757)
(AD-A155260; AD-F300613; USAFSAM-TR-84-35) Avail: NTIS HC A02/MF A01 CSCL 06P

The spectral characteristics of the Cerenkov radiation have been evaluated and converted to equivalent retinal irradiance from external sources. On the basis of the conversion, electron fluxes have been estimated for 2-sec recovery times from flashblindness. The electrons are assumed to have energies greater than 6 MeV and to be delivered in one or more bursts of 1 microsecond each over 1 sec. It is important to note that very little data exists on recovery times as short as 2 sec for either photopic and scotopic conditions. This situation is a direct result of the lack of definition of the critical tasks and their sensitivity to an interruption of background adaptation. The Cerenkov radiation produced within the eye by relativistic electrons can be compared to light from external sources by the relationships: 1 rad approx. = 4.6 scotopic td-sec and 1 rad approx. = 0.55 photopic td sec. Based on these conversion factors, the following estimates can be derived by extrapolation from existing data: (1) Absolute threshold is equivalent to the Cerenkov radiation from a 4.3-microrad electron beam and to a 0.5-mrad X-ray beam. (2) For low photopic levels of adaption (approximately 10 td), 100,000-rad electron beam would be required for a 2-sec recover time for foveal or parafoveal vision. (3) For the dark-adapted eye, a dose of 10 rads may cause a 2-sec interruption in the detection of low-contrast, peripheral targets. GRA

N85-32764# Army Medical Research Inst. of Infectious Diseases, Fort Detrick, Md.
SPONTANEOUS TRANSITIONAL CELL CARCINOMA IN THE URINARY BLADDER OF A STRAIN 13 GUINEA PIG Case Report
C. J. TRAHAN and W. C. MITCHELL May 1985 14 p
(AD-A155645) Avail: NTIS HC A02/MF A01 CSCL 06E

Spontaneous tumors in guinea pigs are very rare. To date, only 318 cases have been reported. This report describes the clinical pathology, gross pathology, and light microscopy histopathology of a spontaneous transitional cell carcinoma in the urinary bladder of a male Strain 13 guinea pig. GRA

N85-33139# Joint Publications Research Service, Arlington, Va.
RESULTS AND PROSPECTS OF PHYSIOLOGICAL RESEARCH DURING SPACEFLIGHTS
O. G. GAZENKO *In its* USSR Rept.: Space (JPRS-USP-84-006) p 66-71 14 Nov. 1984 Transl. into ENGLISH from Vestn. Akad. Med. Nauk SSSR (Moscow), no. 4, Apr. 1984 p 7-11
Avail: NTIS HC A08

The development of space medicine, appearance of new problems in physiology in connection with preparation for and performance of the first spaceflights is discussed. The development of problems of space physiology makes it possible to successfully implement medical support of missions, monitor the health status of cosmonauts, use an effective enough system of preventive and readaptation measures. The results of ground based studies play a substantial part in solving many problems of space physiology. Studies conducted during spaceflights are of particular importance. The cardiac activity, vascular tonus, hemodynamics, skeletomuscular system, blood, fluid, electrolysis and hormone metabolism, condition of the central nervous system, were studied. The physiologically validated system of preventive measures used during missions makes it possible to perform long term flights without deviations in status of vital systems that would be hazardous to man. Individual manifestations of circulatory changes in flight, course of adaptation and readaptation processes, efficacy of preventive measures are indicated. E.A.K.

N85-33140# Joint Publications Research Service, Arlington, Va.
INTRACARDIAC HEMODYNAMICS AND HUMAN HEART FUNCTION IN SIMULATED WEIGHTLESSNESS
Y. B. SHULZHENKO, L. I. KAKURIN, A. A. SAVILOV, and A. M. BABIN *In its* USSR Rept.: Space (JPRS-USP-84-006) p 72-79 14 Nov. 1984 refs Transl. into ENGLISH from Vestn. Akad. Med. Nauk SSSR (Moscow), no. 4, Apr. 1984 p 32-38
Avail: NTIS HC A08

Questions dealing with the effect of weightlessness on intracardiac hemodynamics and function of the human heart are investigated. Estimation methods of studying pumping and contractile functions of the heart were used for inflight cardiological studies. The phenomenology and mechanisms of development of changes in hemodynamics and function of the human heart during the acute period of adaptation of the cardiovascular system to simulated weightlessness were investigated. It is shown that it is possible to reproduce the redistribution of blood to vessels of the upper half of the body more fully with AOH than with hypokinesia in horizontal position. E.A.K.

N85-33141# Joint Publications Research Service, Arlington, Va.
COSMONAUTS' CARDIOVASCULAR SYSTEM FUNCTION DURING LONG-TERM ORBITAL FLIGHTS ABOARD SALYUT-6 STATION
A. D. YEGOROV, O. G. ITSEKHOVSKIY, I. V. TURCHANINOVA, A. P. ALFEROVA, A. P. POLYAKOVA, and V. I. BERNADSKIY *In its* USSR Rept.: Space (JPRS-USP-84-006) p 80-88 14 Nov. 1984 refs Transl. into ENGLISH from Vestn. Akad. Med. Nauk SSSR (Moscow), no. 4, Apr. 1984 p 55-61
Avail: NTIS HC A08

The functional stage of the cardiovascular system during long term spaceflights were evaluated by means of functional tests with use of lower body negative pressure (LBNP) and graded physical loads (GPL) on a cycle ergometer. The former test simulates orthostatic factors in weightlessness and determines readiness of postural mechanisms for gravity forces. The test evaluates the work capacity of cosmonauts according to their hemodynamic reaction to a specific physical exercise. E.A.K.

N85-33142# Joint Publications Research Service, Arlington, Va.
MATHEMATICAL ANALYSIS OF HEART RHYTHM ASSESSMENT OF DISTINCTIVE FEATURES IN ADAPTATION TO SPACEFLIGHT CONDITIONS
R. M. BAYEVSKIY, G. A. NIKULINA, and I. G. TAZETDINOV *In its* USSR Rept.: Space (JPRS-USP-84-006) p 89-98 14 Nov. 1984 refs Transl. into ENGLISH from Vestn. Akad. Med. Nauk SSSR (Moscow), no. 4, Apr. 1984 p 62-69
Avail: NTIS HC A08

The introduction to medicine of advances in electronics, mathematics and cybernetics was discussed. Mathematical analysis of cardiac rhythm as a method of evaluating regulatory and control systems in the integral organism gained particularly broad development. The use of mathematical (cybernetic) analysis of cardiac rhythm in experimental and applied physiology, clinical practice, space and aviation medicine, sports medicine and industrial physiology, engineering psychology and balneology is described. This method is one of the newest directions in physiology and pathology of circulation and a systems approach to investigation of control processes in a living organism. E.A.K.

N85-33143# Joint Publications Research Service, Arlington, Va.
MECHANISMS OF OSTEODYSTROPHY IN WEIGHTLESSNESS
A. I. VOLOZHIN *In its* USSR Rept.: Space (JPRS-USP-84-006) p 99-109 14 Nov. 1984 refs Transl. into ENGLISH from Patol. Fiziol. i Eksperim. Terapiya (Moscow), no. 1, Jan. - Feb. 1984 p 19-27
Avail: NTIS HC A08

The exploration of space has raised for physicians and biologists an extensive range of problems, the most important of which are developing measures to prevent adverse effects resulting from

prolonged sojourns under weightless conditions. Among the various pathophysiological effects of weightlessness, attention was drawn to the increased body losses of calcium, phosphorus and other elements, and also to the lowered content of minerals in the bones, as accessible to study by the modern methods of X-ray photometry and direct photon absorptiometry. It suggested that as a result of the decrease in mechanical loads on the locomotor system there is progressive loss of the body substance and a loss of strength in skeletal bone. The pathogenic effect of actual and modeled weightlessness on bone mineralization were examined. It is shown that calcium and phosphorus losses vary widely on an individual basis and depend on the duration of weightlessness. The mechanisms involved in the development of osteodystrophy occurring under conditions of prolonged hypokinesia and weightlessness are discussed. E.A.K.

N85-33661# Joint Publications Research Service, Arlington, Va.
SPEECH ANALYSIS SYSTEM FOR ASSESSING PILOTS' WORKING FITNESS Abstract Only
S. DVIGANTSEV *In its* USSR Rept.: Life Sci. (JPRS-UBB-85-018) p 56-57 28 Jun. 1985 Transl. into ENGLISH from Med. Gazeta (Moscow), 10 Apr. 1985 p 4
Avail: NTIS HC A07/MF A01

The development of features of the equipment for distinguishing speech-signal parameters (SVPRS) system is reported. The system makes it possible to evaluate the emotions and working fitness of such operators on the basis of the sound of their speech. The system's components include a magnetic memory device, audiosignal filters, a frequency analyzer, sound-pressure recorders, a specially programmed minicomputer, and data-input devices and other instruments for processing recordings of human speech. With the aid of the SVPRS, an operator's condition can be diagnosed on the basis of a single word containing two vowel sounds. Changes in voice tone which are indicative of stress can be detected. E.A.K.

N85-33664# Joint Publications Research Service, Arlington, Va.
EFFECTS OF BLOOD VOLUME OVERLOAD ON MYOCARDIAL ULTRASTRUCTURE IN RELATION TO ADAPTATION TO HIGH ALTITUDE HYPOXIA Abstract Only
A. K. KADYRALIYEV and A. Y. TILIS *In its* USSR Rept. Life Sci. (JPRS-UBB-85-018) p 103 28 Jun. 1985 Transl. into ENGLISH from Zdravookhraneniye Kirgizii (Frunze, USSR), no. 6, Nov. - Dec. 1984 p 36-39
Avail: NTIS HC A07/MF A01

The effects of high-altitude adaptation on the ultrastructural consequences of surgically induced mitral insufficiency were studied in dogs maintained at sea level and adapted to a 3200 m altitude. At sea level, compensatory myocardial hyperfunction was fully adequate to meet the hemodynamic challenge of the mitral lesion and provide an adequate oxygen supply to the body. No evidence of decompensation was manifested over a prolonged period of observation. It was found that high-altitude adaptation, alleviates the clinical consequences of surgically induced mitral lesions in dogs under alpine conditions. Author

N85-33665# Joint Publications Research Service, Arlington, Va.
CARDIORESPIRATORY FUNCTION AND WORK PERFORMANCE DURING ADAPTATION TO INDUSTRIAL LABOR IN MIDALPINE CONDITIONS Abstract Only
B. S. MAMBETALIYEV and K. U. AKYNBEKOV *In its* USSR Rept.: Life Sci. (JPRS-UBB-85-018) p 104 28 Jun. 1985 Transl. into ENGLISH from Zdravookhraneniye Kirgizii (Frunze, USSR), no. 1, Jan. - Feb. 1985 p 10-12
Avail: NTIS HC A07/MF A01

Various aspects of the cardiorespiratory system were analyzed in miners working under moderate altitude conditions in Kirghizia, using workers with more than 3 years of employment in the industry and newcomers to the region. The demanding physical labor was performed with no loss of work efficiency in comparison with similar work performed at low altitudes in the case of the adapted individuals. Despite the fact that adapted individuals present with a more efficiently functioning cardiorespiratory system at rest, and especially during physical exertion, working under moderate high-altitude conditions does place an additional demand on the system. E.A.K.

N85-33666# Joint Publications Research Service, Arlington, Va.
STRUCTURAL CHANGES IN THYROID DUE TO HIGH-ALTITUDE ADAPTATION IN KIRGHIZIA Abstract Only
V. T. LYAMTSEV, Y. K. BAZUMOVSKIY, M. D. TURGUNBAYEV, and M. O. BRAGIN *In its* USSR Rept.: Life Sci. (JPRS-UBB-85-018) p 104-105 28 Jun. 1985 Transl. into ENGLISH from Zdravookhraneniye Kirgizii (Frunze, USSR), no. 1, Jan. - Feb. 1985 p 32-35
Avail: NTIS HC A07/MF A01

A variety of thyroid enzymes involved in redox reactions and in catalytic hydrolysis were monitored in outbred rats in Tuya-Ashu for a period of 60 days, to determine the effects of hypoxia on thyroid cytochemistry. Initially, the periodic acid shift (PAS) reaction became weaker, while cytochemical analysis showed elevation of succinic dehydrogenase, cytochrome oxidase, lactate dehydrogenase, and acid phosphatase activities. Adenosine triphosphatase (ATP) activity remained unaltered and alkaline phosphatase activity showed a time-dependent depression. The data indicate depressed thyroid function under hypoxic conditions for ca. the first 20 days. After 20 days, the cytochemical studies on enzymatic activities and the PAS reaction indicated functional recovery, which was essentially completed by day 60. E.A.K.

N85-33667# Joint Publications Research Service, Arlington, Va.
USSR REPORT: SPACE BIOLOGY AND AEROSPACE MEDICINE, VOLUME 19, NO. 2, MARCH - APRIL 1985
12 Aug. 1985 149 p refs Transl. into ENGLISH of Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) Avail: NTIS HC A07

Various topics in space biology and aerospace medicine are discussed. The effect of body position and immobilization on the intensity of spatial illusions in weightlessness, an investigation of the spectrum of human bile acids during 120-day antiorthostatic hypokinesia, and the effect of short-term antiorthostatic hypokinesia on the dynamics of cardiorespiratory parameters during graded physical exercise are among the topics covered.

N85-33668# Joint Publications Research Service, Arlington, Va.
LABYRINTHINE AND EXTRALABYRINTHINE MECHANISMS OF DEVELOPMENT OF MOTION SICKNESS IN WEIGHTLESSNESS
A. D. YEGOROV and Y. M. YUGANOV *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) p 1-11 12 Aug. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 4-11
Avail: NTIS HC A07

An important problem of aerospace medicine, space motion sickness is discussed. Relevant Soviet and foreign publications are surveyed. Possible mechanisms of the symptom-complex in the weightless state are discussed. The authors put forth their own ideas concerning current hypotheses of space motion sickness and discuss potential applicability of the theoretical concepts with respect to the prevention of this adverse symptom complex. R.J.F.

N85-33672# Joint Publications Research Service, Arlington, Va.
EFFECT OF BODY POSITION AND IMMOBILIZATION ON INTENSITY OF SPATIAL ILLUSIONS IN WEIGHTLESSNESS
F. A. SOLODOVNIK and A. V. CHAPAYEV *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) p 30-33 12 Aug. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 23-26
Avail: NTIS HC A07

Test subjects were exposed to short-term weightlessness in various positions: standing, seated, supine in the cosmonaut's chair and on the flat surface with the head kept straight ahead, bent forward or backward. Their susceptibility to illusionary sensations was measured. It was found that the development of spatial illusions

in the weightless state was not correlated with body position, head position relative to the torso or restraint type. Author

N85-33673# Joint Publications Research Service, Arlington, Va.
TYPOLOGICAL CHARACTERISTICS OF HEMODYNAMIC STATES OF HEALTHY SUBJECTS IN ORTHOSTATIC POSITION
V. A. DARTSMELIYA and G. S. BELKANIYA *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) p 34-43 12 Aug. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 26-33
Avail: NTIS HC A07

Central circulation and respiratory function of 90 healthy men, aged 24 to 45, were investigated during active and passive tilt tests. It was found that circulation can be influenced by the orthostatic factor which is expressed as the stage of early effects, intermediate stage, and the stage of stabilized hemodynamics. With respect to cardiac output the three basic hemodynamic states can be distinguished: hypokinetic, intermediate and hyperkinetic. It is shown that circulation parameters in clino- and orthostatics are reciprocally related. It is demonstrated that the cardiorespiratory parameters used can be selectively employed in the classification of the circulating state in orthostatics. It is claimed that the hemodynamic conditions reflect the sequential phase states in circulation regulation. The concept of clino and orthostatic normative characteristics of hemodynamics is presented. Author

N85-33674# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF SPECTRUM OF HUMAN BILE ACIDS DURING 120-DAY ANTIORTHOSTATIC HYPOKINESIA
O. V. ZHIZNEVSKAYA and I. L. MEDKOVA *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) p 44-46 12 Aug. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 33-35
Avail: NTIS HC A07

The composition of bile acids in the B and C portions of the duodenal juice of six essentially healthy test subjects exposed to 120-day head-down bed rest was investigated. As the exposure continued, the percentage content of bile acids conjugated with taurine increased and that of bile acids conjugated with glycine decreased. The rapid and significant decrease of the ratio of glycine conjugated to taurine conjugated bile acids suggests a specific modification of the synthetic function of hepatocytes under the above conditions. Author

N85-33675# Joint Publications Research Service, Arlington, Va.
VASCULAR MECHANISMS OF ADAPTATION TO ANTIORTHOSTATIC POSITION
T. A. KABESHEVA, S. V. KOPANEV, N. Y. PANFEROVA, and A. F. ZAVADOVSKIY *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) p 47-53 12 Aug. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 35-39
Avail: NTIS HC A07

Using occlusion plethysmography and rheology, the state of peripheral circulation of 18 test subjects during 25 exposures to head-down tilt was investigated. The test subjects were subdivided into two groups: nine subjects actively changed their body position by 90 deg and nine others were passively transferred to the head-down position at an angle of -12 deg. It was found that regular training facilitated the development of vascular mechanisms which assisted adaptation to the head-down tilt: it decreased the tone of resistance vessels of the arms and legs and that of capacitance vessels of the legs; it increased the tone of cerebral resistance and capacitance vessels. The tone of leg capacitance vessels varied, depending on the type of training; passive tilting increased their compilance and active tilting decreased it. The final result of the tone redistribution in the peripheral vascular bed during training was a smaller increase of head blood content and a smaller fluid outflow from the legs. Author

N85-33676# Joint Publications Research Service, Arlington, Va.
CEREBRAL HEMODYNAMICS AND VENTRICULAR FUNCTION IN -15 DEG ANTIORTHOSTATIC POSITION
V. I. SOKOLOV *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) p 54-58 12 Aug. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 39-42
Avail: NTIS HC A07

Sixteen men were exposed to head-down tilt at -15 deg for 16 hours. Cerebral circulation was examined by bipolar rheoencephalography, ventricular function by one-dimensional echoventriculometry, and blood pressure by Korotkoff's sounds. Group 1 consisting of 10 test subjects tolerated the antiorthostatic exposure well enough (they reported only blood rush to the head and moderate facial puffiness). They showed stable parameters of cerebral circulation, ventricle size, and mean blood pressure, which is indicative of adequate compensatory capabilities of their organisms. Group 2 consisting of 6 test subjects exhibited polymorphic clinical symptoms, including the syndrome of liquor hypertension (burst-like headache, autonomic dysfunction, etc). This was accompanied by decreased pulse pressure of cerebral vessels, primary in the vertebrobasilar area, instability of the vessel tone against the background of marked dilatation of the capacitance vessels and brain ventricles. Author

N85-33677# Joint Publications Research Service, Arlington, Va.
EFFECT OF SHORT-TERM ANTIORTHOSTATIC HYPOKINESIA ON DYNAMICS OF CARDIORESPIRATORY PARAMETERS DURING GRADED PHYSICAL EXERCISE
A. M. GENIN, V. M. BARANOV, V. G. SHABELNIKOV, N. M. ASYAMOLOVA, A. N. KOTOV, M. Y. VOLKOV, K. S. YUROVA, and A. T. POLESHCHUK *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) p 59-63 12 Aug. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 43-46
Avail: NTIS HC A07

Seven healthy volunteers were exposed to head down tilt at -15 for 5 hours. Before and after exposure they exercised on a bicycle ergometer in the supine and seated positions. During the study their respiration function, gas exchange and arterialized blood parameters were measured. It was found that after exposure the physical aerobic performance diminished. The changes detected suggest that a lower exercise tolerance can be caused not only by a decreased circulating blood volume but also by increased energy expenditures of the cardiorespiratory system itself.
Author

N85-33678# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF SOME ASPECTS OF AMINO ACID METABOLISM IN MAN DURING BRIEF EXPOSURE TO ANTIORTHOSTATIC HYPOKINESIA COMBINED WITH ULTRAVIOLET RADIATION
A. S. USHAKOV, T. F. VLASOVA, Y. B. MIROSHNIKOVA, N. Y. PANFEROVA, and T. P. MURUGOVA *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) p 64-67 12 Aug. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 46-49
Avail: NTIS HC A07

Changes in the amino acid pool in the plasma of test subjects exposed to short term head down tilt combined with ultraviolet irradiation were investigated. Exposure to head down tilt alone (group 1 of 3 test subjects) and combined with ultraviolet irradiation (10 sessions) (groups 2 and 3 of 3 test subjects each) acted as a stress agent that diminished the amino acid pool. Exposure to 2 hour head down tilt in combination with 20 UV irradiations (groups 2 and 3) increased the amino acid pool as a result of inhibition of anabolic and stimulation of catabolic processes. The amino acid pool did not return to normal within the recovery period allowed.
Author

N85-33679# Joint Publications Research Service, Arlington, Va.
GENERAL DESCRIPTION OF EXPERIMENT DEALING WITH RAT ONTOGENESIS ABOARD COSMOS-1514 BIOSATELLITE
L. V. SEROVA, L. A. DENISOVA, Z. I. APANASENKO, L. A. BRYANTSEVA, and N. A. CHELNAYA *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) p 68-74 12 Aug. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 49-53
Avail: NTIS HC A07

Ten female Wistar rats were exposed to zero g during 5 days, i.e., from gestation day 13 to day 18. After recovery the flight aminals showed a significant delay in weight gain, thymus involution, decreased liver weight, hemoglobin concentration. Nevertheless, their reproductive function did not differ from that of the controls; the rate of preimplantation and total fetal mortality as well as the number of live fetuses were very similar in the experimental and control animals. The flight group showed a slight decline of fetal weight and water content. The size of the litters produced by the flight and control rats was identical but the mortality rate of those former during the first 7 days after birth was significantly higher. This experiment has demonstrated that the mammalian fetus exposed to zero g during the last term of pregnancy, i.e., at the stage of active organogenesis, can grow and develop in the normal way. A large body of biological material was obtained for biochemical and histological examinations that will help evaluate the condition of dams, fetuses and newborns. Author

N85-33680# Joint Publications Research Service, Arlington, Va.
MORPHOLOGICAL STUDY OF ANTIORTHOSTATIC HYPOKINESIA IN MONKEYS
A. S. KAPLANSKIY, Y. A. SAVINA, P. B. KAZAKOVA, I. P. KHOROSHILOVA-MASLOVA, G. M. KHARIN, V. I. YAKOVLEVA, G. I. PLAKHUTA-PLAKUTINA, V. N. SHVETS, and T. Y. BURKOVSKAYA *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) p 75-84 12 Aug. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 53-60
Avail: NTIS HC A07

Morphological examinations of rhesus monkeys (Macaca mulatta) exposed to head down tilt for 7 and 19 days are summarized. The major changes detected in various systems, organs and tissues are described. The changes are thought to be of different origin and caused by blood redistribution, hypokinesia per se and concommitant stress. It is emphasized that head down tilt is one of the most adequate methods for simulating effects of zero g in monkeys. Author

N85-33681# Joint Publications Research Service, Arlington, Va.
RAT PLASMA HORMONE LEVELS FOLLOWING FLIGHT ABOARD COSMOS-1129 BIOSATELLITE
R. A. TIGRANYAN, N. F. KALITA, L. MACHO, and R. KVETNANSKY *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) p 85-90 12 Aug. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 60-64
Avail: NTIS HC A07

The concentration of ACTH, insulin, glucagon, glucose, epinephrine, norepinephrine, thyrotrophic hormone, thyroxine, and triiodothyronine was measured in plasma of the rats flow for 18.5 days on Cosmos 1129. As a result of the flight, the concentration of insulin, thyrotrophic hormone, and triiodothyronine increased and that of thyroxine decreased. It is suggested that the above changes have been induced by an acute stress associated with biosatellite reentry and touchdown. Author

N85-33682# Joint Publications Research Service, Arlington, Va.
RESULTS OF MICROBIOLOGICAL STUDIES CONDUCTED DURING OPERATION OF SALYUT-6 ORBITAL STATION
S. N. ZALOGUYEV, A. N. VIKTOTOV, V. M. SHILOV, V. P. GORSHKOV, K. V. ZARUBINA, M. M. SHINKAREVA, and T. Y. NORKINA *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) p 91-94 12 Aug. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 64-66
Avail: NTIS HC A07

The results of microbiological examinations of the Salyut 6 crewmembers and environment are presented. There were few cases of adverse changes in the automicroflora composition, i.e., propagation of staphylococci of a certain biotype among crewmembers. However, no over manifestations of infectious pathology were seen. This allows the conclusion that personal hygiene measures and general hygiene and antiepidemic measures taken before and during Salyut 6 missions were adequate and efficient. Author

N85-33683# Joint Publications Research Service, Arlington, Va.
DISTINCTIONS IN FORMATION OF MICROFLORA ON CONSTRUCTION MATERIALS USED IN HABITABLE PRESSURIZED COMPARTMENTS
A. N. VIKTOROV and N. D. NOVIKOVA *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) p 95-98 12 Aug. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 66-69
Avail: NTIS HC A07

The composition of microbial and fungal associations on nonmetal materials used in the interior design and equipment of enclosures was investigated when they were inhabited by men. It was found that the microorganisms formed on the structure materials were influenced by such factors as men and their specific microflora, accumulated water and dust, as well as the chemical structure of the polymers used. Author

N85-33684# Joint Publications Research Service, Arlington, Va.
COMPOSITION AND DYNAMICS OF BACTERIOCENOSIS ASSOCIATED WITH ALGAE IN HUMAN LIFE-SUPPORT SYSTEMS
Y. M. KONDRATYEVA *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) p 99-106 12 Aug. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 69-74
Avail: NTIS HC A07

The species and group composition as well as the number of bacteria concomitant with algae in the course of their continuous cultivation on a mineral medium as a self contained system and as part of the biological life support system were investigated. The major components of urine were passed to the reactor after its premineralization in a special unit. The experiments were carried out for 37 to 51 days. Under such cultivation conditions the number and generic composition of the algal microflora were stable. The common gas line between the algal reactors, units for urine microbiological mineralization and the manned module facilitated the generation of new bacterial groups which were, however, unable to develop in actively growing algal cultures and therefore disappeared rapidly. This indicates that the algal-bacterial cenosis within a biological life-support system has signs of a self-regulating system. Author

N85-33685# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL VALIDATION OF ALLOWABLE CONCENTRATIONS OF SODIUM AND POTASSIUM IN RECYCLED DRINKING WATER
V. A. KONDRATYUK *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) p 107-112 12 Aug. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 74-78
Avail: NTIS HC A07

White noninbred rats were used to study the effect of reclaimed water containing 25-100 mg/l sodium and 2.5-10mg/l potassium. The results show that consumption of water containing 50 mg/l sodium and/or 5 mg/l potassium disturbs their balance in the body. It is recommended to use water that contains 35 mg/l sodium and 4.0 mg/l potassium as a maximum, and 5.7 mg/l sodium and 0.6 mg/l potassium as a minimum. Author

N85-33686# Joint Publications Research Service, Arlington, Va.
MAMMALIAN TISSUE SENSITIVITY TO LONG-TERM EXPOSURE TO HIGH-INTENSITY STATIONARY MAGNETIC FIELDS
G. V. GALAKTIONOVA, V. M. MASTRYUKOVA, and A. D. STRZHIZHOVSKIY *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) p 113-117 12 Aug. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 78-81
Avail: NTIS HC A07

The retinal epithelium, bone marrow and spermatogenic epithelium of mice exposed for 30 days to constant magnetic fields of 1.6 T were examined cytologically. During and after exposure the retinal and bone marrow epithelium showed no biologically significant deviations from normal. The mitotic changes were of small amplitude and insufficient to cause cell unbalance. No chromosome aberrations or degenerative changes in the cells were seen. In the spermatogenic epithelium the exposure to a constant magnetic field produced a destruction of mature cell elements. Due to this the total amount of spermatogenic cells was significantly lower during and immediately after exposure.
Author

N85-33687# Joint Publications Research Service, Arlington, Va.
ELECTROANESTHESIA AS A MEANS OF CONTROLLING COLD STRESS OF LOCAL HYPOTHERMIA
L. L. STAZHADZE, V. V. SIGAYEV, A. A. TITOV, A. N. ROMANOV, L. G. REPENKOVA, and S. I. AVDEYEV *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) p 118-122 12 Aug. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 81-85
Avail: NTIS HC A07

Local hypothermia has gained wide use in clinical practice in the last two decades. Selective cooling of individual organs and parts of the body has made it possible to attenuate significantly adverse changes in the body and, consequently, enhance the efficacy of treating many serious diseases. Considering the prospects of exploring extraterrestrial space, local hypothermia may expand significantly the existing capabilities of space medicine.
G.L.C.

N85-33688# Joint Publications Research Service, Arlington, Va.
MORPHOLOGICAL MANIFESTATIONS OF HEMODYNAMIC CHANGES IN LUNGS OF MONKEYS SUBMITTED TO ANTIORTHOSTATIC HYPOKINESIA
V. I. YAKOVLEVA and G. S. BELKANIYA *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) p 123-126 12 Aug. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 85-87
Avail: NTIS HC A07

Comprehensive material has been accumulated to date on investigation of the effects of long-term clinostatic and antiorthostatic hypokinesia (AOH) on man. In particular, it was established that, under hypokinetic conditions and particularly AOH, there is redistribution of blood in the body, intensification of venous return of blood to the heart, which leads to plethora of the atria and vessels in the pulmonary circulatory system. Recently, works have been published concerning investigation of hemodynamics in the pulmonary circulation using different methods (radioisotope, rheographic, catheterization of vessels). With these methods it was shown that both short- and long-term AOH is associated with an increase in volume of circulating blood in the lungs. Since hemodynamics in monkeys are similar to man, it was interesting to examine the lungs of monkeys during AOH using histological and morphometric methods. G.L.C.

N85-33689# Joint Publications Research Service, Arlington, Va.
REGULATION OF PHYSICAL ACTIVITY IN ANTIORTHOSTATIC POSITION BY ACTING ON ADRENOSYMPATHETIC AND HYPOPHYSEO-ADRENOCORTICAL SYSTEMS
E. A. SHIRINYAN and O. M. AVAKYAN *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) p 127-130 12 Aug. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 87-89
Avail: NTIS HC A07

It is common knowledge that the adrenosympathetic and adrenocorticopituitary systems play a leading role in adaptive reactions of an organism submitted to stress. There have been comprehensive investigations of their role and influence on different biological parameters during exposure to a physical load and a number of other stressors. The combined effect of physical and mental stimuli and their influence on work capacity have been studied considerably less. G.L.C.

N85-33690# Joint Publications Research Service, Arlington, Va.
EFFECT OF EXPERIMENTAL MOTION SICKNESS ON POSTROTORY NYSTAGMUS AND COUNTERROTATION ILLUSION
G. S. AYZIKOV and G. N. KLYUSHNIKOVA *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) p 131-134 12 Aug. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 89-91
Avail: NTIS HC A07

Man's exposure to frequent and prolonged vestibular stimuli, which are associated with development of motion sickness (MS), leads to change in reaction of the system of semicircular canals to angular accelerations. Flattening of the cupulogram has been found in seamen. Prolonged operator work in a slowly revolving room lowers the intensity of the nystagmic reaction. Analogous findings were made on animals, and the effects were more marked with prolonged rotation and hypergravity. These facts are usually considered to be a reflection of adaptation processes in the vestibular system. A special role is attributed to prolonged and simultaneous stimulation of semicircular canals and otolith organs. G.L.C.

N85-33691# Joint Publications Research Service, Arlington, Va.
CHEMICAL COMPOSITION OF MUSCA DOMESTICA L. LARVAL AND PUPAL BIOMASS WHEN DEVELOPING IN ORGANIC WASTE OF BIOLOGICAL LIFE-SUPPORT SYSTEM FOR MAN
Y. G. GOLUBEVA, T. S. GURYEVA, and O. I. TIKHOBAYEVA *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) p 135-139 12 Aug. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 91-93
Avail: NTIS HC A07

Heretofore, only man performed the function of the heterotrophic element in man-plants models. In order to render such a system more closed, the model of its biocenotic structure should be considerably more complex. Studies aimed at finding organisms capable of occupying an ecological niche in a biological life-support system (BLSS) have been pursued for a long time for

the purpose of enhancing the energy efficiency and further close mass exchange. Among such organisms, as a representative of the detritus feed chain, Musca domestica L. housefly was suggested, as its larvae are efficient users of organic waste such as human and animal excreta. In developing the ecological system, the larval biomass recovered after utilization of waste can be used as feed for animals in the heterotrophic link. For this reason, it is rather important to assess the feed qualities of larval biomass.
G.L.C.

N85-33693*# National Aeronautics and Space Administration. Johnson (Lyndon B.) Space Center,
SPACELAB 1 HEMATOLOGY EXPERIMENT (INS103): INFLUENCE OF SPACE FLIGHT ON ERYTHROKINETICS IN MAN
C. S. LEACH, J. P. CHEN (Tennessee Univ., Knoxville), W. CROSBY (Walter Reed Army Medical Center, Washington, D.C.), C. D. R. DUNN (Northrop Services, Inc. and Baylor Coll. of Medicine, Houston, Tex.), P. C. JOHNSON, R. D. LANGE (Tennessee Univ., Knoxville), E. LARKIN (Veterans Administration Hospital, Martinez, Calif.), and M. TAVASSOLI (Mississippi Univ., Jackson) Aug. 1985 73 p refs
(NASA-TM-58268; S-548; NAS 1.15:58268) Avail: NTIS HC A04/MF A01 CSCL 06E

An experiment conducted on the 10-day Spacelab 1 mission aboard the ninth Space Shuttle flight in November to December 1983 was designed to measure factors involved in the control of erythrocyte turnover that might be altered during weightlessness. Blood samples were collected before, during, and after the flight. Immediately after landing, red cell mass showed a mean decrease of 9.3 percent in the four astronauts. Neither hyperoxia nor an increase in blood phosphate was a cause of the decrease. Red cell survival time and iron incorporation postflight were not significantly different from their preflight levels. Serum haptoglobin did not decrease, indicating that intravascular hemolysis was not a major cause of red cell mass change. An increase in serum ferritin after the second day of flight may have been caused by red cell breakdown early in flight. Erythropoietin levels decreased during and after flight, but preflight levels were high and the decrease was not significant. The space flight-induced decrease in red cell mass may result from a failure of erythropoiesis to replace cells destroyed by the spleen soon after weightlessness is attained. Author

N85-33694# Army Medical Bioengineering Research and Development Lab., Fort Detrick, Md.
EFFECTS OF LOW LEVEL CARBON MONOXIDE (CO) ON TRACKING AND MONITORING. AN ATTEMPT TO REPLICATE THE FINDINGS OF PUTZ ET AL. (1976) PROTOCOL 2 Final Report, 1983 - 1984
V. A. BENIGNUS, K. E. MULLER, C. N. BARTON, and J. D. PRAH Jan. 1985 52 p
(AD-A155722; USAMBRDL-TR-1812) Avail: NTIS HC A04/MF A01 CSCL 06T

The present study was an attempt to replicate the experiment and findings of Putz, et at., (1976). In the Putz, et al., study it was shown that 5 percent COHb resulting from four hours of exposure to 70 ppm CO produced decrements in tracking and monitoring behavior in healthy young men. Intensive effort was made to assure that the Putz et al. procedure and equipment were duplicated. Certain procedural changes were introduced out of necessity or due to lack of exact information. The results of the present study using 22 healthy men did not show a statistically significant effect of CO exposure to 100 ppm for four hours on either tracking or monitoring. In the present study: (1) observed trends were in the same direction as those of Putz, et al., (2) results approached statistical significance criterion, and (3) several inadvertent methodological changes from Putz et al. apparently occurred. Due to these considerations and the findings of Putz, et al., (1976) and Putz (1979), it may be tentatively concluded that: (1) tracking may be sensitive to impairment by CO exposure, (2) monitoring does not appear to be affected by CO exposure, and (3) important variables in research on the effects of CO exposure on tracking appear to be the level of subject training and the task difficulty.
GRA

N85-33695# Oak Ridge National Lab., Tenn.
LEGIONNAIRES' DISEASE BACTERIA IN POWER PLANT COOLING SYSTEMS: PHASE 2
R. L. TYNDALL, S. W. CHRISTENSEN, and J. A. SOLOMON Apr. 1985 99 p refs
(Contract DE-AC05-84OR-21400)
(DE85-011546; EPRI-EA-4017) Avail: NTIS HC A05/MF A01; Research Reports Center, Box 50490, Palo Alto, CA 94303

Legionnaires' Disease Bacteria (Legionella) are a normal component of the aquatic community. Various environmental factors that affect Legionella profiles in power plant cooling waters are investigated. The results indicate that each of the four factors investigated (incubation temperature, water quality, the presence and type of associated biota, and the nature of the indigenous Legionella population) is important in determining the Legionella profile of these waters. At incubation temperatures of 32 C and 37 C, waters from a power plant where infectious Legionella were not observed stimulated the growth of stock Legionella cultures more than did waters from plants where infectious Legionella were prevalent. This observation is consistent with Phase 1 results, which showed that densities of Legionella were frequently reduced in closed cycle cooling systems despite the often higher infectivity of Legionella in closed cycle waters. DOE

N85-33696# Brookhaven National Lab., Upton, N. Y.
PRACTICAL CONSEQUENCES OF THE ASSESSMENT OF DIFFERENT ENERGY HEALTH RISKS
L. D. HAMILTON 1984 60 p refs Presented at the Intern. Workshop on Environ. Impacts of Energy Systems on Risk Management in the Eighties, San Miniato, Italy, 22 Jun. 1984
(Contract DE-AC02-76CH-00016)
(DE85-004538; BNL-35461; CONF-8406229-1) Avail: NTIS HC A04/MF A01

Four examples of the use by decision makers of health impact assessments are given. Comparative risk assessment of the health effects of coal and nuclear fuel cycles used in nuclear power plants siting and licensing hearings; health risks of acid deposition and other air transported pollutants, carried out as part of an assessment for the US Congress Office of Technology Assessment; public health risks of radon from uranium mining and milling, used in nuclear power plant licensing hearings; and review of the US Environmental Protection Agency's risk assessment for atmospheric radon-222 and daughters used by EPA in support of proposed standards are cited. DOE

N85-33697# Tennessee Univ., Oak Ridge. Graduate School of Biomedical Sciences.
THREE-DIMENSIONAL RECONSTRUCTION AND DATA DISPLAY OF CHROMOSOME STRUCTURE STUDIED BY ELECTRON MICROSCOPE TOMOGRAPHY
D. E. OLINS 1985 11 p Presented at Computer Graphics '85, Dallas, 14 Apr. 1985 Prepared in cooperation with ORNL
(Contract DE-AC05-84OR-21400)
(DE85-011562; CONF-8504121-2) Avail: NTIS HC A02/MF A01

Modern transmission electron microscopes can be employed to generate useful and informative three dimensional reconstructions of asymmetric cell structures by adapting the principles of axial tomography and utilizing the power of digital image processing. An example of this technique, called electron microscope tomography (EMT), applied to analysis of the 3-D structure of an active eukaryotic gene in situ is presented. Future improvements in the field of EMT depend upon the development of methods for visualizing, editing and interpreting the rich image information of the 3-D reconstructions. DOE

53

BEHAVIORAL SCIENCES

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

A85-43325
CORRELATION BETWEEN THE PSYCHODYNAMICS OF VERBAL MEMORY FUNCTION AND THE STRENGTH AND LABILITY OF NERVOUS PROCESSES [O SOOTNOSHENII PSIKHODINAMIKI VERBAL'NOI MNEMICHESKOI FUNKTSII S SILOI I LABIL'NOST'IU NERVNYKH PROTSESSOV]
V. B. STRELKOV (Ufimskii Aviatsionnyi Institut, UFA, USSR) and G. A. AMINEV (Bashkirskii Gosudarstvennyi Universitet, UFA, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 11, May-June 1985, p. 523-525. In Russian. refs

Experiments performed on 20 subjects 18 to 24 years of age show reliable peaks in two ranges of the fluctuation spectra of memory capacity (MC): HF waves with a period of 1-20 min and LF waves with a period greater than 25 min. In repeated tests, a unique high positive correlation was observed between the markedness of spectral peaks in the 1-1.5 min range in MC fluctuations and the lability of nervous processes. Also studied was the correlation of the MC fluctuation spectrum and the excitation strength. B.J.

A85-43857*# Systems Technology, Inc., Hawthorne, Calif.
INVESTIGATION OF OUTSIDE VISUAL CUES REQUIRED FOR LOW SPEED AND HOVER
R. H. HOH (Systems Technology, Inc., Hawthorne, CA) IN: Atmospheric Flight Mechanics Conference, 12th, Snowmass, CO, August 19-21, 1985, Technical Papers . New York, AIAA, 1985, p. 337-349. NASA-supported research. refs
(AIAA PAPER 85-1808)

Knowledge of the visual cues required in the performance of stabilized hover in VTOL aircraft is a prerequisite for the development of both cockpit displays and ground-based simulation systems. Attention is presently given to the viability of experimental test flight techniques as the bases for the identification of essential external cues in aggressive and precise low speed and hovering tasks. The analysis and flight test program conducted employed a helicopter and a pilot wearing lenses that could be electronically fogged, where the primary variables were field-of-view, large object 'macrotexture', and fine detail 'microtexture', in six different fields-of-view. Fundamental metrics are proposed for the quantification of the visual field, to allow comparisons between tests, simulations, and aircraft displays. O.C.

A85-44242
THOUGHTS ON THE PSYCHOLOGICAL APTITUDE OF MILITARY PILOTS - A BALANCE SHEET FROM A FLIGHT MEDICAL OFFICER'S PRACTICE [CONSIDERATIONS SUR L'APTITUDE PSYCHOLOGIQUE DES PILOTES MILITAIRES - BILAN D'UNE PRATIQUE]
J. R. GALLE-TESSONNEAU, J. C. DUBOUIS-BONNEFOND (Armee de l'Air, Centre Medical de Psychologie Clinique, Paris, France), and G. SOLIGNAC (Centre Principal d'Expertise Medicale du Personnel Navigant, Paris, France) Medecine Aeronautique et Spatiale, vol. 24, 2nd Quarter, 1985, p. 111-120. In French.

Psychopathological characteristics common to military pilots are summarized from a qualitative study of the dossiers of 146 military pilots. The study was in part spurred by a desire to identify pilot candidates who will be able to adapt to military flight duty. The study covered pilots of a variety of military aircraft, their ages, the number of years of experience, and medical histories, including unsupported claims of illness. The most frequent illnesses were anxiety and depression, followed by vertigo, lowered activity, digestive troubles, headaches and insomnia, the latter five symptoms being of nearly equal occurrence. Outside of air accidents, the most frequent problems were either associated with professional experiences outside of flight or personal life, particularly in fulfilling the role of fatherhood, after heart problems, or when mourning the death of another. M.S.K.

A85-44243
A PSYCHOLOGICAL REPORT ON THE MILITARY AIR TRAFFIC CONTROLLER - SOME CLINICAL AND STATISTICAL DATA [L'EXPERTISE PSYCHOLOGIQUE DU CONTROLEUR AERIEN MILITAIRE *QUELQUES APERCUS CLINIQUES* ET STATISTIQUES]
J. C. DUBOUIS-BONNEFOND (Armee de l'Air, Centre Medical de Psychologie Clinique, Paris, France) Medecine Aeronautique et Spatiale, vol. 24, 2nd Quarter, 1985, p. 120-126. In French. refs

The results of psychological examinations of 50 military air traffic controllers (ATCs) were examined qualitatively and statistically in an attempt to identify personality traits which might be predictive of the performance of the ATC, particularly in emergency situations. Petty officers were found to exhibit nonspecific illnesses, i.e., unrelated to being ATCs. No similarities were noted between the common ATC illnesses and pilot illnesses. One quarter of the ATCs who exhibited chronic illnesses were involved in air accidents. Overall, the number of ATCs who displayed notable psychopathological symptoms was only a small fraction of the ATCs who completed their training and functioned effectively as ATCs. M.S.K.

A85-44244
PSYCHOLOGICAL TECHNIQUES FOR THE SELECTION AND INITIAL TRAINING OF MILITARY AIR TRAFFIC CONTROLLERS [*METHODES D'APPROCHE PSYCHOLOGIQUE DE LA SELECTION ET DE LA FORMATION INITIALE DU CONTROLEUR AERIEN MILITAIRE*]
J.-J. HOFFMANN and G. VERON (Service de Santedes Armees, Saint-Cyr-l'Ecole, France) Medecine Aeronautique et Spatiale, vol. 24, 2nd Quarter, 1985, p. 130-134. In French. refs

An 18 month psychological study was carried out on 120 probationary students at the French military air traffic controller (ATC) school. Results of a pre-school battery of tests were compared with the results of entrance tests for the school. It was hypothesized that ATCs must minimize logical thought in utilizing the high technology tools at their disposal, and must have a good capacity for spatial conception and for verbal communications. The candidates were given tests dealing with accident avoidance in space. Written tests were also given to establish the levels of nervousness, extroversion and introversion, anxiety, hysteria, obsessiveness, neuroses, paranoia, schizophrenia, and psychosomatic illnesses. The results, when correlated (or negatively correlated) with the entrance tests scores, indicated that the psychological profile tests will be a valid aid in determining the motivational levels of candidates for ATC training. M.S.K.

A85-44245
ON SIZE, DISTANCE, AND VISUAL ANGLE PERCEPTION
D. MCCREADY (Wisconsin, University, Whitewater) Perception and Psychophysics (ISSN 0031-5117), vol. 37, no. 4, April 1985, p. 323-334. refs

Standard descriptions of visual spatial experiences, especially illusions, create destructive paradoxes because, along with the perceived distance variable (D prime) they use only one 'perceived size' variable (S prime) in the equations S prime/D prime = V rad, to describe perception of a target's linear size, S m, its distance, D m, from the eye, and the visual angle, V deg, its outer edges subtend at the eye. Simple paradoxes vanish in descriptions using the different equation, S prime/D prime = V prime rad, which adds the perceived visual angle variable V prime rad. Redefining classic illusions as illustrations primarily of misperceived direction difference (V) values removes the pseudoparadoxes that have made extant explanations of illusions seem unsatisfactory.
Author

A85-44609
THE STRESS OF WORK - AN OVERVIEW
C. L. COOPER (Manchester, Victoria University, England) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, July 1985, p. 627-632. refs

This paper looks at a number of potential occupational stressors found to predict job dissatisfaction and ill health (both mental and physical) in a variety of different occupational settings. Factors intrinsic to the nature of the job, role ambiguity and conflict, poor relationships at work, lack of career development, inadequate organization structure/climate, and problems associated with the interface between work and homelife are the focal points of attention. Many of these sources of occupational stress are prevalent in the field of aviation, and may be exacerbated by the move toward deregulation and increasing commercial competition within the industry. Author

A85-44610
OCCUPATIONAL STRESS AND THE PROFESSIONAL PILOT - THE ROLE OF THE PILOT ADVISORY GROUP (PAG)
N. JOHNSTON (International Federation of Air Line Pilots Associations, Egham, England) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, July 1985, p. 633-637. refs

This paper discusses the role of pilot peer group involvement, using the Pilot Advisory Group (PAG), in assisting pilots who manifest personal problems which derive from occupational and other stressors. Some general aspects of 'background' occupational stress are discussed. Attitudes and opinions of professional aviators are identified and their role in denial of symptomatology is developed. The concept of the PAG is then discussed in detail before its role in relation to occupational stress is introduced. While some of the better known problems associated with occupational stress in pilots are mentioned, the emphasis in the paper is on developing new perspectives regarding the identification of stress-induced dysfunction, and also in exploring the suitability of PAG involvement. The formal obligations of management and regulatory authorities are contrasted with what the author sees as the countervailing imperatives of pilot attitudes and beliefs. Author

A85-44611
STRESS AND ACCIDENTS
R. G. GREEN (RAF, Institute of Aviation Medicine, Farnborough, England) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, July 1985, p. 638-641. refs

Relationships are examined between three types of stress and the error-generated accidents or incidents. These three types of stress are environmental stress (noise, vibrations, heat, cold, mild hypoxia in the military pilot; and fatigue and sleep deprivation in the civil pilot); acute reactive stress (during alarming though not fatal events or acute aircraft emergency); and domestic or life stress (produced by recent events like divorce or bereavement). Evidence is drawn from laboratory experiments, surveys and accident reports. It is concluded that, with the notable exception of fatigue and sleep deprivation, environmental stress is the least potent error-causing factor. Acute reactive stress increases the chance of behavioral disruption and potentiates further errors, but can be ameliorated by the extension of training in the simulator in order not only to teach the pilot the corrective emergency behavior but to habituate and to condition his associated affective responses. Life stress is perceived as possibly the most important and the least known factor and must be studied extensively. I.S.

A85-44766
STRESS IN AIRCREW
L. R. C. HAWARD (Surrey, University, Guildford, England) Stress Medicine (ISSN 0748-8386), vol. 1, Apr.-June 1985, p. 109-115. refs

Professional aircrew, pilots especially, are subjected to a cumulative complexity of stresses unique in occupational medicine. The assessment of strain and of 'stress thresholds' and the prediction of breakdown under stress by psychophysiological techniques are areas of contemporary aeromedical research. Stress management techniques have been applied to aircrew members, both prophylactically and as therapy, with some measure of success. Existing techniques can provide a practical and useful screening device by which the more stress-vulnerable members of aircrew can be detected. Author

A85-45089
THE EFFECT OF TASK TYPE AND STIMULUS PACING RATE ON SUBJECTIVE MENTAL WORKLOAD RATINGS
W. H. ACTON (System Research Laboratories, Inc., Dayton, OH) and H. A. COLLE (Wright State University, Dayton, OH) IN: NAECON 1984; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 21-25, 1984. Volume 2 . New York, IEEE, 1984, p. 818-823. refs

A study was conducted to determine whether subjective ratings of time stress and task difficulty are differentially sensitive to manipulation of stimulus pacing and task type. Four different tasks requiring different types of processing with single digit numbers were performed at four different rates. Subjective ratings of time stress were not statistically independent of task difficulty ratings. However, difficulty ratings were more sensitive to the task manipulation, and time stress ratings were more sensitive to the rate manipulation. This result suggests that time stress and processing complexity do constitute separate dimensions of subjective mental load. Author

A85-45090
A PROJECTIVE APPLICATION OF THE SUBJECTIVE WORKLOAD ASSESSMENT TECHNIQUE
G. B. REID, C. A. SHINGLEDECKER (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH), R. L. HOCKENBERGER (Hughes Aircraft Co., Culver City, CA), and T. J. QUINN (McDonnell Douglas Corp., St. Louis, MO) IN: NAECON 1984; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 21-25, 1984. Volume 2 . New York, IEEE, 1984, p. 824-826. refs

A Projective Subjective Workload Assessment Technique (PRO-SWAT) has been developed by the Air Force to evaluate the impact on aircrew workload of aircraft system enhancements. The technique is designed for simulations in which an expert aircrew is asked to evaluate the workload impact of various navigation aids, displays, automatic control and weapons management systems. The results of preliminary part-task simulations indicate that PRO-SWAT ratings can be very useful in refining the selection of system enhancements for air-to-ground attack mission scenarios. I.H.

A85-45122
TRAINING TASK HIERARCHY DEVELOPMENT
R. CLAPP (Boeing Military Airplane Co., Wichita, KS) IN: NAECON 1984; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 21-25, 1984. Volume 2 . New York, IEEE, 1984, p. 1072-1075. refs

Special emphasis should be directed in flight simulation training programs to those tasks that are especially hazardous to crew or aircraft in actual flying, and are characterized by contingency or emergency events in flight procedures. Attention is presently given to a Training Task Hierarchy which has been developed to cover the range of possible simulator training tasks, listing those that are fully, partly, or not at all adequately simulable. Fully simulable emergency and malfunction situations encompass engine radio communication and electrical system failures, icy or wet runways, and the appearance of unfriendly aircraft. O.C.

A85-46174
USE OF SELF-ASSESSMENT METHODS IN THE EVALUATION OF THE PSYCHOPHYSIOLOGICAL CONDITION OF THE LONG-DISTANCE PILOT [ISPOL'ZOVANIE METODA SAMOOTSENKI PSIKHOFIZIOLOGICHESKOGO SOSTOIANIIA LETCHIKA V DLITEL'NOM POLETE]
S. G. MELNIK and A. V. SHAKULA Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), June 1985, p. 65-68. In Russian. refs

Several self-assessment methods were tested in which various subjectively perceived parameters of mental and physical well-being (such as feeling fresh or exhausted, alert or dull, feeling no muscle discomfort or feeling it) were monitored by pilots, navigators, and the auxiliary crew members before, during, and after long-distance flights. The arithmetic mean of the most reliable of these parameters, graded on a scale of one to seven in the bipolar method of Doskin et al. (1975) was taken as an indicator of the general psychophysiological condition (PPC). The PPC of pilots and navigators, but not of the auxiliary personnel, showed a significant decline four to five hours after takeoff, which continued for hours after landing. A self-evaluation form, based on the bipolar method, is suggested, which allows the crew to detect the onset of the fatigue syndrome and to counteract it by prophylactic or corrective measures. I.S.

A85-46565
REACTION - PSYCHOLOGICAL MECHANISMS OF VISUAL INFORMATION PROCESSING [DEISTVIE: PSIKHOLOGICHESKIE MEKHANIZMY VIZUAL'NOGO MYSHLENIIA]
B. I. BESPALOV Moscow, Izdatel'stvo Moskovskogo Universiteta, 1984, 192 p. In Russian. refs

Theoretical and experimental investigations of the mechanisms of visual information processing in the human brain are reviewed. Theories concerning the psychological operations of mental imaging are discussed, and experimental techniques for studying reaction processes are described. A morphological model of visual information processing is proposed. Some mathematical aspects of the psychological theory of reaction are discussed. I.H.

A85-46696
ASSIMILATION AND CONTRAST OF PERCEIVED LENGTH DEPEND ON TEMPORAL FACTORS
K. JORDAN (San Jose State University, CA) and J. UHLARIK (Kansas State University of Agriculture and Applied Science, Manhattan) Perception and Psychophysics (ISSN 0031-5117), vol. 37, no. 5, May 1985, p. 447-454. refs

A85-46697
EARLY LIGHT ADAPTATION IN YOUNG, MIDDLE-AGED, AND OLDER OBSERVERS
J. F. STURR, K. L. CHURCH (Syracuse University, NY), and H. A. TAUB (U.S. Veterans Administration, Medical Center, Syracuse, NY) Perception and Psychophysics (ISSN 0031-5117), vol. 37, no. 5, May 1985, p. 455-458. Army-supported research. refs
(Contract NIH-AG-04465)

In the present examination of early light adaptation (ELA) in young, middle aged, and older observers by means of two experiments employing a criterion-free procedure, all subjects had corrected visual accuity of at least 20/30. A white, 1.2-deg, 50-msec flash was presented in the center of a white, 8.2 x 7.4-deg, 1000-msec photopic adapting field through an artificial pupil to the left temporal retina. Results indicate a systematic slowing in the ELA time course, where the young group has a steep recovery function, the middle group a less steep one, and the oldest group a reversal of the function. The middle aged observers exhibited interesting transitional functions. The possibility of selective loss of channels in the aging visual system is discussed. O.C.

N85-32765*# Old Dominion Univ., Norfolk, Va.
AN ERROR-DEPENDENT MODEL OF INSTRUMENT-SCANNING BEHAVIOR IN COMMERCIAL AIRLINE PILOTS Ph.D. Thesis - May 1983
D. H. JONES Washington Jul. 1985 190 p refs
(Contract NGT-47-003-801)
(NASA-CR-3908; NAS 1.26:3908) Avail: NTIS HC A09/MF A01 CSCL 05I

A new flexible model of pilot instrument scanning behavior is presented which assumes that the pilot uses a set of deterministic scanning patterns on the pilot's perception of error in the state of the aircraft, and the pilot's knowledge of the interactive nature of the aircraft's systems. Statistical analyses revealed that a three stage Markov process composed of the pilot's three predicted lookpoints (LP), occurring 1/30, 2/30, and 3/30 of a second prior to each LP, accurately modelled the scanning behavior of 14 commercial airline pilots while flying steep turn maneuvers in a Boeing 737 flight simulator. The modelled scanning data for each pilot were not statistically different from the observed scanning data in comparisons of mean dwell time, entropy, and entropy rate. These findings represent the first direct evidence that pilots are using deterministic scanning patterns during instrument flight. The results are interpreted as direct support for the error dependent model and suggestions are made for further research that could allow for identification of the specific scanning patterns suggested by the model. Author

N85-32766# Naval Postgraduate School, Monterey, Calif.
REVIEW OF THE PSYCHOLOGICAL ISSUES RELATING TO THE EFFECTIVENESS OF STRUCTURED PROGRAMMING M.S. Thesis
C. A. C. MCGRATH Dec. 1984 61 p
(AD-A154593) Avail: NTIS HC A04/MF A01 CSCL 05J

Claims have been made that the failure of empirical studies to establish the efficacy of structured programming is due to the lack of psychological models of the programming task. Many authors have pointed out that psychological research on the human information processing model might provide substance to the claim that structured programming facilitates a programmer's understanding of program logic. This thesis reviews the results of current psychological research and shows that at this time it is not possible to build a satisfactory psychological model of the programmer and his/her task. In order to define the programming task more clearly, the issues involving the psychological model are identified. GRA

N85-32767# Naval Submarine Medical Research Lab., Groton, Conn.
THE EFFECT OF SET SIZE ON TIME TO RECALL COLOR CODED INFORMATION Interim Report
A. R. JACOBSEN 27 Mar. 1985 21 p
(AD-A155013; NSMRL-1044) Avail: NTIS HC A02/MF A01 CSCL 05J

The ability of observers to accurately identify up to twenty different colors presented on a CRT screen was studied. The effect of set size on time to recall color-coded information was also investigated via a paired-associates paradigm in which each color was paired with a letter of the alphabet. On test trials the time between color presentation and the subject's verbal response with the appropriate letter were recorded. All twenty subjects were able to identify accurately all twenty colors. For sets of two through seven colors, increases in set size resulted in significant rises in time to recall. Subsequent increases in set sizes, up to twenty, resulted in little or no further increase in time to recall. The time to recall was also found to vary significantly to the different colors. Although no statistical differences were found among 16 of the 20 colors, the other 4 yielded significantly slower times to recall. GRA

N85-32768# American Coll. Testing Program, Iowa city, Iowa. Test Development Div.
MODELS FOR MULTIDIMENSIONAL TESTS AND HIERARCHICALLY STRUCTURED TRAINING MATERIALS Final Report, 1 Sep. 1981 - 28 Feb. 1985
M. D. RECKASE May 1985 32 p
(Contract N00014-81-K-0817; RR0-4204)
(AD-A155231; RR-85-1-ONR) Avail: NTIS HC A03/MF A01
CSCL 14B

Work on item response theory was extended to include two areas that had not been extensively researched previously. They include models for test items that require more than one ability for a correct response and models for the interaction between modules of instruction that have a hierarchical relationship. For both of these types of models, estimation procedures were developed for model parameters and extensive work was done to determine the appropriate interpretation of the parameter values. This report is a summary of work performed on these modules over a three year period. GRA

N85-32769# Texas A&M Univ., College Station. Dept. of Management.
SYMBOLIC AND INTERACTIONAL PERSPECTIVES ON LEADERSHIP: AN INTEGRATIVE FRAMEWORK
R. W. GRIFFIN, K. D. SKIVINGTON, and G. MOORHEAD May 1985 52 p
(Contract N00014-83-C-0025)
(AD-A155247; TR-ONR-DG-15) Avail: NTIS HC A04/MF A01
CSCL 05J

This paper presents the development of a Symbolic Interactional Leadership model. The model integrates three emergent streams of thought, symbolic action, reciprocal interactions, and interactional psychology, into a fresh approach which offers considerable advancement over simple, unidirectional, bivariate, static models. Implications for future theory and research are discussed. This model, while not yet a fully articulated theory, does represent a significant advancement over simple unidirectional, bivariate, static models. While likely to be subject to further refinement and development, the SIL model, then, may provide a useful framework for organizing existing theory and serving as a blueprint for future research. GRA

N85-32770# Colorado Univ., Boulder. Inst. of Cognitive Science.
CONCEPTUALIZING IN ASSEMBLY TASKS Interim Technical Report, 1983 - 1985
P. BAGGETT and A. EHRENFEUCHT Apr. 1985 37 p
(Contract N00014-85-K-0060; N00014-78-C-0433; N00014-84-C-0112)
(AD-A155564; ICS-TR-139) Avail: NTIS HC A03/MF A01
CSCL 05J

This paper gives a method to determine a person's hypothetical conceptualization of an object, its breakdown into subassemblies, and so on, from the person's sequence of requests for pieces given a group of conceptualizations, there is a typical one. The hypothesis that assembly instructions presenting a typical conceptualization will yield better structural and functional performance than those presenting a minority one, is supported experimentally. Conceptualizations are derived from objects built from memory (and incorrectly) by people who first studied typical or minority instructions. A new distance measure determines how far these conceptualizations are from those presented in the instructions. People studying typical instructions yield typical conceptualizations, and importantly, people studying minority instructions also yield typical conceptualizations, although they are significantly less typical than those from typical instructions. From the theoretical construct of conceptualizations and the methods of measuring them a practical principle, and a way to implement it, are found. The principle: When a single set of procedural instructions is designed, it should present the conceptualization that the majority of people to be instructed by it bring to the situation naturally. Author (GRA)

N85-32771# Walter Reed Army Inst. of Research, Washington, D.C. Div. of Neuropsychiatry.
HUMAN PERFORMANCE IN CONTINUOUS/SUSTAINED OPERATIONS AND THE DEMANDS OF EXTENDED WORK/REST SCHEDULES. AN ANNOTATED BIBLIOGRAPHY
G. P. KRUEGER, L. CARDENALES-ORTIZ, and C. A. LOVELESS May 1985 211 p
(AD-A155619; WRAIR-BB-85-1) Avail: NTIS HC A10/MF A01
CSCL 05J

The performance of workers under conditions of sustained or continuous work is a particularly important topic to the military services. Available research data on the topic are scattered throughout diverse printed sources, many of which are difficult to locate. This annotated bibliography lists 399 references containing research data, conceptual position papers and different methodological approaches to studying human performance in continuous/sustained operations and extended work/rest schedules. The time frame covered in the references is from 1940 to 1985. GRA

N85-33669# Joint Publications Research Service, Arlington, Va.
PSYCHOPHYSIOLOGICAL DISTINCTIONS OF ORGANIZATION AND REGULATION OF DAILY CYCLOGRAMS OF CREW ACTIVITIES DURING LONG-TERM SPACECRAFT
A. N. LITSOV and V. F. SHEVCHENKO *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) p 12-18 12 Aug. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 12-16
Avail: NTIS HC A07

The results of analysis of work-rest cycles of the Salyut-6 and Salyut-7 prime crewmembers are discussed. The distribution of work-rest cycles within the day, week, month and the flight as a whole, their relation with other components of the time schedule, the effect of various factors involved on the health status and work capacity were studied. It was shown that specific work-rest cycles should be rigorously adhered to. It was demonstrated that proper planning and realization of work-rest cycles, as well as their correction during actual flight with respect to psychophysiological and biorhythmological variations are required to maintain good health condition and high work capacity of crewmembers. R.J.F.

N85-33670# Joint Publications Research Service, Arlington, Va.
OPERATOR'S FUNCTIONAL COMFORT ZONE WHEN CONTROLLING MOVING OBJECT
V. I. MYASNIKOV, B. N. RYZHOV, and V. P. SALNITSKIY *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) p 19-23 12 Aug. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 17-19
Avail: NTIS HC A07

An objective evaluation of the psychic strain of six operators who performed multiparameter compensatory tracking of the moving object helped to identify the zone of changes of basic parameters. The control within this zone required a minimum psychophysiological cost (zone of functional comfort). The control beyond this zone was associated either with information overload or with a dramatic increase of the risk of failure. In five operators this led to a significant aggravation of the psychic strain. This study showed that special identification of the zone of functional comfort in the design of data display devices may be a method of optimizing man's work in the ergatic systems. R.J.F.

N85-33671# Joint Publications Research Service, Arlington, Va.
RAPID DETERMINATION OF CADET DISCIPLINE BY PROJECTIVE TESTS
V. I. YEVDOKIMOV *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) p 24-29 12 Aug. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 20-23
Avail: NTIS HC A07

The reliability of rapid prediction of the disciplined or undisciplined behavior of cadets using selected projective tests (the modified apperception test, the Rosenzweig test of picture frustration, and the Zondi test) was investigated. The tests were performed on 50 certified pilots and 400 cadets. By means of correlation and factor analyses the references given to the cadets by their seniors were compared with the results of the projective tests. It was found that the modified apperception test can be used to evaluate cadet's behavior within a comparatively short time. Marked extrapunitive trend combined with self-defense type of solution of the Rosenzweig test diminished the conformity of the personality and facilitated the development of conflict situations and undisciplined acts. The undisciplined cadets preferably selected pictures of seriously ill patients with epilepsy, catatonia or hysteria. These probability characteristics help to distinguish the cadets that need specific attention and supervision. R.J.F.

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

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

A85-43971
ANALYSIS AND DESIGN OF PERSONAL LIFE SUPPORT SYSTEMS FOR AIRCRAFT [RASCHET I PROEKTIROVANIE AVIATSIONNYKH SISTEM INDIVIDUAL'NOGO ZHIZNEOBESPECHENIIA]
M. G. AKOPOV and M. N. DUDNIK Moscow, Izdatel'stvo Mashinostroenie, 1985, 232 p. In Russian. refs

Currently used methods for analyzing and selecting, at the early stages of design, the principal parameters of personal life support systems for aircraft crews are reviewed. In particular, attention is given to the physiological, hygienic, and functional requirements for life support systems; possible approaches to the general design of life support systems and oxygen-supply equipment; adjustment of the functional elements of life support systems; and simulation models of the gas systems of personal equipment. Other topics discussed include the use of computers for optimizing the design parameters of life support systems and problems related to the reliability of life support equipment. V.L.

A85-44241
DATA DISPLAYS IN MODERN AIRCRAFT - A DOCTOR'S POINT OF VIEW OF AERONAUTICAL ERGONOMY [PRESENTATION DES INFORMATIONS DANS LES AERONEFS MODERNES POINT DE VUE DU MEDECIN SUR L'ERGONOMIE AERONAUTIQUE]
J.-P. MENU, R. AMALBERTI, and G. SANTUCCI (Centre d'Etudes et de Recherches de Medecine Aerospatiale, Paris, France) Medecine Aeronautique et Spatiale, vol. 24, 2nd Quarter, 1985, p. 104-106. In French.

Future pilots will manage a complex machine rather than guiding an aircraft. Data for making the decisions will be mostly visual. Occulometers permit examinations of the ways visual information is required, thereby permitting human factors optimization of the displays. The data have already served for the design of HUDs, which configure the symbolic data to appear mixed with the panorama at an infinite focus, at the price of a reduced field of view. Fast maneuvers change the HUD data rapidly, resulting in displays that are correct but imperfectly perceived. The pilot extracts information from data from automated sensor signal processing systems and from the pilot's own perceptions of the environment. The two forms must be continually reconciled. Further research is required to identify more aircraft functions which can be automated and to switch controls to other bodily organs to lower the demands on the visual system. M.S.K.

A85-44617
PUMA (SA 330) HELICOPTER IMPACT SIMULATION - DEMONSTRATION OF THE EFFICIENCY OF THE FRENCH CRASHWORTHY SEAT
B. VETTES, R. AUFFRET, and H. VIEILLEFOND (Centre d'Essais en Vol, Laboratoire de Medecine Aerospatiale, Bretigny-sur-Orge, France) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, July 1985, p. 672-675. refs

An experiment examining the accelerations encountered during a helicopter crash has been conducted on the SA 330 Puma. The measures recorded from anthropomorphic dummies used in this experiment clearly demonstrated the efficiency of crashworthy seats. Very high levels of acceleration recorded on the aircraft floor are attenuated by the seat. Neither phase shift nor amplification have been observed in the elastic response of the various parts of the dummies' bodies (head-chest-pelvis). The four point restraint harness was also found to be very efficient. However, the extrapolation of results obtained from dummies can be misleading. Original data processing technics and interpretation methods have been developed for this experiment. They might allow the prediction of human tolerance to crash accelerations with a fair safety margin. Author

A85-45088#
A SMART STICK CONTROLLER DESIGN BASED ON A STATIC EQUILIBRIUM MODEL
D. W. REPPERGER, J. W. FRAZIER, and R. E. VAN PATTEN (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH) IN: NAECON 1984; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 21-25, 1984. Volume 2 . New York, IEEE, 1984, p. 810-817.

This paper describes the hardware and construction of a position hand controller that accepts force inputs from a human operator as well as those generated under computer control. The forces it generates improve the man-controller interaction to achieve better tracking performance. It had been observed from a previous study that human tracking improved in a lateral acceleration environment with a position stick. It was then hypothesized that if a position stick were modified to apply similar forces to the subject in a static (1Gz) environment, it might be possible to improve tracking even without lateral acceleration forces. A preliminary experiment was run where synthetic stick forces were generated by using a simple one degree of freedom model (mass, spring, damper) of the lateral motion of the forearm in a lateral tracking task. The resulting stick force is termed 'negative biomechanical feedthrough'. Tracking scores improved significantly with the active stick (forces applied) when compared to a simple position stick (no forces applied). Author

A85-45091#
A COMPARISON OF PROJECTED AND MEASURED WORKLOAD RATINGS USING THE SUBJECTIVE WORKLOAD ASSESSMENT TECHNIQUE (SWAT)
R. G. EGGLESTON (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH) IN: NAECON 1984; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 21-25, 1984. Volume 2 . New York, IEEE, 1984, p. 827-831. refs

The Subjective Workload Assessment Technique (SWAT) was used in a projective manner in order to estimate the workload implications of system configurations during the conceptual design stage of development. Experienced aircrews were given descriptions of a basic and several enhanced versions of an advanced attack aircraft. Based on this information and descriptions

of a prototypical mission scenario, the aircrews rated the level of workload expected when selected events occurred in the mission. Subsequently, the system concepts were included in a manned simulation that contained similar mission scenarios, and the workload experienced at selected times in the missions were rated by different aircrews. The predicted workload ratings were found to significantly correlate with those obtained in flight simulation.
Author

A85-45092
AN OPERATIONAL ANALYSIS OF F-16 LANTIRN WORKLOAD
C. R. HALE, K. M. OBRIEN (BDM Corp., McLean, VA), K. KAPKA (USAF, Operational Test and Evaluation Center, Kirtland AFB, NM), and L. CARR (USAF, Aeronautical Systems Div., Wright-Patterson AFB, OH) IN: NAECON 1984; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 21-25, 1984. Volume 2 . New York, IEEE, 1984, p. 832, 833.

Preliminary results of a program of simulations of the Low Altitude Navigation and Targeting Infrared for Night (LANTIRN) system are presented. Emphasis is given to the workload associated with system operation. Some general impressions of the utility of the LANTIRN system are also offered. I.H.

A85-45093
MODEL INTEGRATION METHODOLOGY FOR SYSTEM ANALYSIS
R. F. BACHERT (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH), C. M. HOYLAND, and K. H. EVERS (SofTech, Inc., Dayton, OH) IN: NAECON 1984; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 21-25, 1984. Volume 2 . New York, IEEE, 1984, p. 836-840. refs

Attention is given to the modeling and simulation of human-machine (H-M) systems, as well as to the integration of these models to furnish more powerful systems analysis techniques and a transition mechanism between a research domain and an application-oriented domain. The purpose of H-M model integration is the achievement of synergism, as in the cases of the computer codes designated 'SAINT', which is a language for the modeling of large and complex systems, and 'IDEF', which is specifically intended for the tasks of industrial engineering. O.C.

A85-45094
ANALYTICAL MODELS OF PERFORMANCE OF PROCEDURES
P. J. STICHA (Human Resources Research Organization, Alexandria, VA) IN: NAECON 1984; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 21-25, 1984. Volume 2 . New York, IEEE, 1984, p. 841-848. refs
(Contract MDA903-81-C-0517)

Models that represent the performance of procedural tasks are described, concentrating on different ways sequencing may be represented. Three network simulation techniques are discussed; the Siegel-Wolf model, which predicts the performance of individuals affected by stress; the Human Operator Simulator, which makes extensive use of psychological micromodels; and the System Analysis of Integrated Network of Tasks (SAINT). The techniques are compared for flexibility, validity, generality, and pragmatic considerations. Production systems for representing procedural control are discussed and compared to network simulations in terms of how they represent control and approach cognitive modeling. Of the network simulations, SAINT is preferred for flexibility and generality, while the other simulations are advantageous in situations for which the task domain is restricted. Network models are more suited to requirements of procedural tasks than production systems, which are data driven. C.D.

A85-45095
APPLICATION OF SAINT SIMULATION TO INVESTIGATE TASK-ELEMENT DIFFERENCES
C. M. KNERR and P. J. STICHA (Human Resources Research Organization, Alexandria, VA) IN: NAECON 1984; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 21-25, 1984. Volume 2 . New York, IEEE, 1984, p. 849-852. refs

Differences in learning and retention have been noted between the individual steps of the procedural tasks studied by the U.S. Army's Research Institute for the Behavioral and Social Sciences. This research used the Wortman et al. (1978) Systems Analysis of Integrated Networks of Tasks performance model, together with psychological models of learning and retention, to investigate the task-element characteristics associated with the noted differences. The results obtained indicate that consideration of task-element characteristics significantly improves performance prediction. Eight procedural tasks are examined. O.C.

A85-45097
HUMAN OPERATOR MODELING - A NEW TECHNOLOGY FOR ADDRESSING HUMAN FACTORS DURING DESIGN
K. R. LAUGHERY, JR. (Micro Analysis and Design, Boulder, CO) IN: NAECON 1984; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 21-25, 1984. Volume 2 . New York, IEEE, 1984, p. 857-865. refs

Models which permit human performance in systems to be estimated early in system design are discussed. The situations when such computer models should be used are considered, and the available technologies are addressed. Recent advances in the SAINT technology are described. The steps involved in building a model of human operator performance in a system are discussed. C.D.

A85-45098
THREAT WARNING DISPLAY CONTENT
J. S. HAWKINS, J. M. REISING (USAF, Flight Dynamics Laboratory, Wright-Patterson AFB, OH), and M. E. HORNSBY (Boeing Military Airplane Co., Seattle, WA) IN: NAECON 1984; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 21-25, 1984. Volume 2 . New York, IEEE, 1984, p. 872-878.

An investigation of pictorial display formats for fighter aircraft intended to be compatible with future possible future threat and warning systems is discussed. Twelve pilots flew practice missions and six 24-minute test trials with both monochromatic and color displays. All orders of presentation were counterbalanced to avoid any confounding due to order effects. Objective performance and subjective opinion data were collected. Data were compiled and analyzed on ten different objective performance measures; all ten showed an advantage for the color display over the monochrome version. Only two of these measures, vertical steering error and percent of correct verbal reports, were statistically significant at the 0.05 level. Pilots consistently rated color as slightly better than monochrome with regard to ease of extracting or cross-checking specific information, with most ratings clustered around slightly and moderately easy to use ratings. C.D.

A85-45099#
DIGITAL VERSUS CARTOGRAPHIC
N. R. HUDSON (USAF, Wright Aeronautical Laboratories, Wright-Patterson AFB, OH) IN: NAECON 1984; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 21-25, 1984. Volume 2 . New York, IEEE, 1984, p. 879-883.

An argument is made for using both digital and cartographic maps in aircraft cockpits, making the best use of the unique characteristics of both. The advantages and limitations of both types of maps are described, and the use of film strip maps to cope with the drawbacks of paper maps in high-speed flight is discussed. It is concluded that the film strip map will remain the best method of presenting map data to the pilot for this generation of aircraft. C.D.

A85-45104#
CONTINUOUS SPEECH RECOGNITION USING NATURAL LANGUAGE CONSTRAINTS
R. L. ROUTH and R. W. MILNE (USAF, Institute of Technology, Wright-Patterson AFB, OH) IN: NAECON 1984; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 21-25, 1984. Volume 2 . New York, IEEE, 1984, p. 916-923. refs

The role of semantic and syntactic constraints in the process of speech recognition is investigated, and a real time, general solution to the application of English syntactic constraints to spoken English recognition is developed that is subject to the accuracy of the acoustic analyzer and the accuracy and completeness of an English Parser. It is noted that automated speech recognition at the level of conversation or dictation (as required in future aircraft cockpit systems) must incorporate several hierarchical levels of sophisticated, artificially intelligent, syntactic and semantic analysis, in addition to the extremely accurate 'front end' word-level acoustic analyzer assumed from the outset. O.C.

A85-45105* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ALERTING PREFIXES FOR SPEECH WARNING MESSAGES
N. M. BUCHER, J. W. VOORHEES (NASA, Ames Research Center, Moffett Field, CA), R. L. KARL (San Jose State University, CA), and E. WERNER (Informatics General Corp., Palo Alto, CA) IN: NAECON 1984; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 21-25, 1984. Volume 2 . New York, IEEE, 1984, p. 924-931. refs

A major question posed by the design of an integrated voice information display/warning system for next-generation helicopter cockpits is whether an alerting prefix should precede voice warning messages; if so, the characteristics desirable in such a cue must also be addressed. Attention is presently given to the results of a study which ascertained pilot response time and response accuracy to messages preceded by either neutral cues or the cognitively appropriate semantic cues. Both verbal cues and messages were spoken in direct, phoneme-synthesized speech, and a training manipulation was included to determine the extent to which previous exposure to speech thus produced facilitates these messages' comprehension. Results are discussed in terms of the importance of human factors research in cockpit display design. O.C.

A85-45106
INTELLIGIBILITY OF COMPUTER GENERATED SPEECH AS A FUNCTION OF MULTIPLE FACTORS
C. A. SIMPSON and T. NAVARRO (Psycho-Linguistic Research Associates, Menlo Park, CA) IN: NAECON 1984; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 21-25, 1984. Volume 2 . New York, IEEE, 1984, p. 932-940. refs

A NASA program to investigate the effects of various psycholinguistic and physical factors on the intelligibility of synthesized speech for aircraft information displays is described. The factors affecting pilot compensation are examined within the context of flight tasks with which listeners are already familiar. Estimates of the intelligibility in the range 19-100 percent have been obtained for different types of LPC encoded speech. The flight performance associated with computer speech is obtained in the case of pilots and nonpilots; males and females; and experienced and naive listeners, respectively. I.H.

A85-45109
NON-INVASIVE MICROWAVE INSTRUMENTS FOR THE MEASUREMENT OF RESPIRATION AND HEART RATES
M. NOWOGRODZKI, D. D. MAWHINNEY, and H. F. MILGAZO (RCA Laboratories, Princeton, NJ) IN: NAECON 1984; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 21-25, 1984. Volume 2 . New York, IEEE, 1984, p. 958-960.

The small repetitive excursion of the chest wall can be detected by low-power CW microwave Doppler radar techniques. The resulting detected signal contains information on both the respiration rate and heart-rate frequency of the individual being monitored, and these two distinct frequencies can be separated by judicious filtering or other signal-processing techniques. Instruments utilizing this approach have been demonstrated: both an experimental remote respiration monitor and a heart-rate monitor specifically developed for the monitoring of subjects wearing protective clothing have been tested. Author

A85-45110
MIND OVER MACHINE IN NAVIGATION AND AIR TRAFFIC CONTROL
M. L. RITCHIE (Ritchie, Inc.; Wright State University, Dayton, OH) IN: NAECON 1984; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 21-25, 1984. Volume 2 . New York, IEEE, 1984, p. 961-965. refs

The present discussion of the problem of human error in advanced cockpit and air traffic control systems proceeds under the hypothesis that such errors' reduction need not require additional data on human performance and cannot be entirely precluded through further automation of system functions. Attention is accordingly given to the outline of system design activities which incorporate human performance data and transcend current assumptions and divisions among design specializations. The Dallimonti (1982) determinations for process control systems design are noted to be especially relevant to the present human-operated system design tasks. O.C.

A85-45112
EVALUATION OF PILOT PERFORMANCE AND WORKLOAD AS A FUNCTION OF INPUT DATA RATE AND UPDATE FRAME RATE ON A DOT-MATRIX GRAPHICS DISPLAY
P. W. GRIFFITH, P. J. GROS, JR. (BDM Corp., Dayton, OH), and J. A. UPHAUS, JR. (USAF, Flight Dynamics Laboratory, Wright-Patterson AFB, OH) IN: NAECON 1984; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 21-25, 1984. Volume 2 . New York, IEEE, 1984, p. 988-995.

Pilot performance and workload were examined to determine the result of decreasing input avionic data rate and picture update frame rate for primary flight information depicted on a 64 dot/inch green LED display. Twenty-eight pilots flew proficiency maneuvers (Vertical S, Steep Turn, Aileron Roll, Two-Point Aileron Roll, and Immelman) using this display in a fixed base simulator. Maneuver performance scores were based upon deviations from target values for altitude, airspeed, bank, etc. Workload scores were based upon control stick activity. Multivariate analyses results indicate no significant difference in pilot performance as input data rate was reduced from 50 Hz to 25 Hz and as update frame rate was reduced from 117 Hz to 25 Hz. However, pilot workload was significantly higher for the 25 Hz avionic input rate than for the 50 Hz rate. Although pilot performance improved significantly during the latter missions flown, additional training was not found to significantly reduce pilot workload. Therefore, it is recommended that the minimum input/update rates both be at least 50 Hz for dot-matrix graphics portrayals containing imagery similar to that evaluated on the Vertical Situation Display format. Author

A85-45113#
MAN/MACHINE INFORMATION TRANSFER SYSTEM
W. MULLEY and G. M. HOLMES (U.S. Navy, Naval Air Development Center, Warminster, PA) IN: NAECON 1984; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 21-25, 1984. Volume 2 . New York, IEEE, 1984, p. 996-1003.

The technical requirements of a Man/Machine Information Transfer System for U.S. military aircraft are discussed. Consideration is given to the state of the art advancements in hardware, software, and crew station interface design which are needed to achieve weapons system instrumentation that is adaptable to 1990s aircraft. It is shown that life cycle costs of hardware and software must be reduced in order to achieve the necessary operational effectiveness of future weapons systems. Improvements in the effectiveness, adaptability, and supportability of crew station istrumentation are identified as the major obstacles

to be overcome in the development of Man/Machine interfaces for military aircraft. I.H.

A85-45160
MULTI-COLOR DISPLAY DESIGN CRITERIA
K. T. BURNETTE (Burnette Engineering, Fairborn, OH) IN: NAECON 1984; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 21-25, 1984. Volume 2 . New York, IEEE, 1984, p. 1348-1363. refs
(Contract F33615-82-C-3613)

The color design criteria which must be met to apply multicolor displays in bubble canopy aircraft illumination environments are discussed. The effectiveness of existing color characterization techniques is evaluated, and a theory to predict color perception in a changing chrominance illumination environment is proposed. Color uniformity criteria which are needed to purify signal colors in multicolor dot matrix displays are also discussed. I.H.

A85-45905*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
INTEGRATED MULTI-SENSORY CONTROL OF SPACE ROBOT HAND
A. K. BEJCZY, E. P. KAN, and R. R. KILLION (California Institute of Technology, Jet Propulsion Laboratory, Pasadena) IN: Guidance, Navigation and Control Conference, Snowmass, CO, August 19-21, 1985, Technical Papers . New York, AIAA, 1985, p. 253-259. NASA-supported research. refs
(AIAA PAPER 85-1882)

Dexterous manipulation of a robot hand requires the use of multiple sensors integrated into the mechanical hand under distributed microcomputer control. Where space applications such as construction, assembly, servicing and repair tasks are desired of smart robot arms and robot hands, several critical drives influence the design, engineering and integration of such an electromechanical hand. This paper describes a smart robot hand developed at the Jet Propulsion Laboratory for experimental use and evaluation with the Protoflight Manipulator Arm (PFMA) at the Marshall Space Flight Center (MSFC). Author

A85-45906#
ACTIVE MODAL CONTROL OF FLEXIBLE MANIPULATORS IN APPLICATION TO SPACE CONSTRUCTION AND SERVICING
J. S.-C. YUAN (Spar Aerospace, Ltd., Toronto, Canada) IN: Guidance, Navigation and Control Conference, Snowmass, CO, August 19-21, 1985, Technical Papers . New York, AIAA, 1985, p. 260-268. Sponsorship: Department of Supply and Services.
(Contract DSS-13SR-31053-3-3805Y)
(AIAA PAPER 85-1883)

The point stability of manipulators in the presence of external disturbances associated with space construction and servicing (SCS) is considered. Manipulator control strategies are compared on the basis of a two-dimensional model of an SCS manipulator. The control strategies studied were: rigid-body control; and a strategy including a selected number of flexural modes in the control design. The compensator in each case was a multivariable proportional-integral controller. It is shown that the active modal control is highly robust with respect to variations in the controller gain and the flexural stiffness of the manipulator. In particular, active modal control had a much shorter disturbance recovery time than rigid body control. I.H.

A85-45907#
AN OPERATIONAL 1/16TH SIZE MODEL OF THE SPACE SHUTTLE MANIPULATOR
C. CHASE, W. CHASE, M. LOHR, G. K. F. LEE, and T. A. W. DWYER, III (Colorado State University, Fort Collins) IN: Guidance, Navigation and Control Conference, Snowmass, CO, August 19-21, 1985, Technical Papers . New York, AIAA, 1985, p. 269-277. refs
(AIAA PAPER 85-1884)

In this paper, a microprocessor-based controller for a six degree of freedom manipulator arm with revolute joints is discussed. The arm is based on a 1/16th size scale model of the Space Shuttle manipulator. A sequential single joint control philosophy is followed. Classical linear control strategies can thus be implemented on a microcomputer for real-time path planning or path following. Intel 8086 - based systems are used to implement the controllers; an 86/12A 32K RAM board along with 8087 co-processor are also employed to speed up computation. A vision system is incorporated in the control loop for on-line pick and place tasks. Limitations of single joint control and requirements for ulterior nonlinear control are also discussed. Author

A85-46148
AN ANALYSIS OF ERGONOMIC SYSTEMS [ANALIZ ERGOTEKHNICHESKIKH SISTEM]
G. V. DRUZHININ Moscow, Energoatomizdat, 1984, 160 p. In Russian. refs

The book is concerned with the application of the concepts of human factors engineering to the design and development of automated systems. Attention is given to the biological and psychological characteristics of human operators, method of describing the structure of individual work processes, and operational characteristics of technical equipment. The discussion also covers various methods for describing schedules of operations, probabilistic modeling of work processes, and assessment of the confidence level of information in ergonomic systems. V.L.

A85-46627
MAN-MACHINE CRITERIA FOR SELECTING INSTRUMENTATION
R. BLOOM (Westinghouse Electric Corp., Integrated Logistic Support Div., Hunt Valley, MD) IN: International Instrumentation Symposium, 30th, Denver, CO, May 7-10, 1984, Proceedings . Research Triangle Park, NC, ISA, 1984, p. 559-566.

In order to perform allocated functions, the personnel of a complex system must frequently interface with either display or control instrumentation, or both. Through the application of such task analysis techniques as the Operational Sequency Diagram methodology, the specific instrumentation capabilities required by personnel can be identified. O.C.

A85-46628
PROGRAMMABLE DISPLAY PUSHBUTTON OPERATOR/SYSTEM COMMUNICATION
D. NICHOLSON (Honeywell, Inc., Micro Switch Div., Freeport, IL) IN: International Instrumentation Symposium, 30th, Denver, CO, May 7-10, 1984, Proceedings . Research Triangle Park, NC, ISA, 1984, p. 571-578.

The programmable display pushbutton system presented employs at 16 x 35 pixel array of LEDs for various combinations of characters and rows, as well as graphics employing the full dot-matrix format. The solid state Hall effect switch used is a rugged and environmentally sealed unit. Logic, refresh and self-test functions are built into a control unit which furnishes interface with the host computer. One programmable display pushbutton can perform the functions of many switches and displays in communications between operator and host computer. O.C.

N85-32772*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
LIVING ALOFT: HUMAN REQUIREMENTS FOR EXTENDED SPACEFLIGHT
M. M. CONNORS, A. A. HARRISON (California Univ., Davis), and F. R. AKINS (Santa Clara Univ., Calif.) Washington 1985 426 p refs Original contains color illustrations
(NASA-SP-483; NAS 1.21:483) Avail: NTIS HC A19/MF A01; SOD HC $14.00 as 033-000-00949-6 CSCL 06K

Human psychological and social adjustment to space is investigated. Studies and experiences bearing on human performance capability, psychological well being, and social organization, as they relate to space, were identified and assessed, and suggestions offered as to where further research could ease the Earth/space transition. Special emphasis was given to the variables of crew size, crew diversity, and mission duration, all of which can be expected to increase in future spaceflight. By

providing a conceptual framework in which issues and related information can be integrated, the hope is to aid in discovering those conditions under which future space travelers can flourish.
Author

N85-32773# Army Natick Research and Development Command, Mass.
THE EFFECTS OF PROLONGED FEEDING MEAL, READY-TO-EAT (MRE) OPERATIONAL RATIONS Final Technical Report, period ending 1983
E. HIRSCH, H. L. MEISELMAN, R. D. POPPER, G. SMITS, and B. JEZIOR Oct. 1984 374 p
(Contract DA PROJ. 1L1-62724-AH-99)
(AD-A154763; NATICK/TR-85/035) Avail: NTIS HC A16/MF A01 CSCL 06H

The US Army Natick Research and Development Center conducted a study to evaluate the effects of prolonged feeding Meal, Ready-to-Eat (MRE) operational rations on troop effectiveness. Two combat support companies, from the 25th Infantry Division, participated in this 34 day study while they were engaged in a field training exercise at the Pohakuloa Training Area on the Island of Hawaii. One company subsisted solely on MRE rations. The other company was fed an A ration breakfast, an MRE lunch, and an A ration dinner. The MRE food items were highly rated by the troops but these foods were not consumed in sufficient quantity. Average daily caloric intake was 2,189 calories per day for the MRE group and 2,950 calories per day for the control group. The major consequences of the low food intakes were body weight loss and some vitamin and mineral intakes that were below recommended levels. The MRE group lost 8.1 pounds and the control group lost 4.6 pounds. Both groups had intakes of niacin and magnesium that were below recommended levels. The MRE group also consumed less riboflavin, calcium, and iron than recommended. The other measures that were taken to evaluate the consequences of prolonged feeding the MRE did not reveal any major differences between the two companies. Questionairres on physical symptoms, mood morale and perceptions of leadership showed only minor differences between the two companies. The performance of the two companies did not differ on a test battery of cognitive and psychomotor tasks.
GRA

N85-32774# Southwest Research Inst., San Antonio, Tex. Div. of Engineering and Materials Science.
A CREW EXPOSURE STUDY. PHASE II. VOLUME 2. AT SEA. PART A Final Report, 15 May 1982 - 12 Apr. 1985
W. J. ASTLEFORD, J. C. BUCKINGHAM, H. L. KAPLAN, R. J. MAGOTT, and J. P. RIEGEL Apr. 1985 97 p
(Contract DTCG23-80-C-20015)
(AD-A155233; USCG-D-11-85-VOL-2-PT-A) Avail: NTIS HC A05/MF A01 CSCL 06J

The objective of this effort was to implement the Phase 1 test plan for characterizing occupational exposures of crew members on bulk liquid tankers to chemical substances, primarily cargo vapors. Additional chemical substances included nuisance dust, asbestos fibers, oil mist and silica dust. This report documents the measurement and monitoring data that were collected on six at-sea voyages that involved tankers carrying Subchapter O, Subchapter D and unregulated liquid products. The interpretation of these occupational exposures was based on a conservative method that makes use of the medical monitoring response level concept and current values of the ACGIH TLVs. This method was developed because the work routine that forms the basis for TLVs is not generally applicable to marine operations. Noise dosimetry was performed on two voyages in order to characterize the environment in an Engine Room and in the Deck Department of a state-of-the-art product tanker. This study concluded that the potential for unacceptable inhalation exposures is greatest during open tank gauging and entry into product tanks. Volume 2, Part A represents the body of the final report. The detailed voyage reports are contained in Part B.
GRA

N85-32775# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
ANALYSIS OF THE TRANSIENT RESPONSE OF TEMPORAL ARTERY BLOOD FLOW DATA RELATIVE TO VARIOUS ANTI-G SUIT PRESSURE SCHEDULES Final Report, 1983 - 1984
R. J. CROSBIE 16 Oct. 1984 32 p
(AD-A155242; NADC-84143-60) Avail: NTIS HC A03/MF A01 CSCL 06P

Recent incidences of G-induced loss of consciousness (LOC) by aircrew flying high performance aircraft have reestablished the operational need for increased G-protection for aircrewmen and have prompted a renewed interest in the development of new and improved G-protective equipment and techniques. Of current concern is the rapidity with which these high performance aircraft can achieve high G-levels. This high rate of G-onset creates a period during which the physiological response of the aircrewman and the protective action of his anti-G suit lab behind the G profile, and during which visual symptoms which normally precede LOC and serve to warn the pilot, do not occur. A method is presented for objectively measuring the relative effectiveness of various G protective equipment or techniques by comparing the quantitative response of a subject's mean Doppler flow velocity signal to a series of modest G profiles when using each protective system in turn. The method is applied to evaluate two configurations of the Navy's new servo controlled anti-G valve in comparison with the standard ALAR valve during exposure to G profiles having various rates of G onset.
GRA

N85-32776# Air Force Human Resources Lab., Brooks AFB, Tex.
ADVANCED SIMULATOR FOR PILOT TRAINING AND HELMET-MOUNTED VISUAL DISPLAY CONFIGURATION COMPARISONS Interim Report, Jan. 1983 - Jan. 1984
R. R. WOODRUFF, D. C. HUBBARD, and A. SHAW May 1985 24 p
(Contract AF PROJ. 1123)
(AD-A155326; AFHRL-TR-84-65) Avail: NTIS HC A02/MF A01 CSCL 05I

This effort compared five flight simulator visual display configurations using a simulated aerial refueling task. The configurations were: (1) a helmet-mounted stereoscopic display with a 40 deg field of view (FOV), (2) a helmet-mounted biocular display with a 40 deg FOV, (3) the full Advanced Simulator for Pilot Training (ASPT) 300 FOV, (4) the ASPT visual display masked to present a 40 deg FOV, and (5) lead lanthanum zirconate titanate (PLZT) googles (stereoscopic) using one ASPT window. Performance of pilots using the different display configurations was observed. The results indicated that horizontal position was maintained better with the wide-FOV ASPT display and that boom movement was minimized with the stereoscopic display.
GRA

N85-33698 Defence Research Information Centre, Orpington (England).
THERMAL STRESS SUFFERED BY TANK CREWS WORKING IN SUMMER HEAT
G. KLEINHAUSS, C. PIEKARSKI, G. SCHAAD, and W. GORGES Mar. 1985 24 p refs Transl. into ENGLISH from Wehrmed. Monatsschr. (West Germany), vol. 3, no. 28, 1984 p 89-98
(DRIC-T-7492; BR95444) Avail: NTIS HC A02/MF A01

Air conditioning techniques for tanks including active cooling, isolation measures, and adiabatic moisturizing of the air are compared. The expected efficiency and limits of the systems are illustrated. Compared with the air conditioner, the smaller technical expenditure and lower energy consumption of the water atomizer offers a constructive and logistical alternative under combat conditions.
Author (ESA)

N85-33699 Royal Signals and Radar Establishment, Malvern (England).
PERFORMANCE OF ROLLING BALL AND ISOMETRIC JOYSTICK ON A 2-D TARGET ALIGNMENT TASK
A. JACKSON Apr. 1984 38 p refs
(RSRE-MEMO-3695; BR95202) Avail: NTIS HC A03/MF A01

A rolling ball and a rate controlled isometric joystick were employed in a target alignment task with dimensions comparable with those of many air traffic control (ATC) tasks. Variables included amplitude and target with three levels of control-display relationship (gain), and direction of movement. The two devices were compared on overall performance time, the rate of incorrect responses, adherence to Fitts' law, and directional biases. This last factor proves significant only for the joystick. The rolling ball is recommended for the ATC environment. Control-display relationship has no effect on the performance measures employed. Author (ESA)

N85-33700# Boeing Commercial Airplane Co., Seattle, Wash. Program Engineering and Maintenance Service.
THE DEVELOPMENT AND EVALUATION OF COLOR DISPLAY SYSTEMS FOR AIRBORNE APPLICATIONS. PHASE 1: FUNDAMENTAL VISUAL, PERCEPTUAL, AND DISPLAY SYSTEM CONSIDERATIONS Final Report, Sep. 1983 - Jul. 1984
L. D. SILVERSTEIN and R. M. MERRIFIELD 18 Jul. 1985 328 p refs Sponsored in part by Navy
(Contract DTFA01-83-C-20033)
(FAA/PM-85-19; D6-53012) Avail: NTIS HC A15/MF A01

A great number of complex, interacting factors determine the effectiveness of a color display system. Many of these factors characterize visual displays in general, while others are specifically related to the production of use of color. Because it is difficult, if not unwise, to isolate and consider human visual and perceptual factors separately from color display system hardware characteristics, both operator and display system requirements must be analyzed according to common functional units. The objectives of the study were to review the current philosophy and standards on the airborne applications of electronic color display systems, develop guidelines for specifying and measuring color CRT display performance parameters, conduct a survey of currently available color systems, review and evaluate existing system capabilities, and predict future trends and applications in color display systems and componentry. Author

55

PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

A85-44389* Leiden Univ. (Netherlands).
CAN SPORES SURVIVE IN INTERSTELLAR SPACE?
P. WEBER and J. M. GREENBERG (Leiden, Rijksuniversiteit, Netherlands) Nature (ISSN 0028-0836), vol. 316, Aug. 1, 1985, p. 403-407. refs
(Contract NGR-33-018-148)

Experimental evidence is presented for the effects of very low temperature and UV radiation, characteristic of the interstellar medium, on the survival of bacteria. In the most general space environment, 10 percent survival times are only of the order of hundreds of years, too short for panspermia to work. In a substantial fraction of space within dark clouds, however, it is shown that, even with conservative figures, survival times as long as millions to tens of millions of years are attainable. In such conditions, clouds could transport organisms from one solar system to another in times significantly shorter than the mean survival time. This occurs with significant probability. C.D.

A85-44630
PRIMEVAL CELLS - POSSIBLE ENERGY-GENERATING AND CELL-DIVISION MECHANISMS
A. L. KOCH (Indiana University, Bloomington) Journal of Molecular Evolution (ISSN 0022-2844), vol. 21, no. 3, 1984-1985, p. 270-277. refs
(Contract NSF PCM-79-11241)

A hypothesis is proposed for the abiotic processes of energy generation, and for growth and division in the phospholipid vesicle as a model for the primeval cell. Donation of 2H(+) + 2e(-) at the vesicle external surface, with subsequent transfer of the electrons into the vesicles by metal impurities, is suggested to be the protonmotive force that preceded photochemical and electron transport mechanisms in the process of the evolution of the live cell. The protonmotive force would lead to accumulation of small molecules and the resultant increase in osmotic pressure inside a vesicle. This in turn would generate the processes that preceded abiotic growth and division: incorporation of phospholipid-like molecules into the two layers of the vesicular membrane, the infolding of the inner membrane, and the formation and eventual splitting of the septum. Assuming that the genetic material could be replicated in a semiconservative fashion, the liposome-like structure could have served three functions: (1) for segregation of genetic units, (2) as units for selection of phenotypes, and (3) for energy development. Experimental tests for the theory are outlined. I.S.

A85-44631
THE GEOLOGICAL SETTING OF THE EARLIEST LIFE FORMS
E. G. NISBET (Saskatchewan, University, Saskatoon, Canada) Journal of Molecular Evolution (ISSN 0022-2844), vol. 21, no. 3, 1984-1985, p. 289-298. NSERC-sponsored research. refs

Life on earth may have begun about 4 Ga ago. Plate tectonics probably operated in the early Archaean, with rapid spreading at mid-ocean ridges, a komatiitic (magnesium-rich) oceanic crust, active volcanic arcs and the development of extensional basins on continental crust. Shallow water environments would have been more restricted and probably shorter-lived than in later geological times; however, extensive shallow seas existed in the later phases of the development of extensional basins. Bacterial communities - presumably photosynthetic have probably existed in such shallow-water settings and probably at shallow depths in the oceans for at least 3.5 Ga. Because the mid-ocean ridges were probably subaqueous, hydrothermal systems would have been very vigorous and would have offered suitable habitats for early chemo-autotrophic bacterial communities. Early life forms probably also occupied vesicles in lavas, pumice and volcanic breccias, and pores in soft sediments, living in the constant flux of fluid flushing through permeable strata. Other, similar habitats would have existed in volcanic island arcs and in extensional basins. Author

A85-44632* Salk Institute for Biological Studies, San Diego, Calif.
TEMPLATE-DIRECTED POLYNUCLEOTIDE SYNTHESIS ON MINERAL SURFACES
A. W. SCHWARTZ and L. E. ORGEL (Salk Institute for Biological Studies, San Diego, CA) Journal of Molecular Evolution (ISSN 0022-2844), vol. 21, no. 3, 1984-1985, p. 299, 300. refs
(Contract NGR-05-067-001)

Ferric hydroxide, a plausible prebiotic material, strongly adsorbs polynucleotides. It is shown that adsorption on ferric hydroxide and on several other minerals has no effect, under the conditions studied, on the template-directed oligomerization of guanylic acid on polycytidylic acid. Author

A85-45814* Salk Institute for Biological Studies, San Diego, Calif.
ALANINE SYNTHESIS FROM GLYCERALDEHYDE AND AMMONIUM ION IN AQUEOUS SOLUTION
A. L. WEBER (Salk Institute for Biological Studies, San Diego, CA) Journal of Molecular Evolution (ISSN 0022-2844), vol. 21, no. 4, 1984-1985, p. 351-355. refs
(Contract NSG-7627)

The formation of alanine (ala) form C(14)-glyceraldehyde and ammonium phosphate in the presence or absence of a thiol is reported. At ambient temperature, ala synthesis was six times more rapid in the presence of 3-mercaptopropionic acid than in its absence (0.6 and 0.1 percent, respectively, after 60 days). Similarly, the presence of another thiol, N-acetylcysteinate, increased the production of ala, as well as of lactate. The reaction pathway of thiol-catalyzed synthesis of ala, with the lactic acid formed in a bypath, is suggested. In this, dehydration of glyceraldehyde is followed by the formation of hemithioacetal. In the presence of ammonia, an imine is formed, which eventually yields ala. This pathway is consistent with the observation that the rate ratio of ala/lactate remains constant throughout the process. The fact that the reaction takes place under anaerobic conditions in the presence of H2O and with the low concentrations of simple substrates and catalysts makes it an attractive model prebiotic reaction in the process of molecular evolution. I.S.

A85-45815
RADIATION CHEMISTRY OF OVERIRRADIATED AQUEOUS SOLUTIONS OF HYDROGEN CYANIDE AND AMMONIUM CYANIDE
Z. D. DRAGANIC, I. G. DRAGANIC, J. A. AZAMAR, S. I. VUJOSEVIC, and M. D. BERBER (Universidad Nacional Autonoma de Mexico, Mexico City) Journal of Molecular Evolution (ISSN 0022-2844), vol. 21, no. 4, 1984-1985, p. 356-363. refs

Aqueous solutions (O2-free) of HCN and NH4CN were subjected to high doses (of up to 230 Mrad) of Co-60 gamma radiation, and the products were analyzed by chromatographic and chemical methods. The findings suggest the presence of two main stages of radiolysis. The first stage involves absorbed doses below 50 Mrad. At doses up to 20 Mrad, decomposition of cyanide is accompanied by formation of high-MWt products of 2000-20,000 daltons and of aminoacids (aa). The concentrations of these products decrease at doses of 20-50 Mrad, with increased accumulation of H2, NH3, CO2, CH4, CO, amides, and carboxylic acids. In the second stage, at doses of 50-230 Mrad, the concentrations of NH3, CO2, and amides remain stable, but the abundance of 6000-20,000 dalton polymers decreases, with the concomitant increase of 2000-6000 dalton oligomers. Carboxylic acids and aa are found at all doses of radiation. The relevance of these findings to phenomena on the primitive earth and within a cometary nucleus is discussed. I.S.

A85-45816
STEREOSELECTIVE DECARBOXYLATION OF AMINO ACIDS IN THE SOLID STATE, WITH SPECIAL REFERENCE TO CHIRAL DISCRIMINATION IN PREBIOTIC EVOLUTION
B. NORDEN, J.-O. LILJENZIN, and R. K. TOKAY (Chalmers Tekniska Hogskola, Goteborg, Sweden) Journal of Molecular Evolution (ISSN 0022-2844), vol. 21, no. 4, 1984-1985, p. 364-370. Research supported by Chalmers Tekniska Hogskola. refs

A85-46025
FORMATION OF OLIGONUCLEOTIDES ON A MINERAL SURFACE [OBRAZOVANIE OLIGONUKLEOTIDOV NA MINERAL'NOI POVERKHNOSTI]
V. A. OTROSHCHENKO, N. V. VASILEVA, and A. M. KOPYLOV (AN SSSR, Institut Biokhimii, Moscow, USSR) Akademiia Nauk SSSR, Izvestiia, Seriia Biologicheskaia (ISSN 0002-3329), July-Aug. 1985, p. 622-625. In Russian. refs

Effects of gamma-radiation (Co-60, 12 hr at 10 Mrad) on the reactivity of (C-14)AMP-molecules adsorbed on surfaces of volcanic slags and ashes was studied. Fractionation of the desorbed material revealed the presence of dinucleotides (0.3 percent of original adsorbed AMP) and traces of hepta- and octaoligonucleotides in the irradiated samples. The oligonucleotides were susceptible to hydrolysis by snake venom phosphodiesterase (specific for the 3'-5' nucleotide bonds) and could thus be identified with the naturally-occurring oligonucleotides. It is suggested that the abiogenic synthesis of the original biopolymers was facilitated by adsorption of the monomer molecules on the surface of volcanic rock, which stabilized the molecules in close proximity and in the correct orientations. The necessary energy could have been provided by the gamma-radiation of K-40, which is usually present in crustal rocks. I.S.

N85-32777*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SEARCH FOR THE UNIVERSAL ANCESTORS
H. HARTMAN, ed. (MIT), J. G. LAWLESS, ed., and P. MORRISON, ed. (MIT) Jul. 1985 145 p refs
(NASA-SP-477; A-8646; NAS 1.21:477) Avail: NTIS MF A01; SOD HC $3.75 as 033-000-009-3-4 CSCL 06C

By its nature, the study of the origins of life is multidisciplinary, requiring contributions from astronomers, biologists, chemists, geologists, physicists, and many others. Partial answers are provided to many questions about organic chemical evolution and the origin of life. It is observed that the gaps in our knowledge concerning the steps from the nonliving to the living are numerous. Among these gaps are: (1) a solar system formation with its accumulation of raw materials; (2) the synthesis of the life forming monomers, such as the amino acids, nucleotides, and lipids; (3) the condensation of these monomers into useful polymers, such as proteins and nucleic acids; (4) the sequestering of these materials into droplets of proteinoid or membrane-like structures; and (5) the development of a chemical memory (the genetic code) to pass on to the progeny the information acquired. Author

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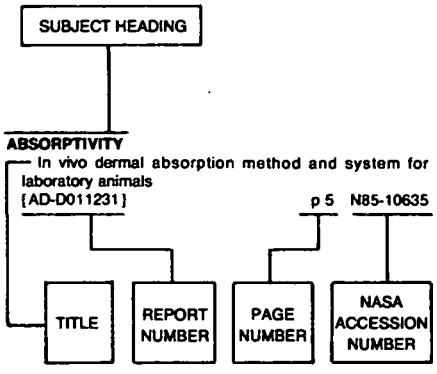

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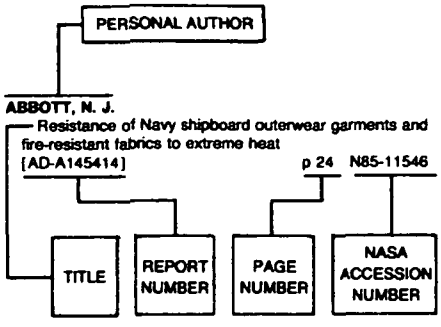

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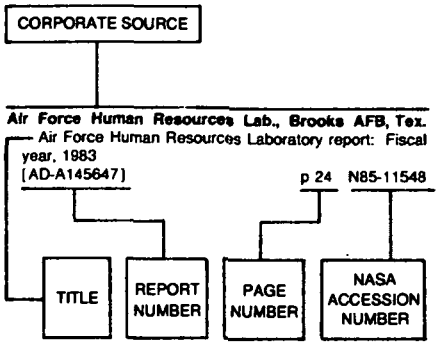

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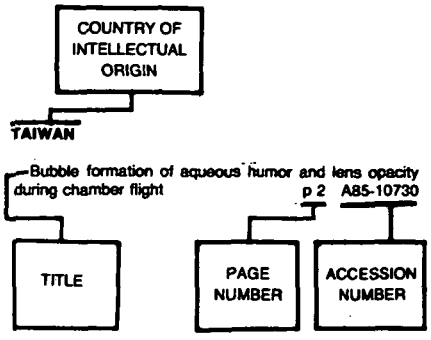

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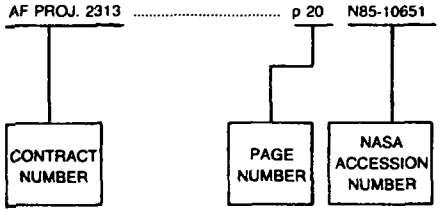

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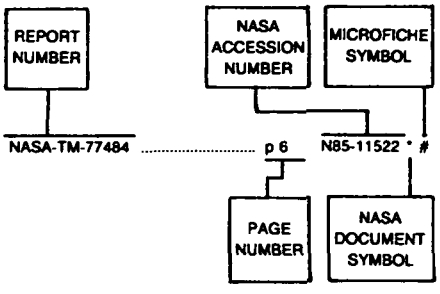

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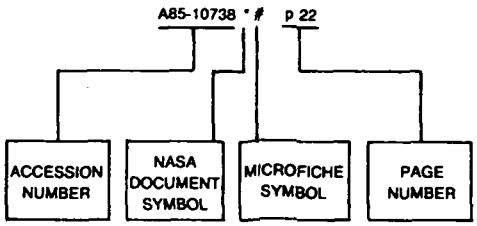

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15. Supplementary Notes

16. Abstract

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17. Key Words (Suggested by Author(s))	18. Distribution Statement
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