



Aerospace Medicine
and Biology
A Continuing
Bibliography
with Indexes

NASA SP-7011 (178)
March 1978

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ACCESSION NUMBER RANGES

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STAR (N-10000 Series) N78-12000—N78-13997

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AEROSPACE MEDICINE AND BIOLOGY

**A CONTINUING BIBLIOGRAPHY
WITH INDEXES**

(Supplement 178)

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 February 1978 in

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



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INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* (NASA SP-7011) lists 230 reports, articles and other documents announced during February 1978 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*. The first issue of the bibliography was published in July 1964; since that time, monthly supplements have been issued.

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 in two major sections: *IAA Entries* and *STAR Entries*, in that order. 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. This procedure, which saves time and money, accounts for the slight variation in citation appearances.

Two indexes -- subject and personal author -- are included.

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1978 Supplements.

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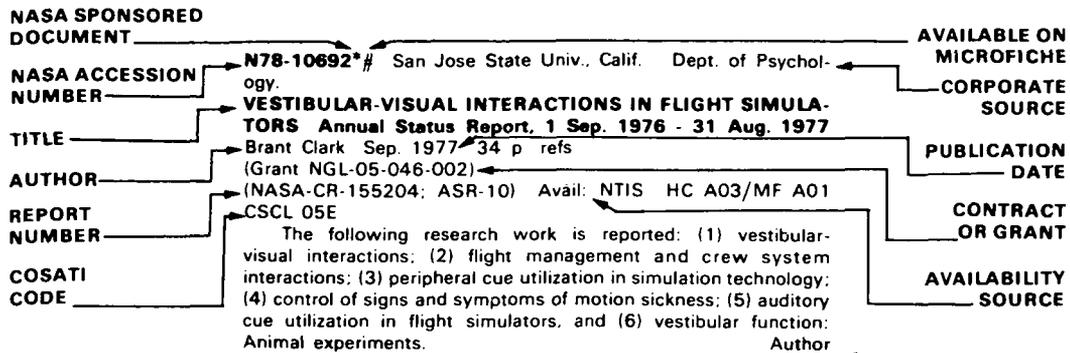
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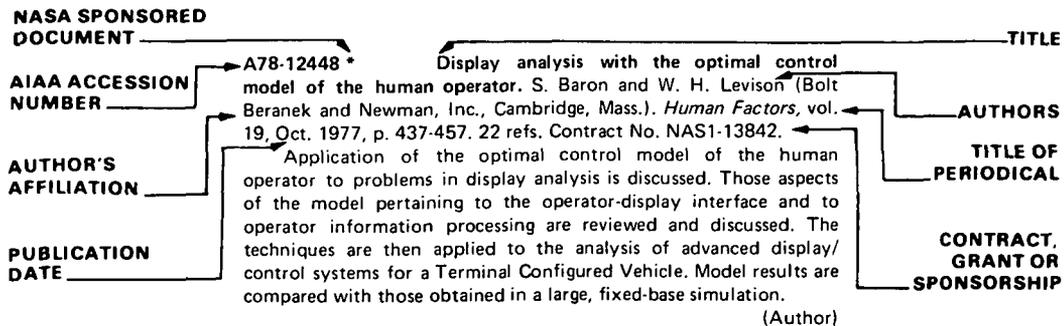
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TYPICAL CITATION AND ABSTRACT FROM IAA



AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 178)

MARCH 1978

IAA ENTRIES

A78-13117 Spatial frequency and the mediation of short-term visual storage. G. E. Meyer and W. M. Maguire (New York, State University, Buffalo, N.Y.). *Science*, vol. 198, Nov. 4, 1977, p. 524, 525. 27 refs. Grant No. NIH-5-T32-EY-07019-01-02.

In the analysis of information processing in terms of discrete stages, one of the stages considered involves short-term visual storage (STVS) whereby visual impression is preserved for several hundred milliseconds after removal of the stimulus and acts as an input to more central memory systems. An investigation was conducted regarding the duration of STVS produced by gratings of various spatial frequencies. It was found that the duration of STVS increased with spatial frequency in a manner consistent with increasing sustained channel mediation. The significance of the obtained results is discussed. G.R.

A78-13146 Correlations between electrocardiographic, vectorcardiographic, and echocardiographic findings in patients with left ventricular overload. H. Toshima, Y. Koga, and N. Kimura (Kurume University, Kurume, Japan). *American Heart Journal*, vol. 94, Nov. 1977, p. 547-556. 48 refs. Research supported by the Ministry of Education of Japan.

A78-13147 Precordial T wave vectors in the detection of coronary heart disease - The Framingham study. J. F. Schneider, H. E. Thomas, Jr., and W. B. Kannel (Boston University, Medical Center, Boston, Mass.). *American Heart Journal*, vol. 94, Nov. 1977, p. 568-572. 10 refs.

A case-control study based on the epidemiologic data of the Framingham heart study was designed to test the hypothesis that an anteriorly oriented T wave vector manifested by a T wave amplitude in V1 greater than that in V6 is a practical criterion for detection of coronary heart disease (CHD) in humans with otherwise normal EKG. The case population consisted of 518 subjects (323 M, 195 F) who had developed CHD between 1948 and 1968 while under observation by the Framingham heart study program, and the control population comprised 518 age- and sex-matched subjects free from CHD. The data obtained indicate that TV1 greater than TV6 in an otherwise normal EKG cannot be considered a reliable criterion for detection of CHD. S.D.

A78-13148 The effect of respiration on normal and abnormal Q waves - An electrocardiographic and vectorcardiographic analysis. J. W. Mimbs, V. deMello, and R. Roberts (Washington University, St. Louis, Mo.). *American Heart Journal*, vol. 94, Nov. 1977, p. 579-584. 16 refs. Grant No. NIH-1-P17-HL-17646.

Electrocardiographic and vectorcardiographic experiments were conducted before and after inspiration on 33 patients with acute myocardial infarction and on 22 normal volunteers in order to determine the effect of respiration on Q waves in Lead 3. The diagnosis of inferior myocardial infarction was based on serial EKG changes and serial enzyme elevations as well as elevated MB CPK. It

is found that the vectorcardiogram exhibits increased sensitivity over that of the electrocardiogram. However, inspiration is highly unreliable as a means of separating normal from abnormal Q waves that may be associated with inferior infarction. S.D.

A78-13264 Intracardial gas bubbles at altitude after negative pressure breathing. U. I. Balldin (Lunds Universitet, Lund, Sweden) and P. Borgstrom (National Defence Research Institute, Linköping, Sweden). *Aviation, Space, and Environmental Medicine*, vol. 48, Nov. 1977, p. 1007-1011. 17 refs.

The influence of negative pressure breathing on the appearance of intracardial gas bubbles at a subsequent decompression to altitude was investigated in five subjects using the precordial Doppler ultrasound technique. Every subject was tested for a suitable exposition that, after 30 min oxygen breathing at surface, caused both intracardial bubbles and decompression sickness. An identical exposition followed a week later, except that oxygen breathing at the surface now included negative pressure breathing. In all cases, negative pressure breathing caused a delay of the onset of both intracardial bubbles and bends and, in some cases, neither bubbles nor bends appeared at all. The total amount of bubbles was always less after negative pressure breathing. Thus, negative pressure breathing in connection with decompression may reduce the amount of intracardial bubbles and the risk of decompression sickness. (Author)

A78-13265 Prediction of airborne target detection. G. T. Chisum (U.S. Naval Material Command, Naval Air Development Center, Warminster, Pa.). *Aviation, Space, and Environmental Medicine*, vol. 48, Nov. 1977, p. 1018-1022. 5 refs.

Aircraft-simulating targets must be such that the simulated aircraft be detectable at the same distance that a real aircraft would be detected. The visibility of a uniformly luminous object is known to be dependent on the apparent contrast between the object and its background, the angular size of the object, the contrast threshold of the observer at the level of luminance to which the eyes are adapted, the conditions and technique of human observation, and the shape of the object. An analytical procedure is described in which techniques for combining the effect of the various factors are applied to solve the problem of predicting airborne target detectability under different illumination conditions. S.D.

A78-13266 Femur-bending properties as influenced by gravity. III - Sex-related weakness after 4-G mouse growth. C. C. Wunder (Iowa, University, Iowa City, Iowa). *Aviation, Space, and Environmental Medicine*, vol. 48, Nov. 1977, p. 1023-1025. 9 refs. Grant No. NIH-RG-5236.

Optimum gravitational intensity for growth stimulation depends upon the type of growth measurement. Although the 4-G field resulted in relatively weaker male bones, relative bone size increased. The more moderate 3-G field is known to stimulate relative bone-strength as well. Femurs from 36 male white mice demonstrated no growth of load-supporting ability after 1 to 8 weeks of chronic centrifugation at 4-G from the fifth week of age. Although measurable with 35 female mice, this growth tended to fall below the control rate. When compared to 82 younger control femurs of the

same cross-sectional geometry, experimental female femurs could sustain comparable breaking moments while experimental male femurs could not. (Author)

A78-13267 Transfer functions for eye-level blood pressure during +Gz stress. K. K. Gillingham, R. C. McNee (USAF, School of Aerospace Medicine, Brooks AFB, Tex.), and J. J. Freeman. *Aviation, Space, and Environmental Medicine*, vol. 48, Nov. 1977, p. 1026-1034. 16 refs.

A description of the eye-level blood-pressure response to +Gz stress in relaxed humans was obtained as an empirical, ensemble-average, G-to-blood-pressure transfer function based on three subjects' responses to a total of 23 simulated aerial combat maneuvering runs on a human centrifuge. Three different analytic transfer functions were fitted to the empirical function for frequencies from 5 to 200 mHz, and predictive performance of the empirical and three analytic functions was examined. The double-zero, double-pole mathematical model most closely fit the empirical transfer function and displayed reasonable predictive ability. (Author)

A78-13268 Effect of sojourn at 3200-m altitude on spinal reflexes in young adult males. W. T. Schmeling, H. V. Forster, and M. J. Hosko (Wisconsin, Medical College, Milwaukee, Wis.). *Aviation, Space, and Environmental Medicine*, vol. 48, Nov. 1977, p. 1039-1045. 66 refs. Grant No. NIH-15469.

Studies of the H reflex and the Achilles tendon reflex (ATR) were performed in 12 healthy males under six conditions: 1) sea level control, 2) during the first 1-3 hr at altitude while normoxic conditions were maintained, 3-5) at 6, 24 and 72 hr of hypoxia, and 6) after acclimatization at altitude in 5-14 days. After altitude acclimatization, the peak-to-peak amplitude of the H reflex and the ATR response was significantly elevated over control. A trend toward decreased amplitudes of both the ATR and the H reflex was observed at 6 hr after the onset of hypoxia. There was no significant alteration in latency of the H reflex under any test condition. These findings suggest that sojourn at altitude by sea level residents induces changes in spinal motor reflexes. These changes are most probably mediated by altered high central modulation of the cord. (Author)

A78-13269 Influence of systemic factors on hyperbaric oxygen toxicity in the rat visual system. D. E. Ray and B. J. Hawgood (Queen Elizabeth College, London, England). *Aviation, Space, and Environmental Medicine*, vol. 48, Nov. 1977, p. 1046-1050. 14 refs. Research supported by the Ministry of Defence.

A78-13270 * Effect of space flight on cell-mediated immunity. A. D. Mandel (NASA, Ames Research Center Moffett Field, Calif.) and E. Balish (Wisconsin, University, Madison, Wis.). *Aviation, Space, and Environmental Medicine*, vol. 48, Nov. 1977, p. 1051-1057. 17 refs.

The cell-mediated immune response to *Listeria monocytogenes* was studied in rats subjected to 20 days of flight aboard the Soviet biosatellite Kosmos 7820. Groups of rats were immunized with 1,000,000 formalin-killed *Listeria* suspended in Freund's Complete Adjuvant, 5 days prior to flight. Immunized rats subjected to the same environmental factors as the flight rats, except flight itself, and immunized and nonimmunized rats held in a normal animal colony served as controls. Following recovery, lymphocyte cultures were harvested from spleens of all rats, cultured *in vitro* in the presence of *L. monocytogenes* antigens, Phytohemagglutinin, Concanavalin A, or purified protein derivative (PPD), and measured for their uptake of H-3-thymidine. Although individual rats varied considerably, all flight and immunized control rats gave a blastogenic response to the *Listeria* antigens and PPD. With several mitogens, the lymphocytes of flight rats showed a significantly increased blastogenic response over the controls. The results of this study do not support a hypothesis of a detrimental effect of space flight on cell-mediated immunity. The data suggest a possible suppressive effect of stress and gravity on an *in vitro* correlate of cell-mediated immunity. (Author)

A78-13271 Service life analysis of the SPH-4 aviator helmet. B. A. Slobodnik and W. R. Nelson (U.S. Army, Aeromedical

Research Laboratory, Fort Rucker, Ala.). *Aviation, Space, and Environmental Medicine*, vol. 48, Nov. 1977, p. 1058-1067. 9 refs.

The sound protective helmet SPH-4 was introduced in 1969 to provide Army aviators with the best combination of protection and comfort. Tests were conducted to evaluate the extent to which the protective performance of the SPH-4 aviator helmet has decreased after extensive field use. Results are discussed in terms of impact attenuation, helmet retention, and sound attenuation. It is shown that the shell thickness of the present SPH-4 helmet can be reduced without significantly reducing its impact protection and that there is a pronounced difference in the failure mode for chin strap systems of old and new helmets. Current standards for impact attenuation performance should be modified to more closely reflect human tolerance limits to head impact. S.D.

A78-13272 * Motion sickness and otolith sensitivity - A pilot study of habituation to linear acceleration. A. R. Potvin (NASA, Ames Research Center, Moffett Field, Calif.; Texas, University, Arlington, Tex.), M. Sadoff (NASA, Ames Research Center, Biomedical Research Div., Moffett Field, Calif.), and J. Billingham (NASA, Ames Research Center, Extraterrestrial Biology Div., Moffett Field, Calif.). *Aviation, Space, and Environmental Medicine*, vol. 48, Nov. 1977, p. 1068-1075. 30 refs.

Astronauts, particularly in Skylab flights, experienced varying degrees of motion sickness lasting 3-5 days. One possible mechanism for this motion sickness adaptation is believed to be a reduction in otolith sensitivity with an attendant reduction in sensory conflict. In an attempt to determine if this hypothesis is valid, a ground-based pilot study was conducted on a vertical linear accelerator. The extent of habituation to accelerations which initially produced motion sickness was evaluated, along with the possible value of habituation training to minimize the space motion sickness problem. Results showed that habituation occurred for 6 of the 8 subjects tested. However, in tests designed to measure dynamic and static otolith function, no significant differences between pre- and post-habituation tests were observed. Cross habituation effects to a standard Coriolis acceleration test were not significant. It is unlikely that ground-based pre-habituation to linear accelerations of the type examined would alter susceptibility to space motion sickness. (Author)

A78-13273 Prediction of carboxyhemoglobin concentration from transient carbon monoxide exposure. F. W. Weir (Texas, University, Houston, Tex.) and D. C. Viano (GM Research Laboratories, Warren, Mich.). *Aviation, Space, and Environmental Medicine*, vol. 48, Nov. 1977, p. 1076-1080.

The mathematical model of Coburn, Forster, and Kane (1965) was investigated for use in estimating carboxyhemoglobin concentrations resulting from transient carbon monoxide exposures. The model proved useful in estimating the probable pattern of carbon monoxide exposures in two fatal cases. In each circumstance, using the predictive capabilities of the model in the reconstruction of events, the obvious source of exposure (automobile) could be absolved. (Author)

A78-13274 Epidemiologic investigation of occupation, age, and exposure in general aviation accidents. C. F. Booze, Jr. (FAA, Civil Aeromedical Institute, Oklahoma City, Okla.). *Aviation, Space, and Environmental Medicine*, vol. 48, Nov. 1977, p. 1081-1091. 32 refs.

Results are presented for an analytic, epidemiologic study involving a census of general aviation accidents for 1974 in order to obtain relevant occupation, exposure, and other descriptive epidemiologic profile information. The study of occupation, age, exposure, and their interrelationships is conducted in a search for a factor, or factors, with respect to the aircraft, the pilot, or the environment, which can be used to reduce accident incidence or influence outcome. Major findings are that (1) physicians, lawyers, sales representatives, farmers, and housewives experience the highest accident rates; (2) recent exposure appears to be the best discriminator of accident risk; (3) younger ages are at greater risk when

exposure is considered; and (4) fatigue resulting from long-duration flights is a negligible factor in the etiology of general aviation accidents. S.D.

A78-13446 * **Some new control theoretic models for human operator display monitoring.** D. L. Kleinman (Connecticut, University, Storrs, Conn.) and R. E. Curry (NASA, Ames Research Center, Aviation Safety Research Office, Moffett Field, Calif.). *IEEE Transactions on Systems, Man, and Cybernetics*, vol. SMC-7, Nov. 1977, p. 778-784. 15 refs. Contract No. NAS1-13653.

Control theoretic techniques are applied to develop two new models for predicting human operator performance when monitoring an automatically controlled system. In one case it is assumed that the human monitors the instruments in order to rapidly detect failures. A second approach assumes that the instruments are sampled to best reconstruct the system status information. The relation of these models to existing prediction schemes, e.g., equal attention and the Senders model is explored. It is concluded that a combination of failure detection and status estimation models offers the best potential for human operator application. (Author)

A78-13476 **Inversion of the sleep wakefulness pattern - Effects on circadian variations in psychophysiological activation.** T. Akerstedt (Karolinska Institutet, Stockholm, Sweden). *Ergonomics*, vol. 20, Sept. 1977, p. 459-474. 52 refs. Research supported by the Swedish Work Environment Fund; Swedish Medical Research Council Grant No. 4316.

Experiments were conducted on a group of day-shift railway repairmen aged 18-60 yr engaged in rather strenuous physical activity on the night shift for three weeks. The objective was to study the circadian rhythm of the subjects in terms of catecholamine excretion, body temperature, self-rated alertness and mood. The control group worked on the day shift for comparison purposes. The results from the day-shift weeks indicate pronounced circadian variations of approximately sinusoidal shape for all the parameters studied. However, night-shift work has a strong effect on all parameters and epinephrine excretion is indicative of stress response. It appears that norepinephrine adjusts much faster than epinephrine to an inversion of the sleep/activity pattern. S.D.

A78-13477 **Human circadian rhythms in resting and exercise pulse rates.** C. J. Cohen and G. E. Muehl (Purdue University, West Lafayette, Ind.). *Ergonomics*, vol. 20, Sept. 1977, p. 475-479. 11 refs.

Circadian rhythmicity in resting, exercise and recovery pulse rates was studied on five male subjects. Resting pulse rate data were collected at seven separate times during a 24-hr period. Exercise and recovery pulse rate data were collected at the exact same times, as follows: 0400, 0800, 1200, 1500, 1800, 2100 and 2400 hr. The lowest resting pulse rates for all subjects occurred between 0400 and 0800 hr; highest resting pulse rates occurred between 1800 and 2400 hr. Exercise pulse rates followed this same general pattern and tended to amplify the circadian rhythmicity. (Author)

A78-13479 **The subjective magnitude of whole-body vibration.** L. C. Fothergill and M. J. Griffin (Southampton, University, Southampton, England). *Ergonomics*, vol. 20, Sept. 1977, p. 521-533. 16 refs.

Two experiments have been performed to investigate the relation between the level of whole-body vertical vibration and the degree of discomfort it produces. The first experiment, which employed both magnitude estimation and magnitude production methods, suggested that the relation between discomfort and vibration level could be adequately expressed in a power law. However, the value of exponent differed greatly between subjects and had a mean value of 1.13 when determined by the method of magnitude estimation and 1.75 when determined by magnitude production. It is suggested that while the convenient value of unity will sometimes be a sufficient approximation to the value of the exponent, the response of all individuals cannot be well approxi-

mated by a single value. The second experiment required subjects to adjust the level of a whole-body vibration to correspond to phrases on a four point semantic scale of discomfort. It is shown that the variability in the data obtained by this semantic method is greater than that obtained by comparable numerical scaling methods such as magnitude production and intensity matching. (Author)

A78-13483 **Myocardial oxygen consumption - The role of wall force and shortening.** K. T. Weber and J. S. Janicki (Pennsylvania, University, Philadelphia, Pa.). *American Journal of Physiology*, vol. 233, Oct. 1977, p. H421-H430. 31 refs. Grants No. NIH-HL-17441; No. NIH-HL-18740; No. NIH-HL-08805.

Experiments were conducted on the servoregulated isolated canine heart during the steady-state response in both coronary flow and arteriovenous oxygen difference with a view toward determining the relationship between the force in the left ventricular wall during systole and myocardial oxygen consumption. The relative effect of the load during contraction and fiber shortening on myocardial oxygen consumption is evaluated. It is shown that the influence of fiber shortening on energy expenditure is negligible and that the conditions of force generation and maintenance reflecting the initial and subsequent conditions of loading encountered at the onset and throughout any given ventricular contraction are the major factors regulating myocardial oxygen consumption for any given contractile state. S.D.

A78-13505 # **High-altitude pulmonary edema (L'edema polmonare da alta quota).** G. Rotondo (Aeronautica Militare, Servizio di Sanità, Rome, Italy). *Rivista di Medicina Aeronautica e Spaziale*, vol. 40, Jan.-June 1977, p. 5-31. 39 refs. In Italian:

The pathology and therapeutic treatment of high-altitude pulmonary edema are discussed. Electrocardiograms, X-ray evidence and histological studies are cited in analyzing the nonuniform arterial vasoconstriction, the arterial deoxygenation and the normal pulmonary capillary diffusion pressure and left-atrium pressure characteristic of the phenomenon. In particular, the role of preterminal arterioles in the pathology is mentioned. The benefits of antibiotics, morphine, atropine, acetazolamide and diuretics in treating the symptoms of high-altitude pulmonary edema are considered. J.M.B.

A78-13506 # **On the toxicity of fire-resistant materials - Methods of study (Sulla tossicità di sostanze antincendio - Metodica di studio).** G. Paolucci (Aeronautica Militare, Centro di Studi e Ricerche di Medicina Aeronautica e Spaziale, Rome, Italy). *Rivista di Medicina Aeronautica e Spaziale*, vol. 40, Jan.-June 1977, p. 32-39. In Italian.

Standardized tests involving laboratory mice to determine the minimum lethal concentrations of fire-resistant materials and of the combustion products of the materials are described. Metabolic criteria applied to the selection of the mice, as well as the aerosol dispersion apparatus, the pyrolysis process, and the combustion-product diffusion mechanism used in the standardized testing are discussed. The schedule of exposures to the toxic substances, and the subsequent histological and hematological examinations of the mice are also considered. J.M.B.

A78-13507 # **Catecholamine excretion in helicopter pilots (Escrezione catecolaminica in piloti di elicottero).** G. Paolucci and G. Blundo (Aeronautica Militare, Centro di Studi e Ricerche di Medicina Aeronautica e Spaziale, Rome, Italy). *Rivista di Medicina Aeronautica e Spaziale*, vol. 40, Jan.-June 1977, p. 40-45. In Italian.

The urinary catecholamine, epinephrine and norepinephrine levels of experienced helicopter pilots, advanced trainees and novice trainees were monitored before and after flights. A significant correlation between flight experience and catecholamine excretion was found. It is suggested that monitoring catecholamine excretion may provide a means of studying emotional stress and fitness in pilot trainees. J.M.B.

A78-13508 # **A contribution to the study of mental confabulation and a general hypothesis on the functioning of logical and**

critical processes (Contributo allo studio della confabulazione mentale e ipotesi generale sulle modalità dei processi logici e critici). F. Sparvieri (Aeronautica Militare, Istituto Medico-Legale, Rome, Italy). *Rivista di Medicina Aeronautica e Spaziale*, vol. 40, Jan.-June 1977, p. 46-58. 19 refs. In Italian.

Individual Zulliger tests were administered to 30 normal children and 20 children who showed a disposition to confabulation. The tests, similar in scope to Rorschach tests, were used to study the tendency to acritical or allogical thinking processes. The relevance of the study for understanding errors in perception to which pilots may be subject is also mentioned. J.M.B.

A78-13509 # Perceptual and intellectual activities in tachistoscopic vision - Comparisons with the same activities during normal conditions, and theoretical considerations (Attività intellettivo-percettive in condizioni di visione tachistoscopica - Raffronti con le stesse attività in condizioni normali e considerazioni dottrinarie). F. Sparvieri (Aeronautica Militare, Istituto Medico-Legale, Rome, Italy). *Rivista di Medicina Aeronautica e Spaziale*, vol. 40, Jan.-June 1977, p. 59-70. 6 refs. In Italian.

Tachistoscopic and standard versions of the Zulliger test were administered to 50 pilot trainees in a study of the human perception of rapidly observed objects. It was concluded that interpretations of extended shapes and fine detail were strongly affected by tachistoscopic conditions. However, thirteen of the subjects studied did not suffer losses in the scope and integrity of their fields of vision under tachistoscopic conditions, apparently indicating a capacity similar to that termed 'photographic memory'. J.M.B.

A78-13510 # Phobic syndromes and in-flight errors: Their relation to predisposing or determining psychological factors - Clinical studies (Sindromi fobiche ed errori in rapporto al volo: Loro relazione con fattori umani predisponenti o determinanti in ambito psicologico - Casistica clinica). E. D'Antino (Aeronautica Militare, Commissione Sanitaria di Appello, Rome, Italy). *Rivista di Medicina Aeronautica e Spaziale*, vol. 40, Jan.-June 1977, p. 71-106. 65 refs. In Italian.

Twelve case studies involving pilots or copilots who were temporarily or permanently suspended from flight duty due to the onset of phobic syndromes are reported. Two types of phobic syndrome, one related principally to traumatic in-flight experiences, the other connected principally with pre-existing neurotic tendencies, are identified; it is found that subjects in the first category showed a better rate of return to service than the second group. Cognitive processes in individuals suffering from phobic syndromes are also discussed. J.M.B.

A78-13511 # Recruitment in chronic acoustic trauma (Il reclutamento nel trauma acustico cronico). R. Caporale and M. Patrizi (Roma, Università, Rome, Italy). *Rivista di Medicina Aeronautica e Spaziale*, vol. 40, Jan.-June 1977, p. 107-115. 10 refs. In Italian.

Diagnostic tests used to distinguish hearing damage due to chronic acoustic trauma from hearing damage due to other sources are discussed. In particular, the presence of recruitment in the auditory systems of pilots who suffered hearing losses due to in-service trauma is investigated through automatic audiometry, the Lüscher technique, and the Short Increment Sensitivity Index. It is found that the presence of recruitment is not an adequate criterion for determining whether hearing losses are derived from chronic acoustic trauma or are of a different etiology. J.M.B.

A78-13512 # Remarks on tonal threshold and voice discrimination during negative acceleration in normal subjects and in subjects who have undergone endolymphatic-cerebrospinal fluid shunt operations (Rilievi sulla soglia tonale e sulla discriminazione vocale durante accelerazione negativa in soggetti normali ed in soggetti operati di shunt endolinfatico-liquorale). R. Caporale, M. Patrizi, and M. Sagnelli (Roma, Università, Rome, Italy). *Rivista di Medicina Aeronautica e Spaziale*, vol. 40, Jan.-June 1977, p. 116-122. 6 refs. In Italian.

A78-13513 # Current status of immunotherapy. I - Immunosuppressive therapy (L'immunoterapia oggi. I - Terapia immunodepressiva). R. D'Amelio (Aeronautica Militare, Servizio Sanitario, Rome, Italy). *Rivista di Medicina Aeronautica e Spaziale*, vol. 40, Jan.-June 1977, p. 123-152. 110 refs. In Italian.

The immunosuppressive function of cytostatic drugs, corticosteroids, antilymphocytic and gamma globulin antilymphocytic serums, radiation treatment, and mechanical immunosuppressive techniques is discussed. Immunosuppressive therapy based on studies of the T and B lymphocytic populations is considered. Therapy involving cyclophosphamides, methotrexate or aziathioprine is mentioned; the suppression of T or B lymphocytic populations through the use of corticosteroids or radiation therapy is also mentioned. J.M.B.

A78-13514 # Problems in maintaining the alertness of air force personnel - The organization of work schedules during long-distance flights (Problèmes du maintien de la vigilance chez les personnels de l'aéronautique militaire - Organisation temporelle du travail pour les vols à longue distance). J. P. Papin (Centre d'Expertise et Recherche de Médecine Aéronautique, Paris, France). (NATO, AGARD, Meeting, Scuola Militare di Sanità Aeronautica, Rome, Italy, Feb. 24, 1976.) *Rivista di Medicina Aeronautica e Spaziale*, vol. 40, Jan.-June 1977, p. 153-164. In French.

A78-13515 # The organization of work schedules for air traffic controllers (Organisation temporelle du travail des contrôleurs de la navigation aérienne). J. P. Papin (Centre d'Expertise et Recherche de Médecine Aéronautique, Paris, France). (NATO, AGARD, Meeting, Scuola Militare di Sanità Aeronautica, Rome, Italy, Feb. 25, 1976.) *Rivista di Medicina Aeronautica e Spaziale*, vol. 40, Jan.-June 1977, p. 165-180. In French.

A study of the alertness of 66 French air traffic controllers, based on a test of saccadic eye movements, is reported. The alertness levels determined by the experiment were found to show no significant correlation with the various work schedules of the air traffic personnel; however, the performance level did vary from day to night. Work schedules of air traffic controllers in other Western European nations are also discussed. J.M.B.

A78-13516 # Techniques for monitoring on-ground and in-flight alertness levels (Techniques permettant de contrôler le niveau d'éveil en vol et au sol). J. P. Papin (Centre d'Expertise et Recherche de Médecine Aéronautique, Paris, France). (NATO, AGARD, Meeting, Scuola Militare di Sanità Aeronautica, Rome, Italy, Feb. 25, 1976.) *Rivista di Medicina Aeronautica e Spaziale*, vol. 40, Jan.-June 1977, p. 181-193. In French.

Voice recordings, filmed studies of crew behavior, measurements of heart rate and eyelid movements, as well as a recording of the direction of gaze, are proposed as a means to monitor the alertness of flight crews. The apparatus used to record the direction of gaze is described; data on the typical motor activity of flight-crew members during the performance of in-flight tasks are presented. Characteristics of the muscular activity, the eyelid movements, heart rate and speech of crew members concentrating on various tasks are reviewed. J.M.B.

A78-13517 # Smoking (Il fumo). L. Buratti (Aeronautica Militare, Istituto Medico-Legale, Rome, Italy). *Rivista di Medicina Aeronautica e Spaziale*, vol. 40, Jan.-June 1977, p. 194-209. 10 refs. In Italian.

Programs intended to reduce the prevalence of tobacco smoking are discussed. Attention is given to cardiac and arterial disease, chronic bronchitis, lung cancer, and other pathologies that have been associated with smoking. The effects of nicotine, carbon monoxide, tar and other byproducts of smoking on human physiology and behavior are also mentioned. J.M.B.

A78-13518 # Behavior and the mind (Le psiche comportamentistiche). P. Ceccarelli. (*Rivista Aeronautica*, no. 1, 1977.)

Rivista di Medicina Aeronautica e Spaziale, vol. 40, Jan.-June 1977, p. 210-225; Discussion, p. 225-228. In Italian.

Psychological factors influencing the behavior of training pilots are discussed. Behavioral insufficiencies which may lead to accidents, such as lack of alertness, forgetfulness, confusion and panic are mentioned; the significance of the term 'mental fatigue' is considered. Psychological testing as a means to select flight crews is also described, with attention given to testing programs instituted or contemplated by the British and Italian Air Forces. J.M.B.

A78-13576 Optimization of the professional activity of a cosmonaut (Optimizatsiia professional'noi deiatel'nosti kosmonavta). Edited by O. G. Gazonko and V. I. Miasnikov. Moscow, Izdatel'stvo Nauka (Problemy Kosmicheskoi Biologii. Volume 34), 1977. 308 p. In Russian.

USSR research on developing methods to optimize the performance of cosmonauts is reported. Topics considered include the rational organization of work and relaxation, the spacecraft environment, man-in-the-loop guidance processes, the physical and mental performance of cosmonauts under a variety of conditions, the use of models to study performance, procedures for analyzing space operations, the effects of fatigue, and the effects of weightlessness. Electrophysiological criteria for evaluating the functional state of operators and methods for predicting the reliability of work performed by cosmonauts are analyzed. M.L.

A78-13577 # Optimization of the habitation environment (Nekotorye voprosy optimizatsii sredy obitaniia). O. G. Gazonko, V. I. Miasnikov, and G. A. Berezina. In: Optimization of the professional activity of a cosmonaut. Moscow, Izdatel'stvo Nauka, 1977, p. 9-38. 106 refs. In Russian.

An overview of theoretical and experimental work bearing on the optimization of the artificial environment in spacecraft designated for long missions is presented. A series of factors are considered, including the total system criteria for optimizing the human-machine system, the organization of information and energy interaction in the human-technical-environmental systems, activity algorithms, human factors, safety procedures, and training. Significant ergonomic indices relating to hygiene, biomechanical relationships, and other pertinent fields are indicated. M.L.

A78-13578 # The task of a cosmonaut in operating spacecraft (Rabota kosmonavta po upravleniiu kosmicheskim korabl'em). A. S. Eliseev and B. V. Raushenbakh. In: Optimization of the professional activity of a cosmonaut. Moscow, Izdatel'stvo Nauka, 1977, p. 39-49. In Russian.

The role of cosmonauts in operating spacecraft and on-board equipment is discussed. Cosmonauts function as a link in a multiloop system - that is, they evaluate the quality and reliability of work in light of the specific operant circumstances. Their work involves the management of equipment more than piloting; as even automated equipment requires uninterrupted monitoring. M.L.

A78-13579 # The optimization of cosmonaut activity in processes involving the operation of complex systems (Nekotorye problemy optimizatsii deiatel'nosti kosmonavta v protsesse upravleniia slozhnymi sistemami). L. I. Komarova. In: Optimization of the professional activity of a cosmonaut. Moscow, Izdatel'stvo Nauka, 1977, p. 50-57. In Russian.

An analytic procedure is presented and applied to the study of the interaction of the cosmonaut with the guidance system of spacecraft. The nature and difficulties of the guidance system are characterized, and the optimization of cosmonaut interaction with this system involves improvement in the nature of the participation of the cosmonaut in the process of guiding the spacecraft. Criteria for evaluating the guidance and the human-equipment functioning are considered. M.L.

A78-13580 # Analysis of manual control of spacecraft movement by means of a mathematical model of a human operator

(Analiz ruchnogo upravleniia dvizheniem kosmicheskogo apparata pri ispol'zovanii matematicheskoi modeli cheloveka-operatora). Iu. P. Iablon'ko. In: Optimization of the professional activity of a cosmonaut. Moscow, Izdatel'stvo Nauka, 1977, p. 58-72. 7 refs. In Russian.

A78-13581 # Evaluation of the quality of man-in-the-loop guidance processes (K voprosu otsenki kachestva ergaticheskikh protsessov upravleniia). R. V. Komotskii and V. P. Sal'nitskii. In: Optimization of the professional activity of a cosmonaut. Moscow, Izdatel'stvo Nauka, 1977, p. 72-82. 6 refs. In Russian.

A probability-iterative method is formulated for the purpose of evaluating human performance in the manual operation of spacecraft mooring and docking. Human performance is considered as a component of a man-in-the-loop system which involves the interaction of human input at different stages in the semi-automated functioning of spacecraft equipment. The dynamics of changes in the task execution quality index during training with a simulator are indicated. M.L.

A78-13582 # Use of half-scale modeling for optimizing systems of manual control (Primenenie metodov polunaturnogo modelirovaniia dlia optimizatsii sistem ruchnogo upravleniia). R. V. Komotskii, S. A. Minaev, A. P. Nechaev, E. V. Riabov, and V. P. Sal'nitskii. In: Optimization of the professional activity of a cosmonaut. Moscow, Izdatel'stvo Nauka, 1977, p. 82-96. 9 refs. In Russian.

A half-scale modeling system used to optimize spacecraft manual control systems is described. Human-operator activities studied with this system are enumerated, and problems in the selection of element characteristics of the control system are considered. Results of investigations of spacecraft control at various flight stages are presented. M.L.

A78-13583 # Development of means for optimizing operator activities by analyzing activity content, structure, and function (Vyiavlenie putei optimizatsii operatorskoi deiatel'nosti na osnove issledovaniia ee soderzhaniia, struktury i funktsii). A. K. Popov. In: Optimization of the professional activity of a cosmonaut. Moscow, Izdatel'stvo Nauka, 1977, p. 97-109. 7 refs. In Russian.

Experimental and theoretical studies of the content, structure, and function of sensory-motor and mental activities of spacecraft human operators are described. From a study of the content of spacecraft activities criteria for the evaluation of the degree of operator training can be developed, and consideration of structure activity permits evaluation of the degree of difficulty involved in performing the activity. Structures were studied in relation to the technical characteristics of loop controls, which permits the working out of principles for optimizing operator activities. The results from these studies can be used to modify control systems. M.L.

A78-13584 # Dynamics of the human mental work capacity during some activity regimes (Dinamika psikhicheskoi rabotosposobnosti cheloveka pri nekotorykh rezhimakh deiatel'nosti). A. L. Narinskaia. In: Optimization of the professional activity of a cosmonaut. Moscow, Izdatel'stvo Nauka, 1977, p. 109-120. 9 refs. In Russian.

Experimental studies of the dynamics and characteristics of human mental work capacity during some activity regimes are described. The regimes were: 72 hours awake; 45 days with the daily sleep-wakefulness rhythm reversed (that is, shifted by 12 hours); 25 days with 72 hour periods of wakefulness as well as reversal of the daily sleep-wakefulness rhythm; and 16 hour diurnal periods. The possibility of restructuring the diurnal dynamics of some mental functions was demonstrated, and indices of mental work capacity were used to determine the adaptation period to new diurnal regimes. M.L.

A78-13585 # Time base for the performance of functions by cosmonauts (Vremennaia razvertka rabochikh operatsii kosmonavta). B. S. Aliakrinskii. In: Optimization of the professional activity of a cosmonaut. Moscow, Izdatel'stvo Nauka, 1977, p. 120-130. 30 refs. In Russian.

The organization of cosmonaut work activities over time is examined with attention to the effect of the change of conditions at different stages of the flight. Adaptation to the novelty of the external braking effect, weightlessness, and the change in the usual means of sensing the passage of time are considered. Experimental results are reviewed, and procedures that take adaptation into account are suggested. M.L.

A78-13586 # Effect of the physical load on human biorhythms (Vliianie fizicheskoi nagruzki na bioritmy cheloveka). V. I. Makarov. In: Optimization of the professional activity of a cosmonaut. Moscow, Izdatel'stvo Nauka, 1977, p. 130-135. 7 refs. In Russian.

The effects of increased physical load on the biorhythms of healthy untrained humans were studied for the purpose of determining the upper limit of physical loading to which people can adapt without disruption of the inherent rhythms of their physiological functions. The stress caused by physical loading is considered with attention to the desynchronization it causes and the lowering of the general adaptative capability of the organism. Physical load is a negative effect of prolonged weightlessness, as would be caused by a voyage in space. M.L.

A78-13587 # The forming of sensory motor habits of control and the verification of their stability as a factor in the increased reliability of an operator in a technical system complex (Formirovanie sensomotornykh navykov upravleniia i proverka ikh prochnosti kak faktor povysheniia nadezhnosti operatora v sistemotekhnicheskome komplekse). V. I. Miasnikov and L. G. Mordovskaia. In: Optimization of the professional activity of a cosmonaut. Moscow, Izdatel'stvo Nauka, 1977, p. 136-150. 9 refs. In Russian.

A78-13588 # A psychological factor in the optimization of operator function during monotonous tracking (Psikhologicheskii faktor v optimizatsii operatorskoi deiatel'nosti v usloviakh monotonogo slezheniia). B. P. Shestkov. In: Optimization of the professional activity of a cosmonaut. Moscow, Izdatel'stvo Nauka, 1977, p. 150-160. 16 refs. In Russian.

It was found that fostering an increased emotional attachment to the job led to improved operator performance of monotonous tracking work. This method was more effective than the use of light or sound stimuli to combat fatigue. In fact, homogeneous stimuli worsened the performance of exhausted operators. EEG rhythms of workers at different stages of fatigue are described. A state of tension, presumed to result from a struggle with sleepiness, was found to be concomitant with fatigue. M.L.

A78-13589 # A psychophysiological study of pilot behavior in conditions of combined activity (Psikhofiziologicheskoe issledovanie povedeniia letchika v usloviakh sovmeshchennoi deiatel'nosti). R. M. Bloszczyński and O. P. Kozerenko. In: Optimization of the professional activity of a cosmonaut. Moscow, Izdatel'stvo Nauka, 1977, p. 160-169. 34 refs. In Russian. (Translation).

The behavior of pilots performing two different kinds of tasks simultaneously is described. One task involved reception, working, and transmission of oral information, and the other involved visual tracking and psychomotor compensation during control maneuvers using a simulator. Continuous monitoring of psychomotor compensation indices (control hand movements) and of physiological functions (pulse, arterial pressure, oral temperature) is described. It was found that the quality of compensatory tracking during conditions of semantic loading depends on the initial level of performance. M.L.

A78-13590 # Investigation of the bioelectrical activity of the brain under conditions of varied 24 hour lifecycle (Issledovanie bioelektricheskoi aktivnosti mozga v usloviakh izmenennogo sutochnogo rezhima). A. A. Koreschkov. In: Optimization of the professional activity of a cosmonaut. Moscow, Izdatel'stvo Nauka, 1977, p. 169-172. 10 refs. In Russian.

Experiments were conducted to evaluate the functional state of the human organism in an inverted sleep/wakefulness regime under conditions of total isolation from external illumination and noise. The evaluation concerned the circadian dynamics of heart rate, arterial blood pressure, respiration rate, body temperature, and EEG indicators. It is shown that inversion of the circadian rhythm is accompanied by characteristic changes in the parameters examined. During the first three after rhythm inversion, it is observed that the alpha-wave frequency is reduced and that the slow wave activity during wakefulness is enhanced. It is concluded that the study of the bioelectrical activity of the human brain is suitable for estimating the speed of human adaptation to the inversion of the work/rest order. S.D.

A78-13591 # Effectiveness of the work of an operator with a command signal field as a function of the means of presentation of command information (Effektivnost' raboty operatora s komandno-signal'nym polem v zavisimosti ot sposoba pred'iavleniia komandnoi informatsii). L. A. Sivokon'. In: Optimization of the professional activity of a cosmonaut. Moscow, Izdatel'stvo Nauka, 1977, p. 172-186. In Russian.

A78-13593 # Active rest in prolonged spaceflights as a psychological problem (Aktivnyi otdykh v dlitel'nykh kosmicheskikh poletakh kak psikhologicheskaiia problema). G. M. Zarakovskii and S. L. Rysakova. In: Optimization of the professional activity of a cosmonaut. Moscow, Izdatel'stvo Nauka, 1977, p. 191-200. 21 refs. In Russian.

Concepts about the mechanisms underlying various types of active rest for space crew members are formulated within the framework of the Soviet theory of activity in psychology. Attention is directed to active rest through switching of the operational dominant of the crew members - including games and athletic activities - and to active rest through stimulation of meditative activity - including music and esthetic subjects. Experimental results suggest the application of music, literature and art in prolonged space flights. S.D.

A78-13594 # Means for optimization of group interaction under conditions of prolonged isolation (Sredstva optimizatsii gruppovogo vzaimodeistviia v usloviakh dlitel'noi izolatsii). M. A. Novikov, G. V. Izosimov, and A. A. Gerasimovich. In: Optimization of the professional activity of a cosmonaut. Moscow, Izdatel'stvo Nauka, 1977, p. 200-216. 33 refs. In Russian.

The psychological selection and training of groups as well as the principles of intragroup control are examined as means of optimizing group interaction under conditions of prolonged autonomous activity of crews. Emphasis is placed on instilling in the crew members higher social goals, proper attitude toward values, and enhanced motivation to participate in missions with cooperative efforts. The formulated principles of intragroup control aim at maintaining a high degree of group activity effectiveness, regulating interpersonal relationships, and suppressing or reducing conflict tensions. Investigation of mission groups have revealed the great significance of knowledge and motivation levels as factors assuring the solidarity of the acting group during achievement of group objectives. S.D.

A78-13595 # Possibilities of enhancing the dependability of groups acting in extremal situations (Vozmozhnosti povysheniia nadezhnosti grupp, deistvuushchikh v ekstremal'nykh situatsiakh). A. A. Gerasimovich. In: Optimization of the professional activity of a cosmonaut. Moscow, Izdatel'stvo Nauka, 1977, p. 217-223. 28 refs. In Russian.

The paper analyzes the current status of the problem concerning the investigation of small groups acting under extremal conditions.

Attention is directed to an examination of the qualitative characteristics of extremal (critical) situations, the features of group responses to the threatening environment, and the behavior of designated and psychological leaders. The role of individual-psychological characteristics of group members in the development of 'group phenomena' in real stressful events is highlighted along with ways of psychological correction of group actions. S.D.

A78-13596 # EEG diagnosis of operators (Elektroentsefalograficheskaia diagnostika operatora). N. N. Vasilevskii. In: Optimization of the professional activity of a cosmonaut. Moscow, Izdatel'stvo Nauka, 1977, p. 224-234. 28 refs. In Russian.

It is shown that it is possible to distinguish between spacecraft operators with high and low levels of adaptation by means of their EEG indices. Factors considered include voluntary control of components, the predominance of the alpha-rhythm, and high regulational stability of brain neurodynamic processes along with moderate emotional-parasympathetic responsiveness. The application of EEG techniques to the determination of spacecraft operators' psychophysiological state is discussed, and future developments are considered. M.L.

A78-13597 # Complex evaluation of the functional state of a human operator in control systems (Kompleksnaia otsenka funktsional'nogo sostoiianiia cheloveka-operatora v sistemakh upravleniia). V. M. Akhutin, A. M. Zingerman, M. M. Kislitsin, and D. N. Menitskii. In: Optimization of the professional activity of a cosmonaut. Moscow, Izdatel'stvo Nauka, 1977, p. 234-244. 21 refs. In Russian.

A study of the psychophysiological reactions of human operators performing control operations has indicated two forms of regulation of the heart beat rate by the parasympathetic nervous system. The distinguishing between types of regulation confirms an analysis based on EEG indices and also shows the usefulness of the sensory-motor tracking procedure used in the psychophysiological study. The use of the experimental data to establish regulation-information evaluation criteria and to predict the dynamics of operator tension is considered. M.L.

A78-13598 # The problem of self-regulation of posture (K voprosu o samoregulatsii pozy). O. P. Kozerenko, V. I. Miasnikov, and N. M. Rudometkin. In: Optimization of the professional activity of a cosmonaut. Moscow, Izdatel'stvo Nauka, 1977, p. 245-256. 40 refs. In Russian.

Results are presented for an experimental study of the vertical posture of healthy male volunteers, well-trained sportsmen-divers and military parachutists - aged 21 to 35 yr - tested under conditions of limited support area at heights of 18 and 10 m respectively. Results are analyzed in terms of psychological parameters, behavioral phenomenology, vegetative responses (heart rate, respiration, SGR) and stabilographic indicators characterizing the displacement of the center of gravity of the body in the sagittal and frontal planes. Stabilographic data for astronauts engaged in long-duration flights are also discussed. The principal types of vertical posture regulation under complex spatial conditions and during changes in gravity are analyzed on the basis of a model of postural self-regulation. The structure of this model makes use of the information on the 'tune-up' of the acting segmented system of postural activity through the modulating effects of all supraspinal levels of brain organization. S.D.

A78-13599 # Dependence of the estimation of human state on the personal characteristics of the estimator (Zavisimost' otsenki sostoiianiia cheloveka ot lichnostnykh osobennostei otsenivaiushchego). M. V. Lasko, V. I. Miasnikov, F. N. Uskov, and V. F. Shendrik. In: Optimization of the professional activity of a cosmonaut. Moscow, Izdatel'stvo Nauka, 1977, p. 256-266. 9 refs. In Russian.

Experiments were conducted to study the dependence of estimates of human state on the individual qualities of the estimator

expert. The paired estimation parameters were fitted for work, aggressive-peaceful, anxious-quiet, apathetic-energetic, and depressed-elated. A mathematical model is proposed for describing the diagnosis process in estimates of human state from incomplete data. Problems concerning the style of the diagnostic work of the estimator are discussed. S.D.

A78-13600 # Functional structure and evaluation criteria of instrumental space operations (Funktsional'naia struktura i kriterii otsenki instrumental'nykh prostranstvennykh deistvii). N. D. Gordeeva, V. M. Devishvili, V. P. Zinchenko, and E. I. Kochurova. In: Optimization of the professional activity of a cosmonaut. Moscow, Izdatel'stvo Nauka, 1977, p. 266-293. 12 refs. In Russian.

Micro- and macrostructural analytic methods of instrumental space operations are proposed. The methods permit separation and study of cognitive and performance aspects of these operations. The sequence and regularity of block components of these operations are established, and the possibility of using objective indices to characterize processes and levels of space operations is demonstrated. The relationship of the indices to external events is considered. M.L.

A78-13601 # The role of professional and sexual factors in the auditory evaluation of emotionally tinged speech (O roli professional'nogo i polovogo faktorov v auditor'skoi otsenke emotional'no okrasheynoi rechi). E. F. Bazhin and T. V. Korneva. In: Optimization of the professional activity of a cosmonaut. (A78-13576 03-53) Moscow, Izdatel'stvo Nauka, 1977, p. 293-299. In Russian.

A78-13991 Biomechanics. Y. C. Fung (California, University, La Jolla, Calif.). In: Theoretical and applied mechanics; Proceedings of the Fourteenth International Congress, Delft, Netherlands, August 30-September 4, 1976. Amsterdam, North-Holland Publishing Co., 1977, p. 7-31. 90 refs. NSF-NIH-supported research.

Attention is given to stress-strain relationships for living soft tissues with emphasis on biotheological experiments, viscoelasticity, pseudoelasticity and the simplified representation of the rheological properties of soft tissues, and the mechanics of tissues with higher structures. A typical boundary value problem associated with the sheet flow theory of the lung is examined along with the contributions that biomechanics has made to health science. B.J.

A78-14002 On problems and principles of robots' motion. D. E. Okhotsimskii and A. K. Platonov (Akademiia Nauk SSSR, Institut Prikladnoi Matematiki, Moscow, USSR). In: Theoretical and applied mechanics; Proceedings of the Fourteenth International Congress, Delft, Netherlands, August 30-September 4, 1976. Amsterdam, North-Holland Publishing Co., 1977, p. 185-193. 12 refs.

The problems and principles of robot motion control are analysed taking as an example a six-legged automatic walker equipped with environment-perception, decision-making and planning systems. It has also an execution system and actuator control in the leg joints. The algorithms of the walker's motion control as well as the walker itself and its environment were simulated. The simulation results were displayed on the CRT screen in form of synthesized pictures of the walker's motion. (Author)

A78-14064 Vestibular and somatosensory interaction in the cat vestibular nuclei. A. M. Rubin, A. C. Milne, J. A. Young, J. M. Fredrickson (Toronto, University, Toronto, Canada), and S. R. C. Liedgren. *Pflügers Archiv*, vol. 371, no. 1-2, 1977, p. 155-160. 42 refs. Medical Research Council of Canada Grant No. MA-3311.

The vestibular nuclei of cats were explored extracellularly with micropipettes to locate units with a resting discharge rate which responded to rotation in the horizontal plane. These units were examined for somatosensory input from neck and limbs. Fewer than half responded to somatosensory stimulation. The neck region was

the body area most effective in influencing unitary activity. The response pattern most often noted was an increase and decrease in discharge frequency when the body was moved towards and away from the recording electrode respectively. Change in discharge rate was observed to be primarily dependent upon neck velocity and not upon absolute neck position. Half of the somatosensory units received input from either the forelimbs or the hindlimbs, while the remaining half responded to both. (Author)

A78-14127 Deuterolysis of amino acid precursors - Evidence for hydrogen cyanide polymers as protein ancestors. C. Matthews, J. Nelson, P. Varma (Illinois, University, Chicago, Ill.), and R. Minard (Pennsylvania State University, University Park, Pa.). *Science*, vol. 198, Nov. 11, 1977, p. 622-625. 21 refs.

Deuterolysis experiments suggest that hydrogen cyanide polymers rather than aminoacetonitriles are major precursors of alpha-amino acids obtained from spark reactions and other studies on chemical evolution. These results are consistent with the hypothesis that the original heteropolypeptides on the earth were synthesized spontaneously from hydrogen cyanide and water without the intervening formation of alpha-amino acids. (Author)

A78-14192 Acute and sub-acute inhalation toxicity of peroxyacetyl nitrate and ozone in rats. A. Kruyssen and V. J. Feron (Centrale Organisatie voor Toegepast-Natuurwetenschappelijk Onderzoek, Centraal Instituut voor Voedingsonderzoek TNO, Zeist, Netherlands). (*Verein Deutscher Ingenieure, Tagung über Ozon und Begleitsubstanzen im photochemischen Smog, Düsseldorf, West Germany, Sept. 22-24, 1976.*) *VDI-Berichte*, no. 270, 1977, p. 101-109. 14 refs.

The acute and subacute inhalation toxicities for rats of peroxyacetyl nitrate (PAN) and ozone were studied. The 4-hr LC(50) is about 95 ppm for PAN and 8 ppm for ozone. Four and 13 week repeated exposure studies are also reported. Photographs of histological sections of respiratory tissue are presented, and the histopathological changes induced by the gases are described. Ozone primarily affects the bronchioalveolar tissues, while PAN attacks both the upper and lower respiratory tract. M.L.

A78-14193 Study of the effects of chronic ozone exposure on animals - Morphological and functional changes (Tierexperimente über die chronische Wirkung von Ozon - Morphologische und funktionelle Veränderungen). J. Bruch and H.-W. Schlipkötter (Düsseldorf, Universität, Düsseldorf, West Germany). (*Verein Deutscher Ingenieure, Tagung über Ozon und Begleitsubstanzen im photochemischen Smog, Düsseldorf, West Germany, Sept. 22-24, 1976.*) *VDI-Berichte*, no. 270, 1977, p. 111-117. 29 refs. In German.

Experiments involving the exposure of laboratory mice to ozone concentrations of 0.86 ppm during a period of 12 months are reported. Erythrocyte levels and erythrograms (measures of the chemical resistance of the erythrocytes) were studied on a weekly basis for the test animals. In addition, histograms of alveolar tissue were examined. Pathological reactions were noted in the mice after a period of several weeks. J.M.B.

A78-14194 Reinforcement of ozone action in mice by additional environmental compounds. T. Veninga and J. Wagenaar (Groningen, Rijksuniversiteit, Groningen, Netherlands). (*Verein Deutscher Ingenieure, Tagung über Ozon und Begleitsubstanzen im photochemischen Smog, Düsseldorf, West Germany, Sept. 22-24, 1976.*) *VDI-Berichte*, no. 270, 1977, p. 119-122. 9 refs.

The behavior of a number of biochemical components in mice exposed to ozone for two hours at levels of 0.4 mg/cu m is studied. Such doses are similar to those observed in industrial areas. Among the factors evaluated are: the activity of the enzymes glutamate pyruvate transaminase (GPT), creatine phosphokinase (CPK), and the reduced form of liver ascorbic acid (vitamin C). It is suggested that ozone may lead to a defensive as well as a toxic response in some living organisms, responses which may be of a competitive nature. S.C.S.

A78-14195 Acute effects of ozone on lung function in humans (Zur akuten Wirkung von Ozon auf die Lungenfunktion des Menschen). G. von Nieding (Krankenhaus Bethanien, Moers, West Germany), M. Wagner (Bundesgesundheitsamt, Institut für Wasser-, Boden- und Lufthygiene, Berlin, West Germany), H. Löllgen, and H. Krekeler. (*Verein Deutscher Ingenieure, Tagung über Ozon und Begleitsubstanzen im photochemischen Smog, Düsseldorf, West Germany, Sept. 22-24, 1976.*) *VDI-Berichte*, no. 270, 1977, p. 123-129. 17 refs. In German. Bundesministerium des Innern Contract No. 014-74-1.

Eleven subjects were exposed for two hours to air mixtures including 5 ppm NO₂ or 0.1 ppm O₃, or a combination of the two gases. In addition, some of the subjects were exposed to various mixtures of NO₂, O₃ and SO₂. Except for the case of mixtures with lower concentrations of NO₂, O₃ and SO₂, arterial oxygen partial pressure was found to decrease significantly following exposure, while air passage resistance increased significantly. Acetylcholine-induced bronchial reactions appeared to increase after exposure to mixtures with higher concentrations of NO₂, O₃ and SO₂. J.M.B.

A78-14196 The effects of ozone in the range of the maximum work location concentration on subjects (Wirkungen von Ozon im MAK-Bereich auf Versuchspersonen). K. Dirnagl and J. Kleinschmidt (München, Universität, Munich, West Germany). (*Verein Deutscher Ingenieure, Tagung über Ozon und Begleitsubstanzen im photochemischen Smog, Düsseldorf, West Germany, Sept. 22-24, 1976.*) *VDI-Berichte*, no. 270, 1977, p. 131-135. In German.

The reported investigations, which involved as many as 70 persons within an age range from 20 to 30 years and tests with durations from 1 to 106 hours, did not show an unequivocal effect of ozone on healthy subjects in the case of concentrations of 0.1 ppm. It is concluded that certain apprehensions, based on a consideration of studies reported by Hermann and Heinke (1952), regarding possible detrimental effects of ozone at the considered concentrations are unfounded as far as healthy persons are concerned. G.R.

A78-14197 The human health effects of photochemical oxidant air pollution - A review of experience in the United States. C. M. Shy (North Carolina, University, Chapel Hill, N.C.). (*Verein Deutscher Ingenieure, Tagung über Ozon und Begleitsubstanzen im photochemischen Smog, Düsseldorf, West Germany, Sept. 22-24, 1976.*) *VDI-Berichte*, no. 270, 1977, p. 137-143. 34 refs.

The article describes studies on the effects to human health of photochemical oxidant air pollution. Attention is given to evidence from occupational and epidemiological studies, and the chronic effects of such pollution. It is concluded that the most acute irritating effects of photochemical oxidants are eye irritation, throat and chest discomfort, and cough. It is suggested that since peak levels of ozone usually occur in combination with nitrogen and sulfur oxides, existing standards in different countries (ranging from 120 to 200 mcg/cu m, or 0.06 to 0.10 ppm) may be adequate to protect the general population from irritation symptoms associated with both ozone alone and ozone in combination with oxides of nitrogen and sulfur. S.C.S.

A78-14309 Dark noise in retinal bipolar cells and stability of rhodopsin in rods. J. F. Ashmore and G. Falk (University College, London, England). *Nature*, vol. 270, Nov. 3, 1977, p. 69-71. 22 refs. Research supported by the Medical Research Council.

Voltage fluctuations in dogfish retinal bipolar cells were measured in order to study 'noise' arising from events in the rods indistinguishable from those caused by light. The 'dark light' was found to be strongly temperature dependent, and it is suggested that the dark light results from spontaneous thermal changes in rhodopsin molecules. Reasons are presented for assuming that the contribution of thermal denaturation of rhodopsin to dark light is insignificant. Spontaneous thermal isomerization is proposed as the cause of dark light. The rate constant for this reaction at 37 C was calculated to be 3.5 x 10 to the minus tenth/sec, which conforms with the rate constant consistent with the reliability of light detection at absolute threshold. M.L.

A78-14412 Responses of macaque ganglion cells to far violet lights. F. M. de Monasterio and P. Gouras (National Institutes of Health, Laboratory of Vision Research, Bethesda, Md.). *Vision Research*, vol. 17, no. 10, 1977, p. 1147-1156. 38 refs.

In a sample of 487 color-opponent ganglion cells recorded in the central retina of the rhesus and cynomolgus monkeys, 9% of these neurons were found to have responses with the same sign at both ends of the visible spectrum mediated by red-sensitive cones and mid-spectral responses of opposite sign mediated by green-sensitive cones. Selective chromatic adaptation showed that the responses to far violet lights (400-420 nm) were due to input from red- and not blue-sensitive cones. These responses were enhanced by backgrounds depressing the sensitivity of blue- and green-sensitive cones and they were depressed by backgrounds depressing the sensitivity of red-sensitive cones; the sensitivity of these responses was yoked to that of responses to far red lights. The relative incidence of these ganglion cells was maximal at the foveal region and decreased towards the peripheral retina. The properties of these cells are consistent with some psychophysical observations of human vision at the short wave-lengths. (Author)

A78-14413 Information capacity of eyes. A. W. Snyder, S. B. Laughlin (Australian National University, Canberra, Australia), and D. G. Stavenga (Australian National University, Canberra, Australia; Groningen, Rijksuniversiteit, Groningen, Netherlands). *Vision Research*, vol. 17, no. 10, 1977, p. 1163-1175. 34 refs.

The spatial resolving power of retinal images of animal eyes is derived by taking into account two fundamental limiting factors, photon noise and pupil diffraction. Idealized photoreceptors developed for the study are assumed to be linear photon counters at all intensities, to count photons over retinal areas greater than those covered by single rods, and to count the photons incident during a fixed time interval. The optimum densities of photoreceptors for various mean luminances and contrasts are considered. The photoreceptor model is also used in discussing diurnal and nocturnal image reconstruction performed by the human eye. J.M.B.

A78-14414 Threshold visibility of frequency gradient patterns. H. R. Wilson and S. C. Giese (Chicago, University, Chicago, Ill.). *Vision Research*, vol. 17, no. 10, 1977, p. 1177-1179, 1181-1190. 38 refs. Grant No. PHS-GM-2037.

The role of spatial inhomogeneity in threshold grating perception is studied using grating patterns containing a gradient of spatial frequencies. Based on both psychophysical and neurophysiological evidence, it was decided that an appropriate class of patterns would be those with a linearly varying spatial wavelength. Thresholds were measured both for patterns in which the spatial wavelength increased linearly with eccentricity and for patterns in which it decreased linearly with eccentricity. The results demonstrate that spatial inhomogeneity is indeed an important factor in the threshold visibility of gratings. The data support medium bandwidth estimates for the mechanisms underlying spatial frequency selectivity, and they are inconsistent with the notion that the visual system performs a Fourier analysis of visual images. The data can be fit quantitatively by a semi-empirical model which postulates that the sensitivity to all spatial frequencies is highest in the fovea, but that the sensitivity to high frequencies declines more rapidly than that to low frequencies with increasing eccentricity. A comparison of the model with measured line spread functions permits some estimates to be made of the range of receptive field sizes present at each eccentricity. (Author)

A78-14415 Spatial sensitization as a function of delay. U. Tulunay-Keeseey and R. M. Jones (Wisconsin, University, Medical Center, Madison, Wis.). *Vision Research*, vol. 17, no. 10, 1977, p. 1191-1199. 31 refs. Grant No. NIH-00308.

Foveal increment thresholds were determined for a small test flash presented briefly against backgrounds of various sizes. The interval between the onset of a 3 sec duration background and the test flash was varied. Under unstabilized conditions, when the image moved normally on the retina, the increment threshold varied with

the background size regardless of test target delay. When the image was stabilized, the increment threshold was independent of background size if the diameter exceeded 10 ft, and the delay was longer than 100 msec. For 100 msec, the thresholds taken on unstabilized or stabilized backgrounds were almost identical. (Author)

A78-14416 Latency changes in the human visual evoked response to sinusoidal gratings. D. M. Parker and E. A. Salzen (Aberdeen, University, Aberdeen, Scotland). *Vision Research*, vol. 17, no. 10, 1977, p. 1201-1204. 17 refs.

Averaged potentials evoked by the presentation of sine wave gratings of different spatial frequencies were recorded from the human scalp. Results indicated a progressive delay in peak latency of all negative and positive waves generated by stimulus onset as spatial frequency was increased although this trend was clearer in the early N(90-140) and P(140-180) than in the late N(180-200) and P(255-275) waves. These results are discussed in relation to psychophysical studies which indicate delays in simple reaction time to sinusoidal gratings as spatial frequency is increased. (Author)

A78-14417 Brightness generation in the human visual system - Colour-brightness: A contribution of cortical colour channels to brightness sensation. H. D. Bauer and R. Röhler (München, Universität, Munich, West Germany). *Vision Research*, vol. 17, no. 10, 1977, p. 1211-1216. 5 refs.

A78-14418 Aspheric curvatures for the human lens. M. J. Howcroft and J. A. Parker (Toronto, University, Toronto, Canada). *Vision Research*, vol. 17, no. 10, 1977, p. 1217-1219, 1221-1223. 9 refs. Medical Research Council of Canada Grants No. MA-3560; No. MA-5211.

Spheric and aspheric conic functions were calculated for cross-sections from 60 pairs of human cadaver lenses subjected to cryofixation. For the anterior surface, the mean radius was 7.3 plus or minus 0.3 mm with a hyperbolic conic constant of 2.46 plus or minus 0.13. The posterior mean radius was 5.35 plus or minus 0.14 mm with a parabolic constant of 1.09 plus or minus 0.07. Curvatures generally decreased with age; the aspheric conic constant (b/a - 1) remained relatively constant with age. (Author)

A78-14419 * Proprioceptive information about target location suppresses autokinesis. J. R. Lackner and J. J. Zabkar (Brandeis University, Waltham, Mass.). *Vision Research*, vol. 17, no. 10, 1977, p. 1225-1229. 25 refs. Research supported by the Spencer Foundation and Rosenstiel Biomedical Sciences Foundation; Grant No. NGL-22-009-308.

An experimental study of autokinesis perceived by subjects who had proprioceptive information about target locations was conducted. When subjects were permitted to grasp the target light mount, their perceptions of autokinesis were found to be fewer and of smaller magnitude than when only visual information about the target location was available. The decrease in autokinesis was correlated with an enhancement of oculomotor control. J.M.B.

A78-14499 # The effect of extraversion/introversion on the consolidation processes related to the retention of verbal material (Zum Einfluss von Extraversion/Introversion auf Konsolidierungsprozesse beim Behalten verbalen Materials). M. Amelang (Heidelberg, Universität, Heidelberg, West Germany), W. Wendt, and H. Fründt (Hamburg, Universität, Hamburg, West Germany). *Zeitschrift für experimentelle und angewandte Psychologie*, vol. 24, 4th Quarter, 1977, p. 525-545. 33 refs. In German.

Two experiments investigated the course of consolidation processes hypothetically causal for the formation of memory traces after presentation of learning material to human subjects. Of particular interest was the influence of introversion/extraversion as defined by Eysenck. Reaction time in a simple reaction task and amount of cortical activity in EEG served as indicators for the processes in question. Results show introverts more than extraverts to be characterized by stronger excitations instantly after the

presentation of learning materials though these excitations may persist in extraverts for a longer time. (Author)

A78-14500 # Individual differences during training in the case of alpha brain waves with biofeedback (Individuelle Unterschiede beim Trainieren von Alpha-Hirn-Wellen mit Biofeedback). H. Zeier and M. Graf (Eidgenössische Technische Hochschule, Zurich, Switzerland). *Zeitschrift für experimentelle und angewandte Psychologie*, vol. 24, 4th Quarter, 1977, p. 681-692. 14 refs. In German.

It was investigated whether a person can acquire by learning, involving operant conditioning, the capability to influence the alpha activity in his own EEG. Eighteen of the 28 subjects used in the investigation received reaction-dependent feedback during the training, the other subjects were given pseudofeedback from another person. The experimental session consisted of 26 two-minute sections. The measured parameters included the occipital EEG, the horizontal electrooculogram, and the vertical electrooculogram. It was found that great individual differences exist concerning the capability to increase the alpha activity in connection with EEG feedback. G.R.

A78-14646 The false positive stress test - Multivariate analysis of 215 subjects with hemodynamic, angiographic and clinical data. M. H. Ellestad, S. Savitz, D. Bergdall, and J. Teske (Memorial Hospital Medical Center, Long Beach, Calif.). *American Journal of Cardiology*, vol. 40, Nov. 1977, p. 681-685. 11 refs. Research supported by the Memorial Hospital Medical Foundation.

Progressive treadmill stress tests were conducted on 95 patients with a false positive stress test and normal coronary angiograms and on 120 patients with a true positive stress test in order to determine the factors causing the false positive stress test as well as to evaluate the ability of the computer to improve test classification. The data obtained were subjected to a multivariate discriminant analysis using a suitable computer. The clinical variables ranked in order of importance in correct classification of stress tests in men are found to be maximal heart rate achieved, maximal systolic pressure, ST segment pattern, age, chest pain history, T wave, chest pain during test, changes in ST segment or T wave during hyperventilation, resting EKG diagnosis, time of onset of ST segment depression during exercise, increase in P wave negativity in lead V1 during exercise, and T wave inversion during exercise. A major conclusion is that the applied technique of analysis allowed 65% of false positive tests to be reclassified correctly. S.D.

A78-14647 Computer analysis of the orthogonal electrocardiogram and vectorcardiogram in 257 patients with aortic valve disease. N. A. Yankopoulos, W. K. Häisty, and H. V. Pipberger (U.S. Veterans Administration Hospital, Washington, D.C.). *American Journal of Cardiology*, vol. 40, Nov. 1977, p. 707-715. 26 refs. Research supported by the U.S. Veterans Administration; Grant No. NIH-HL-15047.

The Frank orthogonal EKGs of 90 patients with aortic stenosis and 167 with aortic insufficiency are analyzed. More than 300 measurements are reviewed to select the best criteria for routine use in recognition of left ventricular overload in aortic valve disease. Electrocardiographic recognition of left ventricular overload is examined in terms of sensitivity and specificity, and multivariate analysis is tested for improvement of EKG criteria. It is shown that using more variables in a multivariate analysis scheme designed for computer application increased the recognition rate of aortic valve disease to 82% and 78% for aortic stenosis and aortic insufficiency, respectively. S.D.

A78-14680 * Phosphorus, a key to life on the primitive earth. E. J. Griffith, C. Ponnampuram, and N. W. Gabel (NASA, Ames Research Center, Planetary Biology Div., Mountain View, Calif.; Monsanto Co., St. Louis, Mo.; Maryland, University, College Park, Md.). *Origins of Life*, vol. 8, Aug. 1977, p. 71-85. 48 refs.

The phosphorus of the primitive earth was present as phosphates. It is strongly probable that a portion of the phosphate was present as condensed phosphates. The primitive earth was highly deficient in the total available phosphorus until a sufficient quantity

of phosphorus weathered from the igneous rocks in which it was entrapped. Approximately three billion years were required for the seas to become saturated. Until this time passed the seas acted as a giant sink for phosphorus, diluting it to the extent that all forms of life were deprived of the vital nutrient. When the seas became saturated, the rate of turnover of the phosphorus increased rapidly. As the seas pulsed, they left the excess precipitate phosphorus as sedimentary rock in locally rich deposits on which life could thrive. (Author)

A78-14681 The length of the transition period from the reducing to the neutral biosphere. E. Broda (Wien, Universität, Vienna, Austria). *Origins of Life*, vol. 8, Aug. 1977, p. 87-90. 20 refs.

The development of the complicated mechanisms for N₂ fixation, which in nature is an endergonic process and requires a great deal of ATP, must have taken a long time. During that time primeval NH₃ must still, albeit to a decreasing extent, have been available as a source of nitrogen. This is true, whether N₂ fixation originally arose in the primitive anaerobes, or, according to Postgate, in more advanced bacteria. As NH₃ resists UV radiation only in the presence of excess H₂, it follows that the disappearance of H₂ and the transition from the reducing to the neutral biosphere also took a long time, probably of the order of 10 to the ninth yr. According to previous evidence, the transition from the neutral to the oxidizing biosphere likewise took long; this length enabled the organisms to adapt the N₂ fixing machinery to aerobic conditions. (Author)

A78-14682 * A critical evaluation of the application of amino acid racemization to geochronology and geothermometry. K. M. Williams and G. G. Smith (Utah State University of Agriculture and Applied Science, Logan, Utah). *Origins of Life*, vol. 8, Aug. 1977, p. 91-144. 153 refs. Grant No. NSG-7038.

Attempts have been made to determine the age of biological samples by measuring the racemization of amino acids in protein samples. The pitfalls and inherent complications in diagenetic racemization studies are reviewed, and recent advances in improving techniques are outlined. Methodological topics include isolation of amino acids from geological samples, resolution of amino acid enantiomers, and the effects of acid hydrolysis. The theory and kinetics of amino acid racemization are discussed with attention to the derivation of the rate expression for amino acid racemization, isoleucine and the equilibrium constant, the mechanism of amino acid racemization, the racemization of 'bound' versus 'free' amino acids, and factors affecting the racemization rates of free amino acids in aqueous solution. Applications of amino acid racemization kinetics to geochronology is considered with reference to shells, marine sediments, and bones. Potential complications include heating and diagenesis, diagenetic formation of amino acids, the effect of clays, species effect, and contamination. M.L.

A78-14683 Method for the determination of protein evolution rates by amino acid composition - Evolution rate of actins. M. M. Ogievetskaia (Akademiia Nauk SSSR, Institut Biofiziki, Pushchino-on-Oka, USSR). *Origins of Life*, vol. 8, Aug. 1977, p. 145-154. 26 refs.

A method has been developed to determine the actin evolution rate. The method is based on amino acid composition. The actin evolution rate has been established to be extremely low. Only three or less amino acid changes per hundred amino acid residues have accumulated for a 100 million years. One can explain the conservative nature of actin evolution as a sequence of its unique tightly fitted structure rich in biologically active centres at short distances from each other. The peculiar invariability of polar amino acids leads to a conclusion that some given distribution of charges is necessary for the unique functioning of actin molecules. (Author)

A78-15159 Exercise stress testing. N. J. Fortuin (Johns Hopkins University; Johns Hopkins Hospital, Baltimore, Md.) and J. L. Weiss. *Circulation*, vol. 56, Nov. 1977, p. 699-712. 124 refs.

Functions of clinical exercise testing are discussed along with types of stress tests and the capability of exercise electro-

cardiography as a diagnostic tool in heart assessment of patients and asymptomatic subjects. Contra-indications to exercise testing include unstable angina pectoris, recent myocardial infarction, severe hypertension, congestive heart failure, significant aortic stenosis or other severe valvular disease, uncontrolled cardiac arrhythmias, high-degree AV block severe anemia, pulmonary embolism, or cor. pulmonale. Computer measurement of the negative ST-segment integral or quantification of the ST-segment slope promises to enhance the sensitivity of exercise stress testing. Other topics include arrhythmia detection, epidemiologic studies on populations subjected to stress tests as an important means of validating the significance of abnormal responses, and comparison of stress-test findings with coronary angiographic studies. Indications for exercise stress testing are examined for patients with chest pain, patients with established coronary artery disease, and the asymptomatic subject. S.D.

A78-15160 **Diagnostic value of history and maximal exercise electrocardiography in men and women suspected of coronary heart disease.** J.-M. R. Detry (Cliniques Universitaires Saint Luc, Brussels, Belgium), B. M. Kapita, J. Cosyns, B. Sottiaux, L. A. Brasseur, and M. F. Rousseau (Louvain, Catholic University, Louvain, Belgium). *Circulation*, vol. 56, Nov. 1977, p. 756-761. 36 refs. Commission of the European Communities Grant No. 6245-35/2/005.

A78-15161 **Relationship between plasma lipid concentrations and coronary artery disease in 496 patients.** A. M. Gotto (Baylor University, Houston, Tex.), G. A. Gorry, J. R. Thompson, J. S. Cole, R. Trost, D. Yeshurus, and M. E. DeBailey (Baylor University; Methodist Hospital; Rice University, Houston, Tex.). *Circulation*, vol. 56, Nov. 1977, p. 875-883. 28 refs. U.S. Department of Health, Education, and Welfare Grant No. HL-17269-02; Grant No. NIH-71-2156. NR Project 042-283.

A78-15177 **Life sciences and space research XV; Proceedings of the Open Meeting of the Working Group on Space Biology, Philadelphia, Pa., June 8-19, 1976.** Meeting sponsored by COSPAR. Edited by R. Holmquist (California, University, Berkeley, Calif.) and A. C. Stickland. Oxford and New York, Pergamon Press, 1977. 322 p. \$50.

The biology of extreme environments is considered with attention to the ability of microorganisms to survive or grow in extreme conditions involving heat, moisture, or available nutrients. Other topics discussed include planetary sample quarantine and analysis, the chemistry of the outer planets with respect to their ability to support life, and radiation biology. Space physiology and gravitational biology experiments involving primates, lower vertebrates, insects, plants, or microorganisms are reported. M.L.

A78-15178 * **Effect of sterilization on the scientific value of a returned Mars soil sample.** D. L. DeVincenzi (NASA, Ames Research Center, Moffett Field, Calif.). In: Life sciences and space research XV; Proceedings of the Open Meeting of the Working Group on Space Biology, Philadelphia, Pa., June 8-19, 1976. Oxford and New York, Pergamon Press, 1977, p. 21-26. 10 refs.

It has been proposed that a soil sample from Mars be sterilized prior to return to earth for analysis in order to prevent contamination of earth by hazardous microbial species potentially present in the sample. This paper summarizes experiments on the effect of various methods of sterilization of terrestrial soils on their biological and organic constituents. Sterilization by dry heat caused significant decreases in amino acid content, increases in amino acid racemization, and obliteration of cellular structure. Co-60 irradiation had little effect on amino acid racemization and morphology, and Co-60 irradiation combined with dry heat resulted in retention of some enzymatic activity. Treatment with chemical fixative preserved cellular structure. (Author)

A78-15179 * **Detection of optical asymmetry in amino acids by gas chromatography for extraterrestrial space exploration -**

Results of a new soil processing scheme with breadboard instrumentation. G. E. Pollock (NASA, Ames Research Center, Moffett Field, Calif.), R. Day, S. Kinsey (TRW Systems, Redondo Beach, Calif.), and S. L. Miller (California, University, La Jolla, Calif.). In: Life sciences and space research XV; Proceedings of the Open Meeting of the Working Group on Space Biology, Philadelphia, Pa., June 8-19, 1976. Oxford and New York, Pergamon Press, 1977, p. 27-34. 14 refs.

The life-detection experiments of the Viking spacecraft are of an active biology type that will attempt to elicit metabolic responses from soil samples. Because bioresponses may be difficult to stimulate, it is desirable also to devise a purely chemical life-detection experiment. The unique chemical property of living systems on which such an experiment could be based is the optical activity of the amino acids that compose its protein. We have devised a new soil processing scheme which has been laboratory tested and for which we have built semi-automated breadboard instrumentation. The system involves the operations of heating, filtering, evaporation, conversion of the isolated amino acids to volatile diastereomers, injection onto a gas chromatographic column, and detection using a flame ionization detector. The breadboard form of the soil processing scheme and instrumentation has been successfully end-to-end tested. (Author)

A78-15180 **Resistance of stratospheric and mesospheric micro-organisms to extreme factors.** A. A. Imshenetskii, S. V. Lysenko, G. A. Kasakov, and N. V. Ramkova (Akademiia Nauk SSSR, Institut Mikrobiologii, Moscow, USSR). In: Life sciences and space research XV; Proceedings of the Open Meeting of the Working Group on Space Biology, Philadelphia, Pa., June 8-19, 1976. Oxford and New York, Pergamon Press, 1977, p. 37-39. 8 refs.

The ability of microorganisms isolated from stratospheric and mesospheric air samples collected by rockets to survive exposure to gamma rays, high vacuum, or UV radiation was tested. *Aspergillus niger*, *Penicillium notatum*, *Circinella muscae*, *Papulaspora anomala*, *Mycobacterium luteum*, and *Micrococcus albus* were detected in samples from heights between 49 and 77 km. The data indicate that the gamma ray D-10 index for all organisms tested did not exceed 290 krad, so that exposure to 3.2-3.5 Mrad would ensure the sterility of samples and apparatus. No species with high radioresistance were detected. Most of the organisms were found to be very resistant to high vacuum (10 to the minus ninth mm Hg) and UV radiation. M.L.

A78-15181 * **Evidence for propagation of aerobic bacteria in particles suspended in gaseous atmospheres.** R. L. Dimmick, M. A. Chatigny, H. Wolochow (U.S. Navy, Naval Biosciences Laboratory, Oakland, Calif.), and P. Straat (Biospherics Research, Inc., Rockville, Md.). In: Life sciences and space research XV; Proceedings of the Open Meeting of the Working Group on Space Biology, Philadelphia, Pa., June 8-19, 1976. Oxford and New York, Pergamon Press, 1977, p. 41-45. 9 refs. Navy-supported research. NASA Order W-13450.

One factor involved in the possibility that airborne microbes might contaminate the Jovian atmosphere is whether microbes have the capacity to propagate in air. Prior to these studies, the evidence was that the airborne state was lethal to microbes. An aerosol of aerobic bacteria was mixed with another containing C-14-glucose, and the presence of C-14-CO₂ was subsequently detected, which indicates that the airborne cells were metabolically active. In the same type of experiment, it was shown that thymidine was incorporated into the acid-insoluble fraction of samples, indicating the formation of DNA. It was also shown, both by an increase in the numbers of viable cells and a parallel increase in particle numbers, that at least two new generations of cells could occur. Evidence for propagation of anaerobic bacteria has so far been negative. (Author)

A78-15182 **Physiology of xerophytic micro-organisms growing under Martian conditions.** A. A. Imshenetskii, N. F. Pisarenko, L. A. Kuziurina, and V. M. Iakshina (Akademiia Nauk SSSR, Institut Mikrobiologii, Moscow, USSR). In: Life sciences and

space research XV; Proceedings of the Open Meeting of the Working Group on Space Biology, Philadelphia, Pa., June 8-19, 1976. Oxford and New York, Pergamon Press, 1977, p.

47-52. 9 refs.

The growth of two xerophytic bacteria as a function of the water activity of their media was studied by measuring the amount of CO₂ evolved. For *Bacillus megatherium*, a sharp decline in CO₂ evolution is found in comparing readings at a water activity of 0.920 with those at 0.900, regardless of whether glycerol or NaCl was included in the medium in order to obtain the desired water activity. For *Micrococcus ruber* in the presence of NaCl, a small reduction in CO₂ evolution is found at 0.940 (in comparison with 0.960) and a major reduction at 0.920; however, cultures of this bacterium in the presence of glycerol show a steady decrease in CO₂ evolution for all values less than 0.997. This technique is proposed as a quantitative evaluation of the xerophytic nature of microorganisms, and experimental procedures and other experimental results are described. M.L.

A78-15183 * Isolation and characterization of omnitherms and facultative anaerobes from Cape Canaveral soil samples. J. H. Brewer and T. L. Foster (Hardin-Simmons University, Abilene, Tex.). In: Life sciences and space research XV; Proceedings of the Open Meeting of the Working Group on Space Biology, Philadelphia, Pa., June 8-19, 1976. Oxford and New York, Pergamon Press, 1977, p. 53-58. 6 refs. Grant No. NGR-44-095-001.

In a bacterial population profile of interplanetary spacecraft environments based upon temperature and oxygen requirements, several isolates demonstrated the ability to grow over a temperature range from 3 C to 55 C, and most grew aerobically and anaerobically. Because of the adaptability of these organisms, they may be of significance to planetary contamination. To verify that these were actively growing in this range of temperatures, they were streaked onto trypticase soy agar (TSA) and incubated at the extreme temperatures (3 C and 55 C). Isolated colonies were transferred to fresh TSA and immediately incubated at the opposite extreme temperatures. Almost all of the isolates grew quite well at both temperatures. Because these have been subcultured numerous times and still possess the ability to grow over a broad temperature range, this appears to be a stable characteristic. Many of these isolates possess the ability to grow anaerobically at 3, 32 and 55 C. All of these organisms are sporeformers, and data are presented concerning their heat resistance and biochemical activity. (Author)

A78-15184 * Determinations of microbial loads associated with microscopic-size particles of Kennedy Space Center soil. O. R. Ruschmeyer and I. J. Pflug (Minnesota, University, Minneapolis, Minn.). In: Life sciences and space research XV; Proceedings of the Open Meeting of the Working Group on Space Biology, Philadelphia, Pa., June 8-19, 1976. Oxford and New York, Pergamon Press, 1977, p. 59-63. 14 refs. Grant No. NGL-24-005-160.

Plate counts for six fractions of Kennedy Space Center soil provided estimates of aerobic, mesophilic, heterotrophic, and microbial loads on single soil particles. Analyses included unheated particles, particles subjected to wet heat at 80 C for 20 min, and particles subjected to dry heat at 110 C for 1 hr. Unheated particles yielded mean counts ranging from 6 colonies per particle for the smallest (44-53 microns) soil fraction to approximately 55 colonies per particle for the largest size (105-125 microns) soil fraction tested. Mean counts for heat-resistant forms ranged from 2 colonies per particle for the smaller particles to 12-15 colonies for the largest particles analyzed. (Author)

A78-15185 * Morphology of extremely heat-resistant spores from *Bacillus* sp. ATCC 27380 by scanning and transmission electron microscopy. D. Youvan, M. Watanabe, and R. Holmquist (California, University, Berkeley, Calif.). In: Life sciences and space research XV; Proceedings of the Open Meeting of the Working Group on Space Biology, Philadelphia, Pa., June 8-19, 1976. Oxford and New York, Pergamon Press, 1977, p. 65-72. 15 refs. Grants No. NGR-05-003-460; No. NIH-A1-08427-070.

A structural analysis of the internal and external mature spore morphology of an extremely heat resistant *Bacillus* spore was

obtained by both scanning and transmission electron microscopy and is described. With dry heat, 139 hr at 125 C or 13-17 hr at 138 C is required to kill 90% of *Bacillus* sp. ATCC 27380 spores. A morell-like structure characterized by irregular but distinct polygonal ridges suggestive of extreme dehydration was observed in spore specimens. Some spores also possess a brioche-shaped appendage which is perhaps unique to this species. The explanation of the extreme heat resistance remains unknown, but it is suggested that heat resistance would result if dehydration converts the spore contents into a solid state, either amorphous or quasi-crystalline. The organism was isolated from a surface soil sample. M.L.

A78-15186 * Anaerobic utilization of phosphite/phosphine as a sole source of phosphorus - Implication to growth in the Jovian environment. T. L. Foster and L. Winans, Jr. (Hardin-Simmons University, Abilene, Tex.). In: Life sciences and space research XV; Proceedings of the Open Meeting of the Working Group on Space Biology, Philadelphia, Pa., June 8-19, 1976. Oxford and New York, Pergamon Press, 1977, p. 81-86. 8 refs. Grant No. NGR-44-095-001.

The ability of anaerobic soil isolate microorganisms to metabolize hypophosphite as the sole phosphorus source was studied. Isolates were inoculated into defined medium; growth was determined by turbidity readings, and concentrations of P-32-hypophosphite and its metabolites were determined. Evidence for growth was obtained. Experiments will be performed to see if anaerobes can use phosphine as a sole phosphorous source; the ability of earth organisms to utilize reduced forms of phosphorus would suggest that contaminating organisms from earth would not be eliminated by the absence of phosphate in the Jovian atmosphere. M.L.

A78-15187 * Photochemical synthesis of organic compounds on Jupiter initiated by the photolysis of ammonia. J. P. Ferris, C. Nakagawa, and C. T. Chen (Rensselaer Polytechnic Institute, Troy, N.Y.). In: Life sciences and space research XV; Proceedings of the Open Meeting of the Working Group on Space Biology, Philadelphia, Pa., June 8-19, 1976. Oxford and New York, Pergamon Press, 1977, p. 95-99. 16 refs. NASA-supported research.

The photolysis of ammonia in the presence of certain concentrations of hydrogen, helium, and methane was studied at ambient temperatures and at 115 K. The ratio of reacting methane to photolyzed ammonia varies with concentrations and temperature. Reaction products include almost equal amounts of HCN, ethane, and propane accompanied by lesser amounts of hydrazine, n-butane, n-butane isomers, and pentane isomers. Free radical pathways participating in the reactions are discussed. The components of the starting mixture were chosen because they are believed to be present in the upper atmosphere of Jupiter, and the results are examined with reference to the Jovian atmosphere. M.L.

A78-15188 * Some general principles of planetary quarantine leading to an assessment of the limitations to growth of micro-organisms on Uranus and Neptune. L. Margulis (Boston University, Boston, Mass.), H. O. Halvorson (Brandeis University, Waltham, Mass.), J. Lewis (MIT, Cambridge, Mass.), and A. G. W. Cameron (Harvard College Observatory and Smithsonian Astrophysical Observatory, Center for Astrophysics, Cambridge, Mass.). In: Life sciences and space research XV; Proceedings of the Open Meeting of the Working Group on Space Biology, Philadelphia, Pa., June 8-19, 1976. Oxford and New York, Pergamon Press, 1977, p. 101-106. 25 refs. Grant No. NGR-22-004-025.

A78-15190 Biological investigations of higher and lower plants aboard Soyuz 19. N. P. Dubinin, E. N. Vaulina, V. A. Kordium, K. I. Sytnik, L. R. Palmbakh, Ia. A. Vinnikov, L. N. Kostina, L. V. Polivoda, E. L. Kordium, and I. D. Anikeeva (Akademiia Nauk SSSR, Moscow, USSR). In: Life sciences and space research XV; Proceedings of the Open Meeting of the Working Group on Space Biology, Philadelphia, Pa., June 8-19, 1976.

Oxford and New York, Pergamon Press, 1977, p. 113-118.

The effects of space flight factors on the heredity of lower and higher plants, the radiosensitivity of plant seeds, and the radiation effect of prior gamma-irradiation were studied in organisms recovered after flight in Soyuz 19. Changes in survival of first generation plants, seed germination, chlorophyll mutations, embryonal lethals, chromosome aberrations, mitotic aberrations, and reactions to prior gamma irradiation are characterized. *Chlamydomonas reinhardi* and *Crepis capillaris* were used in these experiments. Differences in spaceborne and control cultures of *Proteus vulgaris* are described. No abnormalities were noted in the course or rate of development of bony fish *Brachydanio rerio* spawn cultivated in a special thermostat aboard Soyuz 19. M.L.

A78-15191 * **Apollo-Soyuz light-flash observations.** T. F. Budinger, C. A. Tobias, R. H. Huesman (California, University, Lawrence Berkeley Laboratory, Berkeley, Calif.), F. T. Upham, T. F. Wieskamp, and R. A. Hoffman (NASA, Johnson Space Center, Houston, Tex.). In: Life sciences and space research XV; Proceedings of the Open Meeting of the Working Group on Space Biology, Philadelphia, Pa., June 8-19, 1976. Oxford and New York, Pergamon Press, 1977, p. 141-146. 11 refs.

While dark adapted, two Apollo-Soyuz astronauts saw eighty-two light flash events during a complete 51 deg orbit which passed near the north magnetic pole and through the South Atlantic Anomaly. The frequency of events at the polar parts of the orbit is 25 times that noted in equatorial latitudes and no increased frequency was noted in the South Atlantic Anomaly at the 225-km altitude. The expected flux of heavy particles at the northern and southern points is 1-2/min per eye, and the efficiency for seeing high Z-high energy (HZE) particles which were below the Cerenkov threshold is 50%. (Author)

A78-15192 **Assignment of particle tracks to spores of *Bacillus subtilis* on silver chloride detectors.** E. Schopper, J. U. Schott, S. Bloching, M. Metka, and E. Obst (Frankfurt, Universität, Frankfurt am Main, West Germany). In: Life sciences and space research XV; Proceedings of the Open Meeting of the Working Group on Space Biology, Philadelphia, Pa., June 8-19, 1976.

Oxford and New York, Pergamon Press, 1977, p. 147-150. 5 refs. Research supported by the Bundesministerium für Forschung und Technologie.

The ionizing effects of high Z-high energy (HZE) particles on *Bacillus subtilis* spores or *Artemia salina* eggs flown in Biostack III B were studied by means of AgCl detectors; particle tracks inside the detectors are used to extrapolate the particle path near the biological objects fixed at the detector surface. Technical aspects of a video-electronic scanning system, Quantimet 720, adjusted to the particular experimental requirements, are described. Improvements include increased precision of coordinate measurements, objective focusing of the microscopic image combined with measurements of the density profile of particle tracks, and speeding up of measurements by automatic data transfer. The impact parameter, the closest distance to an object's geometric center, is determined with a mean accuracy of 0.3 micron for 1 micron spores; using this information and other data the energy deposit and its localization at the object can be determined. M.L.

A78-15193 **Biological effects of high-LET particles on corn-seed embryos in the Apollo-Soyuz test project - Biostack III experiment.** D. D. Peterson, E. V. Benton, M. Tran (San Francisco, University, San Francisco, Calif.), T. Yang, M. Freeling, L. Craise, and C. A. Tobias (California, University, Berkeley, Calif.). In: Life sciences and space research XV; Proceedings of the Open Meeting of the Working Group on Space Biology, Philadelphia, Pa., June 8-19, 1976. Oxford and New York, Pergamon Press, 1977, p. 151-155.

A78-15194 **Calculation of the radiobiological effects of heavy ions on eggs of *Artemia salina* flown in the Biostack experiments.** W. Heinrich (Siegen, Gesamthochschule, Siegen, West

Germany). In: Life sciences and space research XV; Proceedings of the Open Meeting of the Working Group on Space Biology, Philadelphia, Pa., June 8-19, 1976. Oxford and New York, Pergamon Press, 1977, p. 157-163. 17 refs.

A78-15195 **Preliminary results of the Biobloc experiment on the Cosmos 782 flight - Effects of cosmic rays on brine shrimp eggs and tobacco seeds.** Y. Blanquet, H. Paniel, G. Gasset, M. Delpoux, B. Pianezzi (Toulouse III, Université, Toulouse, France), Kh. G. Gregoriev, V. A. Benevolenskii, V. J. Popov, A. M. Marenyi (Centre de Recherches Médico-Biologiques, Moscow, USSR), and C. Jacquot (CNRS, Centre de Recherches Nucléaires de Strasbourg, Strasbourg, France). In: Life sciences and space research XV; Proceedings of the Open Meeting of the Working Group on Space Biology, Philadelphia, Pa., June 8-19, 1976. Oxford and New York, Pergamon Press, 1977, p. 165-168.

A78-15196 **Response of cultured mammalian cells to accelerated krypton particles.** T. C. H. Yang, E. Blakely, A. Chatterjee, G. Welch, and C. A. Tobias (California, University, Berkeley, Calif.). In: Life sciences and space research XV; Proceedings of the Open Meeting of the Working Group on Space Biology, Philadelphia, Pa., June 8-19, 1976. Oxford and New York, Pergamon Press, 1977, p. 169-174. 9 refs.

Cellular radiosensitivity was studied in an experiment involving the bombardment of human kidney cells in the exponential growth phase by Kr-84 ions accelerated to 3 MeV per amu. Results of the investigation indicated that the cross-section of the radiosensitive area in the cells was 145 sq microns. In addition, it appeared that the nucleus was the only site sensitive to high linear energy transfer radiation, and that a single hit of the krypton particles in the nuclear region could lead to lethal effects. The mechanism by which the heavy particle may damage the nuclear region is also discussed. J.M.B.

A78-15197 * **Effects of radiation upon the light-sensing elements of the retina as characterized by scanning electron microscopy.** M. J. Malachowski, C. A. Tobias (California, University, Lawrence Berkeley Laboratory, Berkeley, Calif.), and J. T. Leith (Arizona, University, Tucson, Ariz.). In: Life sciences and space research XV; Proceedings of the Open Meeting of the Working Group on Space Biology, Philadelphia, Pa., June 8-19, 1976.

Oxford and New York, Pergamon Press, 1977, p. 175-181. 17 refs. NASA Order T-7163-B.

A model system using *Necturus maculosus*, the common mudpuppy, was established for evaluating effects of radiation upon the light-sensing elements of the retina. Accelerated heavy ions of helium and neon from the Berkeley Bevalac were used. A number of criteria were chosen to characterize radiation damage by observing morphological changes with the scanning electron microscope. The studies indicated retina sensitivity to high-LET (neon) particles at radiation levels below 10 rads (7 particles per visual element) whereas no significant effects were seen from fast helium ions below 50 rads. (Author)

A78-15198 * **Metabolic energy requirements during manned orbital Skylab missions.** P. C. Rambaut, C. S. Leach (NASA, Johnson Space Center, Houston, Tex.), and G. D. Whedon (National Institutes of Health, Bethesda, Md.). In: Life sciences and space research XV; Proceedings of the Open Meeting of the Working Group on Space Biology, Philadelphia, Pa., June 8-19, 1976. Oxford and New York, Pergamon Press, 1977, p. 187-191. 11 refs.

The metabolic balance of nine Skylab astronauts was studied during the course of 28-, 59-, and 84-day flights. Control periods of at least three weeks preceding each flight and at least 18 days following each flight were included in the metabolic studies. Results of the investigation indicated that all members lost mass in flight without experiencing an increase in body density. Analysis of bone density, blood and urinary nitrogen levels, and overall calcium and nitrogen balances suggested that lean body mass declined through loss of protein. It thus appeared that despite adequate energy intake, the crew members did not reach equilibrium with the weightless environment within the time periods studied. J.M.B.

A78-15199 Preliminary results of medical investigations during manned flights of the Salyut 4 Orbital Station. E. I. Vorob'ev, O. G. Gazenko, N. N. Gurovskii, Iu. G. Nef'edov, B. B. Egorov, I. I. Brianov, A. M. Genin, V. A. Degtiarev, A. D. Egorov, and A. V. Eremin (Ministerstvo Zdravookhraneniia SSSR, Institut Mediko-Biologicheskikh Problem, Moscow, USSR). In: Life sciences and space research XV; Proceedings of the Open Meeting of the Working Group on Space Biology, Philadelphia, Pa., June 8-19, 1976. Oxford and New York, Pergamon Press, 1977, p. 199-206.

Heart rate and respiration were investigated for cosmonauts participating in a 30-day and a 63-day mission on board the Salyut 4 Orbital Station. In addition to assessing the general trend in metabolic changes, the study monitored variations in heart rate during bicycle ergometry tests and during application of negative pressure to the lower body. Adaptive responses to weightlessness, as well as the diet and work schedules of the cosmonauts were also taken into consideration. J.M.B.

A78-15200 * Medically important micro-organisms recovered from Apollo-Soyuz Test Project /ASTP/ crew members. G. R. Taylor (NASA, Johnson Space Center, Houston, Tex.) and S. N. Zaloguev (Ministerstvo Zdravookhraneniia SSSR, Institut Mediko-Biologicheskikh Problem, Moscow, USSR). In: Life sciences and space research XV; Proceedings of the Open Meeting of the Working Group on Space Biology, Philadelphia, Pa., June 8-19, 1976. Oxford and New York, Pergamon Press, 1977, p. 207-212. 14 refs.

The Apollo-Soyuz Test Project (ASTP) provided an opportunity to study in-flight cross-contamination and other behavior of microbial populations carried by the crews. The medical microbiology analysis showed that although various potential pathogens were found, no disease elements were reported. Dysbacteriosis (in which sampled areas are flooded with large numbers of a single type of microorganism) was not found, although there was a large increase in the incidence of gram-negative rods in the oral cavities of the two cosmonauts. The results obtained may be applied to future space flights. S.C.S.

A78-15201 * Continuous 30-day measurements utilizing the monkey metabolism pod. N. Pace, A. M. Kodama, R. C. Mains, D. F. Rahlmann, and B. W. Grunbaum (California, University, Berkeley, Calif.). In: Life sciences and space research XV; Proceedings of the Open Meeting of the Working Group on Space Biology, Philadelphia, Pa., June 8-19, 1976. Oxford and New York, Pergamon Press, 1977, p. 213-218. 7 refs. Grant No. NGL-05-003-024.

A fiberglass system was previously described, using which quantitative physiological measurements could be made to study the effects of weightlessness on 10 to 14 kg adult monkeys maintained in comfortable restraint under space flight conditions. Recent improvements in the system have made it possible to obtain continuous measurements of respiratory gas exchange, cardiovascular function, and mineral balance for periods of up to 30 days on pig-tailed monkeys. It has also been possible to operate two pods which share one set of instrumentation, thereby permitting simultaneous measurements to be made on two animals by commutating signal outputs from the pods. In principle, more than two pods could be operated in this fashion. The system is compatible with Spacelab design. Representative physiological data from ground tests of the system are presented. (Author)

A78-15202 Prevention of human deconditioning during prolonged immersion in water. E. B. Shul'zhenko, I. F. Vil-Vil'iams, A. I. Grigor'ev, K. I. Gogolev, and M. A. Khudiakova (Ministerstvo Zdravookhraneniia SSSR, Institut Mediko-Biologicheskikh Problem, Moscow, USSR). In: Life sciences and space research XV; Proceedings of the Open Meeting of the Working Group on Space Biology, Philadelphia, Pa., June 8-19, 1976. Oxford and New York, Pergamon Press, 1977, p. 219-224. 9 refs.

A 56-day immersion experiment in which two subjects participated was carried out to assess the preventive effect of periodic

acceleration combined with exercise and water-salt consumption. Exposure to acceleration increased the static component of the load upon the musculoskeletal system, increased the gradient of the blood hydrostatic pressure, activated mechanisms responsible for the venous return to the heart, and stimulated the systems regulating antidiuretic and antisodiumdiuretic reflexes. Involvement of these mechanisms restored the haemodynamic parameters, fluid-electrolyte balance, and blood coagulability. The prophylactic effect of acceleration was enhanced if combined with exercise and supplemented water-salt consumption. (Author)

A78-15203 Circulatory adaptive reactions under hypergravity in normal and cold environments. P. Groza, E. Daneliuc, E. Nicolescu, A. Bordeianu, R. Carmaciu, and S. Cananau (Institutul de Fiziologie Normala si Patologica, Bucharest, Rumania). In: Life sciences and space research XV; Proceedings of the Open Meeting of the Working Group on Space Biology, Philadelphia, Pa., June 8-19, 1976. Oxford and New York, Pergamon Press, 1977, p. 239-244. 14 refs.

Rats subjected to various levels of +G-z acceleration exhibited an increased blood concentration of noradrenalin and adrenalin, indicative of a sympatho-adrenergic reaction. Under the same conditions, from plasma determinations, and by histochemical examination of the supraoptic nucleus, an increased antidiuretic response was noted. This response decreased in a cold environment. (Author)

A78-15204 * Food and oxygen requirements for growing mice and turtles after hypergravitational development. C. C. Wunder, W. J. Moressi (Iowa, University, Iowa City, Iowa), C. H. Dodge (Library of Congress, Washington, D.C.), and K. M. Cook (Coe College, Cedar Rapids, Iowa). In: Life sciences and space research XV; Proceedings of the Open Meeting of the Working Group on Space Biology, Philadelphia, Pa., June 8-19, 1976. Oxford and New York, Pergamon Press, 1977, p. 245-249. 24 refs. Grants No. NIH-GM-10093; No. NGR-16-001-031; Contract No. NAS2-6064.

A78-15205 Gravitational influences upon the maintenance requirements of rabbits. A. H. Smith and M. J. Katovich (California, University, Davis, Calif.). In: Life sciences and space research XV; Proceedings of the Open Meeting of the Working Group on Space Biology, Philadelphia, Pa., June 8-19, 1976. Oxford and New York, Pergamon Press, 1977, p. 257-261. 14 refs.

A78-15206 * The effect of increased gravitational stress on bone. R. S. Riggins and K. A. Chacko (California, University, Davis, Calif.). In: Life sciences and space research XV; Proceedings of the Open Meeting of the Working Group on Space Biology, Philadelphia, Pa., June 8-19, 1976. Oxford and New York, Pergamon Press, 1977, p. 263-265. 12 refs. Grant No. NGR-05-004-008.

A group of 34 adult male chickens were chronically accelerated over an 18-week period; for the last 4 weeks the surviving animals were subjected to a 3-g field. Males of a similar weight and age were used as static controls. The objective was to evaluate the effects of an altered gravitational state on the physical properties of the tibia bone tested for torsional fracture. Of the 34 initial animals, 15 survived for the entire period and were subjected to analysis. The results suggest that the altered morphology produced by increased gravitational fields does not materially affect bone strength, at least in torsion. Decreased bone diameters were accompanied by increased cortical thickness without change in the bone resistance to torsion. The findings of increased cortical thickness with decreased bone diameter suggest reversal of the usual cellular dynamics of adult bone. Data on bone ash and density failed to reveal any substantial changes in bone mineral or organic content. Histological examination of the cortical bone did not disclose any evidence of pathology. S.D.

A78-15207 Biological experiments on the orbital station Salyut 4. N. P. Dubinin, Ia. L. Glembotskii, E. N. Vaulina, A. I.

Merkis, R. S. Laurinavichius, L. R. Palmbakh, T. Ia. Grozdova, T. A. Kholikova, A. V. Iaroshius, and A. L. Mashinskii (Akademiiia Nauk SSSR, Moscow, USSR). In: Life sciences and space research XV; Proceedings of the Open Meeting of the Working Group on Space Biology, Philadelphia, Pa., June 8-19, 1976.

Oxford and New York, Pergamon Press, 1977, p. 267-272.

Two series of experiments were carried out on board the orbital station Salyut 4: one series consisted of two experiments (30 and 62 days, respectively) designed to study the effect of space-flight factors on the growth and development of *Drosophila melanogaster*, strain D-32. The other series consisted of two experiments (24-33 days) designed to study the effect of space-flight factors on the growth and development of the dwarf pea, variety 'Pioneer'. Analysis of the progeny from flies exposed to space flight showed an increase in the rate of visible mutations for γ , ct , w and vg loci over those observed in the earth control. Space flight factors produced no noticeable effect on the first growth stages of pea plants. Later on, growth stopped and most of the plants died under weightlessness conditions at the age of 2 to 3 weeks. Possible causes for their death during flight are discussed on the basis of anatomic-morphological, cytological, and biochemical analyses of the experimental plants and controls. (Author)

A78-15208 **Chronic acceleration in plants.** B. F. Edwards and S. W. Gray (Emory University, Atlanta, Ga.). In: Life sciences and space research XV; Proceedings of the Open Meeting of the Working Group on Space Biology, Philadelphia, Pa., June 8-19, 1976.

Oxford and New York, Pergamon Press, 1977, p. 273-278. 45 refs.

The centrifuge has been used in studies of hypergravity effects on plants. Measurements have been taken on the forces needed to stratify cell contents, to suppress cytoplasmic streaming, and to reduce auxin transport. It has been found that: (1) in the range of 2-25 g auxin transport and geotropic response in coleoptiles are increased and growth is stimulated, (2) from 25-500 g coleoptile growth is reduced and some morphological changes occur, (3) at 100-2500 g root formation in willow cuttings increases, (4) from 1000 g upwards cytoplasmic stratification occurs and seed germination decreases, (5) from 200-15,000 g chromosome damage occurs, (6) from 5000-20,000 g algal cell polarity may be reversed, and (7) above 30,000 g some cells cease to respond to gibberellic acid. S.C.S.

A78-15209 * **Nutations of sunflower seedlings on tilted clinostats.** A. H. Brown (University City Science Center, Philadelphia, Pa.) and D. K. Chapman (Pennsylvania, University, Philadelphia, Pa.). In: Life sciences and space research XV; Proceedings of the Open Meeting of the Working Group on Space Biology, Philadelphia, Pa., June 8-19, 1976. Oxford and New York, Pergamon Press, 1977, p. 279-283. 8 refs. Grants No. NGR-39-010-149; No. NGR-39-030-010.

The kinetics of hypocotyl nutations in *Helianthus annuus* L. were measured on plants which were rotated on clinostats with axes of rotation inclined at various angles, α , away from the vertical. The g-force component acting in the direction of the plant axis was taken as $g \cos \alpha$. The average period and average amplitude of nutation were constant for all such axially directed g-forces between 1.0 and 0.2 g (vertical to about 80 inclination). On the horizontal clinostat (90 inclination) nutation was neither initiated nor sustained. The g-force just sufficient fully to activate nutational oscillations should be sought for g-force parameter values ranging from 0 to 0.2. (Author)

A78-15210 **Effect of weightlessness and of artificial gravity on irradiated lettuce seeds.** Iu. G. Grigoriev, L. V. Nevzgodina (Ministerstvo Zdravookhraneniia SSSR, Institut Mediko-Biologicheskikh Problem, Moscow, USSR), A. T. Miller, A. O. Krustyn, and B. A. Shteine (Latvian Academy of Sciences, Institute of Biology, Riga, Latvian SSR). In: Life sciences and space research XV; Proceedings of the Open Meeting of the Working Group on Space Biology, Philadelphia, Pa., June 8-19, 1976.

Oxford and New York, Pergamon Press, 1977, p. 285-289.

A78-15211 **Effects of weightlessness, space orientation and light on geotropism and the formation of fruit bodies in higher fungi.** G. G. Zharikova, A. B. Rubin, and A. V. Nemchinov (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR). In: Life sciences and space research XV; Proceedings of the Open Meeting of the Working Group on Space Biology, Philadelphia, Pa., June 8-19, 1976. Oxford and New York, Pergamon Press, 1977, p. 291-294. 7 refs.

A78-15212 **Apollo-Soyuz test project on biorhythm of zone-forming fungi - Preliminary work.** I. G. Akoev, A. Kh. Akhmadieva, A. P. Savel'ev, A. L. Mashinskii, N. I. Konshin, S. S. Iurov, A. A. Leonov, V. N. Kubasov, A. V. Filipchenko, and N. N. Rukavishnikov (Akademiiia Nauk SSSR, Institut Biologicheskoi Fiziki, Moscow, USSR). In: Life sciences and space research XV; Proceedings of the Open Meeting of the Working Group on Space Biology, Philadelphia, Pa., June 8-19, 1976. Oxford and New York, Pergamon Press, 1977, p. 295-298.

General and localized effects of space flight factors on cellular rhythm activity and on the morphological and genetic properties of zone-forming fungi (the Pushchino strain of *Actinomyces levoris*) is studied. Distinct and continuous rings of spore formation were observed. It is felt that these reflect a high degree of synchronism in changing reproductive forms, seen as transparent rings alternating with convex white rings. An examination of a bacteriophage film culture was used for registering the influence of local radiation by studying genetic effects such as mutation frequency, induced radiation and its spectrum, and subsequent revertability through chemical mutagens. S.C.S.

A78-15213 * **Growth-rate periodicity of *Streptomyces levoris* during space flight.** T. D. Rogers, M. E. Brower (Northrop Services Life Sciences Laboratory, Houston, Tex.), and G. R. Taylor (NASA, Johnson Space Center, Life Sciences Directorate, Houston, Tex.). In: Life sciences and space research XV; Proceedings of the Open Meeting of the Working Group on Space Biology, Philadelphia, Pa., June 8-19, 1976. Oxford and New York, Pergamon Press, 1977, p. 299-305. 10 refs.

Streptomyces levoris provides a suitable biological test system to investigate the effects of space flight on the rhythms of vegetative and spore phase characteristics of both growth-rate periodicity and culture morphology during the pre-, in-, and post-flight periods of the Apollo-Soyuz Test Project. The objectives of the American participation were to study the effects of space flight on the biorhythms of *Streptomyces levoris* based on a comparison of the growth-rate periodicity of the vegetative and spore phase within each culture, to examine the possible alteration of spore morphology and development by SEM, and to compare the effects of a 12-hr phase shift on the periodic growth characteristics of this microorganism in cultures which were exchanged during the joint activities of the space flight. No uniform differences in the biorhythm of *Streptomyces levoris* during space flight were observed. It appears that the single most variable factor related to the experiment was the lack of temperature control for the space-flight specimens. S.D.

A78-15214 **Apollo-Soyuz test project on biorhythm of zone-forming fungi - Results of experiments.** I. G. Akoev, A. P. Savel'ev, and A. Kh. Akhmadieva (Akademiiia Nauk SSSR, Institut Biologicheskoi Fiziki, Moscow, USSR). In: Life sciences and space research XV; Proceedings of the Open Meeting of the Working Group on Space Biology, Philadelphia, Pa., June 8-19, 1976. Oxford and New York, Pergamon Press, 1977, p. 307-313.

Changes in the biorhythms of spore-forming fungal cultures on board the joint Apollo-Soyuz mission of July, 1975 are analyzed. Significant differences in the growth of the Apollo and the Soyuz control cultures were noted. In addition, an arrhythmia in spore-ring development was exhibited by the flight specimens. Possible explanations for this arrhythmia, including temperature oscillations during space flight and the absence of the habitual geophysical synchronization, are reviewed. J.M.B.

A78-15225 Electromagnetic power deposition in prolate spheroid models of man and animals at resonance. P. W. Barber (Utah, University, Salt Lake City, Utah). *IEEE Transactions on Biomedical Engineering*, vol. BME-24, Nov. 1977, p. 513-521. 15 refs. USAF-supported research; NSF Grant No. GK-43124.

The Extended Boundary Condition Method is used to calculate resonance region power deposition in prolate spheroid models of animals and man. The mathematical models consist of homogeneous distributions of muscle tissue, although in the case of the man model calculations, a model consisting of homogenized muscle, fat, and bone is also considered. Calculations are made for bodies isolated in free space and irradiated by a plane wave. Resonant frequencies and power absorption characteristics are predicted for man and a number of commonly used experimental animals. The results given here will be useful in providing a theoretical basis for the interpretation of experimental results and in extrapolating experimentally derived animal results to man's body configuration. (Author)

A78-15254 Acute toxicity of selected hydrazines to the common guppy. A. R. Slonim (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio). *Water Research*, vol. 11, no. 10, 1977, p. 889-895. 16 refs.

Hydrazine, unsymmetrical dimethylhydrazine (UDMH), Aerozine-50 and monomethylhydrazine were evaluated, respectively, in three or four static bioassays each using hard and soft water. Hydrazine was the most toxic compound and UDMH the least toxic to common guppies. Hydrazine was significantly more toxic in soft water than hard water, whereas UDMH was the opposite. The results of bioassays in which survival times of fish pre-exposed to these compounds were compared to those previously unexposed, along with other observations, indicate that the toxic effects of the hydrazines are cumulative. The effects of chemical differences in these compounds, of water quality characteristics and of other factors on acute toxicity are discussed. (Author)

A78-15280 Trichromatic vision in the cat. J. Ringo, M. L. Wolbarsht, R. Crocker, F. Amthor (Duke University, Durham, N.C.), and H. G. Wagner (U.S. Public Health Service, National Institute of Neurological and Communicative Diseases and Stroke, Bethesda, Md.). *Science*, vol. 198, Nov. 18, 1977, p. 753-755. 32 refs. Contract No. F41609-76-C-0020.

A study of the retina of the cat was conducted with the aid of electrophysiological techniques. In the investigation abundant evidence was found for three separate cone systems at the ganglion-cell level. Levick-style tungsten-in-glass microelectrodes were advanced into the eye through an incision in the sclera in order to make extracellular recordings from isolated retinal ganglion cells. Threshold spectral sensitivity curves were plotted in both the center and the surround with various spectral backgrounds. Three independent cone systems were present with peak sensitivities at 450, 500, and 555 nm. G.R.

A78-15312 Flurazepam effects on slow-wave sleep - Stage 4 suppressed but number of delta waves constant. I. Feinberg, G. Fein, J. M. Walker, L. J. Price, T. C. Floyd, and J. D. March (U.S. Veterans Administration Hospital; California, University, San Francisco, Calif.). *Science*, vol. 198, Nov. 25, 1977, p. 847, 848. 27 refs. Research supported by the U.S. Veterans Administration; Grant No. PHS-DA-4RG-012.

Repeated administration of flurazepam reduced stage 4 sleep (high delta-wave concentration) but produced a greater increase in stage 2 duration so that total sleep time was increased. Computer analysis revealed that the increased amount of stage 2 (low delta-wave concentration) sleep provided a number and duration of delta waves sufficient to offset the loss of delta activity in stage 4. However, the amplitude of the average delta wave was reduced. These results demonstrate the value of direct quantification of delta-wave activity, the variable that underlies visual classification of slow-wave sleep into stages 2 to 4. They also give rise to new hypotheses regarding the relative absence of side effects in spite of profound stage 4 suppression by flurazepam and the mechanisms by which total sleep time is increased by this drug. (Author)

A78-15313 Magnification in striate cortex and retinal ganglion cell layer of owl monkey - A quantitative comparison. J. Myerson, P. B. Manis, F. M. Miezins, and J. M. Allman (California Institute of Technology, Pasadena, Calif.). *Science*, vol. 198, Nov. 25, 1977, p. 855-857. 31 refs. Grants No. NIH-NS-12131; No. NIH-NS-00178.

Magnification, the relative size of the neural representation of a portion of the visual field, decreases more rapidly with increasing visual field eccentricity in striate cortex than in the retinal ganglion cell layer of the owl monkey (*Aotus trivirgatus*); the proportion of the cells in striate cortex devoted to central vision is much larger than the comparable proportion of retinal ganglion cells. Magnification in striate cortex is a power function of magnification in the retinal ganglion cell layer. A formula for convergence (ganglion cells to cortical neurons) follows from this relationship. (Author)

A78-15380 Stochastic models of algal photosynthesis in turbulent channel flow. M. Sheth, D. Ramkrishna (Indian Institute of Technology, Kanpur, India), and A. G. Fredrickson (Minnesota, University, Minneapolis, Minn.). *AIChE Journal*, vol. 23, Nov. 1977, p. 794-804. 18 refs.

Models have been formulated and analyzed for photosynthesis by algae in turbulent, channel flow. Analytical and computational results for different stochastic, kinematic models of algal motion have been obtained for two different rate mechanisms. The results indicate that turbulent mixing can achieve an increase in the rates and efficiencies of photosynthesis by realizing the intermittency effects. Optimum levels of turbulence are shown to exist in turbulent channel flow for the mass cultivation of algae. The methodology of this paper is relevant to photochemical reactions in general. (Author)

A78-15403 Absence of color-selectivity in Duncker-type induced visual movement. R. H. Day and R. G. Dickinson (Monash University, Clayton, Victoria, Australia). *Perception and Psychophysics*, vol. 22, no. 4, Oct. 1977, p. 313-320. 10 refs. Australian Research Grants Committee Grant No. A65/15940.

The paper considers a series of six experiments dealing with whether the effects of color combinations of target and field and of monoptic and dichoptic viewing, as previously reported by Over and Lovegrove (1973) for grating patterns, is valid for a display composed of a stationary point and an enclosing, moving frame. The results obtained suggest that the results found by Over and Lovegrove for the effect of like and different colors between target and field are restricted to certain stimulus conditions. It is concluded that the theory that induced movement results from inhibitory interaction between feature detectors with similar response characteristics based on color-selectivity in monoptic viewing must be rejected. S.C.S.

A78-15404 Effect of disparity and viewing distance on perceived depth. M. Ritter (Marburg, Universität, Marburg an der Lahn, West Germany). *Perception and Psychophysics*, vol. 22, no. 4, Oct. 1977, p. 400-407. 32 refs. Translation.

It is shown that veridical depth perception presupposes the processing of both the magnitude of retinal disparity and observation distance according to a square-law function specified by the underlying geometrical stimulus relations. In the present study, after testing its existence, this constancy of depth perception was investigated by measuring perceived depth as a function of retinal disparity and observation distance. In addition, the relative effectiveness of convergence and accommodation as possible indicators of distance was examined through a conflicting-cues paradigm. It was shown that in the perception of depth the visual system computes distance by taking into account the convergence parameter only, rather than that of accommodation or of both. (Author)

A78-15516 Anti-G suit effect on cardiovascular dynamic changes due to +Gz stress. D. F. Peterson, V. S. Bishop, and H. H. Erickson (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 43, Nov. 1977, p. 765-769. 17 refs. Grant No. AF-AFOSR-73-2525.

Acceleration experiments were conducted on 16 anesthetized mongrel dogs (10-12 kg) exposed for 1 min to a stressful +Gz acceleration without and with an abdominal bladder-type anti-G suit. The objective was to determine the degree and nature of cardiovascular protection provided by the anti-G suit during and after +Gz acceleration. During +3 Gz acceleration, all recorded dynamic parameters are lowered and transient tachycardia takes place. It is shown that activation of an abdominal bladder-type suit reverses the deleterious cardiovascular effects due to +3 Gz stress. At +6 Gz, partial protection from adverse cardiovascular effects is obtained by suit inflation. The results indicate that although the tested dogs did not tolerate +3 Gz acceleration well without the protection of an anti-G suit, changes in the internal diameter of the left ventricle were not as dramatic as were changes in other parameters. S.D.

A78-15517 Hypothalamic thermoregulatory pathways in the rat. T. M. Gilbert (John B. Pierce Foundation, New Haven, Conn.) and C. M. Blatteis (Tennessee, University, Memphis, Tenn.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 43, Nov. 1977, p. 770-777. 39 refs. Grant No. PHS-A1-09957.

Microtomic experiments were conducted on 240 adult male rats (325 + or - 25 g) using microknives for selective isolation of the preoptic-anterior hypothalamus (PO/AH) from its several neural connections with a view toward determining whether individual autonomic thermoregulatory responses may be regulated separately. Specific fiber tracts to and from various regions of the hypothalamus previously shown to be involved in autonomic temperature regulation were cut, and the resulting changes in thermoeffector functions were measured in the conscious rats during exposure to heat and cold. It is found that (1) cold-induced cutaneous vasoconstriction and shivering may be integrated in separate areas of the hypothalamus, viz., the preoptic area and the posterior hypothalamus; (2) cold-induced vasoconstriction may depend on the integrity of the preoptic area; and (3) heat-induced cutaneous vasodilation may be controlled separately from cold-induced cutaneous vasoconstriction at a site more caudal than the preoptic area, possibly in the medulla. S.D.

A78-15518 Effects of acute prolonged hypoxia on cardiovascular dynamics in dogs. J. F. Borgia and S. M. Horvath (California, University, Santa Barbara, Calif.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 43, Nov. 1977, p. 784-789. 30 refs. Grant No. AF-AFOSR-73-2455.

Intact anesthetized dogs were exposed for 75 min to either 5.75, 9.0, or 12.0% oxygen in nitrogen. Although pulmonary artery pressures were significantly elevated in all hypoxic exposures, systemic hypertension occurred only at the onset of severe hypoxia. Coronary blood flow increased from an average of 130 during normoxia to a peak of 400 ml/100 g per min during inhalation of 5.75% O₂, and coronary sinus oxygen tensions of 8 torr and oxygen contents of 1.1 ml/100 ml were sustained for 75 min without biochemical, functional, or electrophysiological evidence of myocardial ischemia. Cardiac index (CI) increased significantly only during severe hypoxia, with the greatest elevation after 30 min. Subsequently, CI decreased concomitantly with a 27% elevation in arterial hemoglobin concentration and oxygen-carrying capacity. It is concluded that the hypoxic threshold for significant elevations of cardiac output is between 6.0 and 9.0% O₂. (Author)

A78-15519 Altered control of skin blood flow during exercise at high internal temperatures. G. L. Bregelmann, J. M. Johnson, L. Hermansen, and L. B. Rowell (Washington, University, Seattle, Wash.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 43, Nov. 1977, p. 790-794. 17 refs. Research supported by the American Physiological Society; Grants No. NIH-RR-37; No. NIH-HL-16910.

A78-15520 * Environmental synchronizers of squirrel monkey circadian rhythms. F. M. Sulzman, C. A. Fuller, and M. C. Moore-Ede (Harvard University, Harvard Medical School, Boston, Mass.). *Journal of Applied Physiology: Respiratory, Environmental*

and Exercise Physiology, vol. 43, Nov. 1977, p. 795-800. 28 refs. NSF Grant No. PCM-6-19943; Contract No. NAS9-14249; Grant No. NIH-GN-22085.

Various temporal signals in the environment were tested to determine if they could synchronize the circadian timing system of the squirrel monkey (*Saimiri sciureus*). The influence of cycles of light and dark, eating and fasting, water availability and deprivation, warm and cool temperature, sound and quiet, and social interaction and isolation on the drinking and activity rhythms of unrestrained monkeys was examined. In the absence of other time cues, 24-hr cycles of each of these potential synchronizers were applied for up to 3 wk, and the periods of the monkey's circadian rhythms were examined. Only light-dark cycles and cycles of food availability were shown to be entraining agents, since they were effective in determining the period and phase of the rhythmic variables. In the presence of each of the other environmental cycles, the monkey's circadian rhythms exhibited free-running periods which were significantly different from 24 hr with all possible phase relationships between the rhythms and the environmental cycles being examined. (Author)

A78-15521 Response of medullary respiratory neurons to hypercapnia and isocapnic hypoxia. W. M. Saint John and S. C. Wang (Columbia University, New York, N.Y.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 43, Nov. 1977, p. 812-821. 29 refs. Grants No. NIH-18009; No. NIH-20574; No. NIH-00031.

A78-15522 Phosphagen and lactate contents of m. quadriceps femoris of man after exercise. R. C. Harris, K. Sahlin, and E. Hultman (St. Eriks Sjukhus; Serafimerlasarettet, Stockholm, Sweden). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 43, Nov. 1977, p. 852-857. 30 refs. Research supported by the Swedish Medical Research Council. SMRC Project B77-19X-2647-09C.

A78-15582 Controlling human heat content - Method and application. S. Troutman, J. F. Annis, and P. Webb (Webb Associates, Yellow Springs, Ohio). In: *NAECON '77; Proceedings of the National Aerospace and Electronics Conference*, Dayton, Ohio, May 17-19, 1977. New York, Institute of Electrical and Electronics Engineers, Inc., 1977, p. 259-266. 6 refs.

Regulation of temperature and flow rate of water through a network of tubing on a man's surface while minimizing heat exchange with the environment gives us direct control over human thermal exchange. Body heat content can be increased, maintained constant, or reduced, causing, respectively, hyperthermia, thermal balance, and hypothermia. Hyperthermia and hypothermia are interesting physiologically, and it is especially useful to be able to produce and sustain known states of body heat storage. Hyperthermia is used in treating disease, particularly in cancer therapy. Hypothermia is common among divers and victims of accidents at sea. The measurement of heat loss is direct calorimetry, which is the fundamental measurement for studying human energetics. We will illustrate the uses of controlled heat exchange for: (1) hyperthermia; (2) a calorimetric study of body heat loss; and (3) 24-hr patterns of energy exchange in resting subjects. (Author)

A78-15583 Good and poor tracking performance manifest in error and eye movement phase planes. E. J. Hartzell and D. W. Repperger (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, Ohio). In: *NAECON '77; Proceedings of the National Aerospace and Electronics Conference*, Dayton, Ohio, May 17-19, 1977. New York, Institute of Electrical and Electronics Engineers, Inc., 1977, p. 272-275.

Subjects operating an anti-aircraft artillery (AAA) simulation while tracking an input representing the flyby of a target aircraft experience psychomotor stress. Analysis of subject performance in terms of standard tracking metrics and the relationship with eye movements forms the basis of the work reported here. Teams of well trained (two each) trackers were first classified as 'good' or 'poor' performers based on the results of rms error analysis. Once the teams

were discriminated in terms of performance, the eye movement patterns representing each team were characterized and the differences studied. A phase plane analysis of the eye error signal during the continuous task was conducted. Eye error was defined as distance between the reference cross hair in the simulator field of view and the point of regard of the eye measured by electro-oculographic techniques. The phase plane was able to discriminate between trackers who tend to fixate during the difficult segments of the task versus those who attempt to follow the variations in perceived tracking error. (Author)

A78-15632 **Manned maneuvering unit for Shuttle EVA.** R. B. Schroer (Martin Marietta Aerospace, Denver, Colo.). In: *NAECON '77; Proceedings of the National Aerospace and Electronics Conference*, Dayton, Ohio, May 17-19, 1977. New York, Institute of Electrical and Electronics Engineers, Inc., 1977, p. 692-700.

Extravehicular activity (EVA) technology has steadily advanced since the first brief space walk. Evaluation of a number of self-contained astronaut maneuvering units on the Skylab program verified the desirability of the Astronaut Maneuvering Unit, Experiment M509. This experience has been incorporated into the design of an operational Manned Maneuvering Unit (MMU) for Space Shuttle EVA. The MMU will support tasks such as payload inspection, contingency operations, and orbital assembly. Technology and configuration tradeoffs resulted in selection of a fail safe propulsive backpack using noncontaminating gaseous nitrogen. The MMU is separable into two identical halves with independent hand controller switches, control electronics, power supplies, and propulsion components. Direct hand controller operation is supplemented by an automatic stabilization capability to ease astronaut fatigue. The MMU is attached to a flight support station in the Orbiter payload bay for launch, entry, and on-orbit stowage. (Author)

A78-15903 **The retinex theory of color vision.** E. H. Land (Polaroid Corp., Cambridge, Mass.). *Scientific American*, vol. 237, Dec. 1977, p. 108-120, 122, 123, 126, 128.

A description is given of investigations concerning the approaches used by the visual system to extract reliable color information from the objects of the environment, taking into account the unevenness of lighting conditions and the variations in the spectral composition of the radiation falling on a scene. The investigations have led to the proposal of a model in which sequential products are computed along many arbitrary pathways that wander through the two-dimensional array of energies on the model's 'retina'. The first value in any sequence is arbitrarily assumed to be 100 percent. The computer model developed makes it possible to obtain a triplet of lightnesses for each area in the color Mondrian that corresponds closely to the lightnesses one would measure with a combined retinex filter and photomultiplier. G.R.

A78-15931 **Cardiovascular response during manned space flights.** I. I. Brianov, V. A. Degtiarev, A. D. Egorov, V. V. Kalinichenko, and A. P. Poliakova. *International Astronautical Federation, International Astronautical Congress, 28th, Prague, Czechoslovakia, Sept. 25-Oct. 1, 1977, Paper 77-252*. 17 p. 21 refs.

The report summarizes the results of cardiovascular system studies performed during and after a series of space flights, including flights in orbital stations. Changes in the heart rate and phase composition of the cardiac cycle in flights with no countermeasures pointed to an underload type of response and a more effective functioning of the heart. During complicated operations involved in spacecraft maneuvering or during orbital station flights when a wide variety of countermeasures was used, no evidence of underload response was recorded. Changes in the cardiac bioelectrical activity in flight were minor. Signs of possible blood redistribution were manifested in a sensation of blood rush to the head and in changes in some hemodynamic indices. After flight, a less effective functioning of the cardiovascular system at rest and a more pronounced response to exercise tests were observed. An orthostatic deconditioning was found both during inflight and postflight periods. A circulatory adaptation to zero-G was manifested in decreased disturbances of

systemic hemodynamics and blood flow to the head during the postflight antiorthostatic tests. (Author)

A78-15947 **A phantom-motion aftereffect.** N. Weisstein, W. Maguire, and K. Berbaum (New York, State University, Buffalo, N.Y.). *Science*, vol. 198, Dec. 2, 1977, p. 955-958. 23 refs. NSF Grant No. BNS-76-02052; Grant No. NIH-5-R01-EY-01330-03.

Motion aftereffects, typically found to result only from localized retinal stimulation, were obtained within regions of the visual field that had not been stimulated by moving contours. 'Phantom' stripes are seen moving through a physically homogeneous (empty) region of the visual field when vertical stripes move above and below that region. Immediately afterward, stationary stripes in the previously empty region appear to move in the opposite direction. This phantom-motion aftereffect provides a novel instance of the way global structure affects processes that have been assumed to be influenced only by simpler local spatial and temporal variables. (Author)

A78-15948 **Optical transforms and the 'pincushion grid' illusion.** M. L. Rudee (California, University, La Jolla, Calif.), J. F. Boulter (Defence Research Establishment Valcartier, Courcellette, Quebec, Canada), A. P. Ginsburg, and F. W. Campbell (Cambridge University, Cambridge, England). *Science*, vol. 198, Dec. 2, 1977, p. 960-962; Authors' Reply, p. 962. 7 refs.

Objections are raised to a report by Schachar (1976) who presents evidence which, according to his claims, contradicts the theory that the visual system performs two-dimensional Fourier transformation of observed patterns. It is pointed out that an optical transform considered by Schachar is not that of grid. Another objection is related to the applicability of optical diffraction patterns as an analogy for the Fourier transformation. In a reply to the objections it is maintained that the finding of Fourier components which correspond to certain illusions does not necessarily imply that the visual system does Fourier-transform analysis. G.R.

A78-15955 **Effects of acute hyperkalemia on cardiac excitability.** C. J. Lyons, M. J. Burgess, and J. A. Abildskov (Utah, University, Salt Lake City, Utah). *American Heart Journal*, vol. 94, Dec. 1977, p. 755-763. 30 refs. Research supported by the Richard A. and Nora Eccles Harrison Fund for Electrocardiographic Research; Grants No. NIH-HL-13480; No. NIH-HL-12611.

Anodal-stimulation experiments were performed on seven anesthetized mongrel dogs weighing 15-32 kg in order to determine the effect of hyperkalemia on the shape of anodal excitability curves and thus obtain a better understanding of the role of hyperkalemia in the genesis of arrhythmias in ischemic tissue. The excitation threshold was estimated with 2-msec stimuli at 10-msec intervals in the portion and 2-msec intervals in the early portion of the cardiac cycle during control periods and during potassium infusion. The slope of the excitability curve during the relative refractory period is found to be inversely related to the serum concentration of potassium. It is concluded that low-dose potassium infusion decreases the threshold late in the cardiac cycle and increases it early in the cardiac cycle, while high-dose potassium infusion raises the threshold through the cardiac cycle. The effect of local hyperkalemia on vulnerable-period excitability may be protective by inhibition of very premature ectopic depolarizations. S.D.

A78-15996 **Muscular control of movements with one degree of freedom. I - Single movements.** A. I. Litvinsev and N. S. Seropian. (*Avtomatika i Telemekhanika*, May 1977, p. 88-102.) *Automation and Remote Control*, vol. 38, no. 5, Oct. 10, 1977, pt. 1, p. 686-699. Translation.

Experiments utilizing changes in the electromyographic activity of muscles during sudden cessation of motion were used to investigate the control of human muscles in carrying out single wrist-movements. It is shown that both preprogrammed commands of different kinds as well as feedback signals are used in muscular control. B.J.

A78-16013 * Analysis of pulsatile, viscous blood flow through diseased coronary arteries of man. L. D. Back, J. R. Radbill (California Institute of Technology, Jet Propulsion Laboratory, Pasadena; Southern California, University, Los Angeles, Calif.), and D. W. Crawford (Southern California, University, Los Angeles, Calif.). *Journal of Biomechanics*, vol. 10, no. 5-6, 1977, p. 339-341, 343-353. 46 refs. Contract No. NAS7-100.

A78-16014 * Postural equilibrium following exposure to weightless space flight. J. L. Homick and M. F. Reschke (NASA, Johnson Space Center, Neurophysiology Laboratory, Houston, Tex.). *Acta Oto-Laryngologica*, vol. 83, 1977, p. 455-464. 23 refs.

Postural equilibrium performance by Skylab crewmen following exposure to weightlessness of 28, 59, and 84 days respectively was evaluated using a modified version of a quantitative ataxia test developed by Graybiel and Fregly (1966). Performance for this test was measured under two sets of conditions. In the first, the crewman was required to maintain postural equilibrium on narrow metal rails (or floor) with his eyes open. In the second condition, he attempted to balance with his eyes closed. A comparison of the preflight and postflight data indicated moderate postflight decrements in postural equilibrium in three of the crewmen during the eyes open test condition. In the eyes-closed condition, a considerable decrease in ability to maintain balance on the rails was observed postflight for all crewmen tested. The magnitude of the change was most pronounced during the first postflight test day. Improvement was slow; however, on the basis of data obtained, recovery of preflight baseline levels of performance was evidently complete at the end of approximately two weeks for all crewmen. The findings are explained in terms of functional alterations in the kinesthetic, touch, vestibular and neuromuscular sensory mechanisms induced by the prolonged absence of a normal 1-G gravitational environment. (Author)

A78-16015 * Compartmentalization in proteinoid microspheres. S. Brooke and S. W. Fox (Miami, University, Coral Gables, Fla.). *BioSystems*, vol. 9, 1977, p. 1-22. 30 refs. Grant No. NGR-10-007-008.

Proteinoid microspheres with stable internal compartments and internal structure are made from acidic proteinoid and basic proteinoid with calcium. The populations of microspheres are characterized by a wide diversity of structure. A model of primitive intracellular communication is suggested by the observed movement of internal particles between compartments of a multi-compartmentalized unit. Differential response to pH change and to temperature change has been demonstrated within one population and suggests one mode of adaptive selection among primordial cell populations. (Author)

A78-16076 Electrophysiological techniques for studying visual function in man - A historical overview. L. A. Riggs (Brown University, Providence, R.I.). *Optical Society of America, Journal*, vol. 67, Nov. 1977, p. 1451-1457. 15 refs.

The application of electrophysiology to human subjects is discussed in terms of measuring the gross potential changes appearing between electrodes on the outer surface of the head when light activates the visual system. Research involving the electroretinogram and visually evoked cortical potentials is described. The development of the cathode-ray oscillograph is outlined. S.C.S.

A78-16077 Psychophysical applications of human electroretinography. J. C. Armington (Northeastern University, Boston, Mass.). *Optical Society of America, Journal*, vol. 67, Nov. 1977, p. 1458-1465. 28 refs. Grant No. PHS-EY-00568.

The human electroretinogram (ERG) has applications in psychophysical and physiological measurements of visual functions. Consideration is given to an analysis of the ERG response waveform, recording methods, and techniques of eye stimulation. Experimental results obtained with each of the recording methods are presented. S.C.S.

A78-16078 Transient visually evoked potential. J. A. S. Kinney (U.S. Navy, Naval Submarine Medical Research Laboratory, Groton, Conn.). *Optical Society of America, Journal*, vol. 67, Nov. 1977, p. 1465-1474. 33 refs.

A review of transient visually evoked cortical potential is presented. Problems encountered in its use are outlined such as the variability of the response, the large numbers of influential factors, and the difficulties in understanding what it represents physiologically. Approaches to overcome these difficulties are identified. Fields in which visually evoked cortical potentials are being put to practical use are discussed including the testing of visual function, diagnostics of visual disease, study of visual development, and monitoring of electrophysiological health. S.C.S.

A78-16079 Steady-state evoked potentials. D. Regan (Keele, University, Keele, Staffs., England). *Optical Society of America, Journal*, vol. 67, Nov. 1977, p. 1475-1489. 63 refs.

A comparison of transient and steady-state evoked potentials is presented in terms of the information yielded regarding a nonlinear system such as the visual pathway. Various methods of recording steady-state evoked potentials are described including: Fourier analysis with running average data display, analysis of the evoked potentials into frequency components with different properties, the application of running average display to speedy evoked potential refraction, the method of averaging graphs, the simultaneous stimulation method, and the evoked potential feedback. Applications of evoked potential research in fields including (1) the assessment of visual acuity in amblyopia, (2) the diagnosis of multiple sclerosis, and (3) the measurement of the spectral sensitivities of color channels in the human visual pathway are considered. S.C.S.

A78-16080 Spatiotemporal mapping of scalp potentials. D. H. Fender and T. P. Santoro (California Institute of Technology, Pasadena, Calif.). *Optical Society of America, Journal*, vol. 67, Nov. 1977, p. 1489-1494. 15 refs. Research supported by the Alfred P. Sloan Foundation; Grants No. NIH-NS-03627; No. NIH-GM-01335.

Computerized analysis and display techniques have been used to identify sources of visually evoked scalp potentials (VESP's) on the surface, just under the surface, and within the volume of the brain. It is found that VESP's for white-noise stimulation manifest time domain behavior similar to the response for flash stimuli. The time behavior of equipotential surfaces on the scalp during the VESP are displayed via contour mapping algorithms. The electrical and geometrical parameters of the head are modeled, and electrical fields are generated on the surface of the model head. Computer graphics are used to display, in movie form, the actual and model scalp potential field and the parameters of the dipole generators within the model head during the VESP. Such techniques have applications in studies of retinotopic mapping, fusion, and texture perception. S.C.S.

A78-16081 Scotopic luminosity function and color-mixture data. H. B. Tilton (Arizona, University, Tucson, Ariz.). *Optical Society of America, Journal*, vol. 67, Nov. 1977, p. 1494-1501. 15 refs.

The hypothesis that rods contribute to color information has not been generally accepted primarily because of the apparent lack of a connection between the scotopic luminosity function and color-mixture data. Analyses are presented showing that the scotopic luminosity function is intimately related to color data over the entire spectrum, indicating that rods play a central role in normal color vision. These results, not readily explainable in terms of the trichromatic theory, suggest an alternate idea of sensing in terms of the psychophysical quantities called brightness, hue, and saturation. (Author)

A78-16082 Chromatic two-pulse resolution with and without luminance transients. R. W. Bowen (Loyola University, Chicago, Ill.), D. T. Lindsey, and V. C. Smith (Chicago, University, Chicago, Ill.). *Optical Society of America, Journal*, vol. 67, Nov. 1977, p. 1501-1507. 30 refs. Research supported by Loyola University; Grants No. NIH-EY-70652; No. NIH-EY-00901; No. NIH-EY-00523.

A set of basic measurements is presented in order to study temporal resolution for chromatic stimuli under conditions where differential chromatic adaptation is minimized. The experiments conducted include: (1) determination of two-pulse discrimination thresholds for a homochromatic pair of 65 ms pulses at various wavelengths, (2) evaluation of the effect of background luminance level on threshold, (3) investigation of wavelength effects in hue substitution of 100 ms pulses, and (4) study of pulse duration effects in hue substitution. S.C.S.

A78-16083 A subjective method for the measurement of monochromatic aberrations of the eye. H. C. Howland (Cornell University, Ithaca, N.Y.) and B. Howland (MIT, Cambridge, Mass.). *Optical Society of America, Journal*, vol. 67, Nov. 1977, p. 1508-1518. 17 refs. Research supported by the Bell Telephone Laboratories; Grant No. NIH-5-R01-EY-01149.

A method has been developed to measure monochromatic aberrations of the eye subjectively and quantitatively. It employs an aberroscope utilizing an artificial astigmatism to defocus the image of a point source of light. Using the technique drawings have been obtained for over 50 subjects. The drawings have been analyzed via a two-dimensional polynomial curve fitting method which computes Taylor polynomial terms to the fourth order. The Taylor coefficients are then used to reconstruct the wave aberration surface. It is found that the monochromatic aberrations of the eye are dominated by third-order Taylor terms within the range of physiological pupil sizes, and that spherical aberration frequently occurs about a single axis, a condition called cylindrical aberration. It is noted that third-order (coma-like) aberrations are important in wave aberrations at all pupil sizes. S.C.S.

A78-16231 The prospect of astro-palaeontology. J. Armitage. (*British Interplanetary Society, Conference on Interstellar Travel and Communication, 2nd, London, England, Apr. 4, 5, 1977.*) *British Interplanetary Society, Journal (Interstellar Studies)*, vol. 30, Dec. 1977, p. 466-469. 16 refs.

This paper expresses the view that a large number of life-bearing planets might well develop civilizations during the lifetime of a galaxy, but equally points out that because of the enormous time span of galactic events and the possibly limited lifetimes of many or most technological civilizations, very few such civilizations would be likely to coexist at any given point in time. In the light of these considerations it is suggested that astro-palaeontology and astro-archeology, being concerned with the search for and evaluation of extinct extraterrestrial life forms and civilizations which were not necessarily overlapping in time, are at least as likely, and quite possibly more likely, to furnish evidence of extraterrestrial life forms in the short term than most exobiology or CETI experiments. (Author)

A78-16474 Biological effects of NO, NO₂, SO₂ and combinations thereof: Acute action on human and rat blood in vitro - Chronic action on the lung and blood of rats due to pollution-level concentrations (Effets biologiques de NO, NO₂, SO₂ et de leurs associations: Action aiguë in vitro sur le sang humain et le sang du rat - Action chronique à des concentrations polluantes sur le poumon et le sang du rat). E. Azoulay, L. Lachia (Institut National de la Santé et de la Recherche Médicale, Paris, France), and M. C. Blayo (CNRS; Institut National de la Santé et de la Recherche Médicale, Paris, France). *Pollution Atmosphérique*, vol. 19, July-Sept. 1977, p. 295-299. 16 refs. In French.

A78-16623 # Validation of a model of a human pilot (Validation d'un modèle de pilote). D. Soulatges (ONERA, Châtillon-sous-Bagneux, Hauts-de-Seine, France). *La Recherche Aérospatiale*, Sept.-Oct. 1977, p. 325, 326. 6 refs. In French.

The paper is concerned with a sequential model of a human pilot. The model takes into account the limits of human capacity for acquiring and memorizing information and puts into operation a certain strategy of action based on knowledge of the piloted vehicle and of the desired operation. The model was tested for operation of a LEM-type vehicle; the abilities of the 'robot' and of human pilots

to perform identical tasks were compared. A suitably close similarity of performance was found. M.L.

A78-16700 Does epidemic disease come from space. F. Hoyle and C. Wickramasinghe (University College, Cardiff, Wales). *New Scientist*, vol. 76, Nov. 17, 1977, p. 402-404.

It is suggested that epidemics of disease may be caused by passage of the earth through cometary debris. Evidence is reviewed in support of the hypothesis that a cometary impact on the earth about four billion years ago and subsequent deposition on earth of prebiotic and biological molecules from comets were responsible for the origin of terrestrial life. Observations of organic molecules such as hydrogen cyanide and methyl cyanide in cometary nuclei are cited, and the possible mechanisms of chemical processing and evolution of prebiotic cometary material are described. It is concluded that the spread of many major pandemics on earth may be best explained by the dispersion of organic material from comets through the terrestrial atmosphere. J.M.B.

A78-16766 # Is there extraterrestrial life. F. D. Drake (Ithaca, N.Y.). *AIAA Student Journal*, vol. 15, Winter 1977-1978, p. 6-10.

An overview of experiments conducted in the search for extraterrestrial life is presented. Noting simulations of the earth's primitive atmosphere, the development of chemical processes is reviewed. Discoveries of radio astronomy, suggesting that the chemistry of our biological system occurs throughout the universe, are discussed. Consideration is given to methods for detecting planets via their gravitational forces on the stars about which they orbit. S.C.S.

A78-16794 Combined effect of flight factors. V. V. Antipov and B. I. Davydov. (*Kosmicheskie Issledovaniia*, vol. 15, Mar.-Apr. 1977, p. 286-297.) *Cosmic Research*, vol. 15, no. 2, Sept. 1977, p. 240-249. 59 refs. Translation.

Domestic and foreign investigations of the combined effects on the human organism of acceleration, vibration, weightlessness, temperature, ionizing radiation, hypoxia, and hypodynamia are reviewed and systematized. An attempt is made to determine the mechanism of the interaction of pairs of factors. M.L.

A78-16824 Eye muscle potentiation does not account for adaptation in distance perception based on oculomotor cues. H. Wallach and P. Halperin (Swarthmore College, Swarthmore, Pa.). *Perception and Psychophysics*, vol. 22, no. 5, Nov. 1977, p. 427-430. 7 refs. NSF Grant No. BNS-75-19095-A01.

Ebenholtz and Wolfson have demonstrated an aftereffect of sustained ocular convergence, which they ascribed to eye muscle potentiation. They suggested that this effect can explain an aftereffect of wearing glasses that alter oculomotor cues for distance. Wallach and Frey interpreted this aftereffect as resulting from adaptation. The outcome of two experiments designed to test Ebenholtz and Wolfson's explanation and a review of previous experiments on adaptation in distance perception based on oculomotor cues show that this explanation is untenable. (Author)

A78-16825 * Adaptation to delayed auditory feedback. D. I. Katz (Brandeis University, Waltham, Mass.) and J. R. Lackner (Brandeis University, Waltham; MIT, Cambridge, Mass.). *Perception and Psychophysics*, vol. 22, no. 5, Nov. 1977, p. 476-486. 43 refs. Research supported by the Spencer Foundation and Rosenstiel Biomedical Sciences Foundation; Grant No. NGR-22-009-308.

Delayed auditory feedback disrupts the production of speech, causing an increase in speech duration as well as many articulatory errors. To determine whether prolonged exposure to delayed auditory feedback (DAF) leads to adaptive compensations in speech production, 10 subjects were exposed in separate experimental sessions to both incremental and constant-delay exposure conditions. Significant adaptation occurred for syntactically structured stimuli in the form of increased speaking rates. After DAF was removed, aftereffects were apparent for all stimulus types in terms of increased

speech rates. A carry-over effect from the first to the second experimental session was evident as long as 29 days after the first session. The use of strategies to overcome DAF and the differences between adaptation to DAF and adaptation to visual rearrangement are discussed. (Author)

A78-17096 **The role of afterimages in visual spatial after-effects.** J. Uhlarik and M. Brigell (Kansas State University of Agriculture and Applied Science, Manhattan, Kan.). *Vision Research*, vol. 17, no. 9, 1977, p. 1071-1074. 8 refs. Research supported by the Kansas State University of Agriculture and Applied Science.

Displacement aftereffects were obtained with alternate presentations of an inducing figure and its complement which is a finding contrary to an explanation based on retinal afterimages. Both the strength and decay rate of the aftereffects obtained for this condition were comparable to those found when a single inducing figure was presented for the entire adaptation period. For all conditions a stronger and longer aftereffect resulted for binocular stimulus presentation than was the case for dichoptic presentation. The results suggest that central processes, sensitive to relative figure-ground contrast regardless of polarity, are responsible for both the temporal protraction of the inducing figure and the displacement of the test figure. (Author)

A78-17097 **Temporal properties of the human visual nervous system.** P. E. King-Smith, L. A. Riggs, R. K. Moore, and T. W. Butler (Brown University, Providence, R.I.). *Vision Research*, vol. 17, no. 9, 1977, p. 1101-1106. 43 refs. Grant No. PHS-5-R01-EY-00744.

An image stabilization system was used to study basic temporal properties which are normally obscured by eye movements. The time course of visual response was measured for three types of presentation of a near-threshold line - sudden presentation (on-response), switching it off again (which generates a negative afterimage) and a sudden small lateral displacement. A general model can be used to fit all these data, indicating that the responses to all three stimuli are generated by similar mechanisms. The responses are similar to that of a capacitor-coupled amplifier with a time constant of about 2.5 sec; the corresponding prediction that the visual frequency response should extend down to about 1/16 Hz was confirmed by measuring contrast thresholds for a line oscillated sinusoidally through a small amplitude. The relation of these observations to the process of light adaptation is discussed. (Author)

A78-17098 **Temporal stereopsis and dynamic visual noise.** R. I. MacDonald (Department of Communications, Communications Research Centre, Ottawa, Canada). *Vision Research*, vol. 17, no. 9, 1977, p. 1127, 1128. 5 refs.

Ross (1974) has suggested that the perception of both depth and movement in viewing a field of dynamic visual noise with an interocular delay of the order of tens of milliseconds is due to the interocular delay. An experimental observation is presented which is inconsistent with Ross's theory. The observation is based on a display of binocularly uncorrelated visual noise produced by viewing with a stereoscope a dynamic speckle pattern formed by passing a beam of coherent light through moving ground glass plates. It is shown that stereopsis does not occur as a result of random association between local elements of binocularly uncorrelated noise. A conceptual model including temporal and spatial stereopsis for a visual process operating by interocular delay is described. In this model, spatial-disparity stereopsis operates by detection in the temporal average over about 60 msec of the image streams from each eye. S.D.

A78-17124 **Defining the boundary in a positioning task.** L. Buck (National Research Council, Ottawa, Canada). *Acta Psychologica*, vol. 42, Jan. 1978, p. 7-19. 7 refs.

Overshooting of the target by subjects performing a linear positioning task was studied. As in previous experiments, the rate of overshooting appeared to depend on the distance of the target from the field boundary in the direction of the positioning maneuver. The

investigation also demonstrated that the field boundary may be regarded as a cognitive construct of the subject, conditioned by the magnitude of the positioning maneuvers, rather than a boundary determined by the visual or proprioceptive limits of the display.

J.M.B.

A78-17134 **Relation between the site of origin of ventricular premature complexes and the presence and severity of coronary artery disease.** M. M. Bodenheimer, V. S. Banka (Presbyterian-University of Pennsylvania Medical Center; Pennsylvania, University, Philadelphia, Pa.), and R. H. Helfant (Presbyterian-University of Pennsylvania Medical Center, Philadelphia, Pa.). *American Journal of Cardiology*, vol. 40, Dec. 1977, p. 865-869. 31 refs.

To define more precisely the relation between the site of origin of ventricular premature complexes and the presence and severity of coronary heart disease in patients with a chest pain syndrome, 39 patients with ventricular premature complexes of right or left ventricular contour who were undergoing cardiac catheterization and coronary arteriography for evaluation of chest discomfort were studied. Nineteen patients had left and 17 had right ventricular premature complexes and 3 had both. Of the 19 with left ventricular premature complexes, 15 had coronary artery disease. Four had normal cardiac catheterization studies. Twelve patients had asynergy on ventriculography. The 17 patients with right ventricular premature complexes had similar angiographic findings. Eleven of the 17 had coronary artery disease. Six had normal arteries. Eight of the 11 with coronary artery disease and right ventricular premature complexes also had asynergy. All three patients with both left and right ventricular premature complexes had coronary obstructive disease. These findings indicate that in patients with a chest pain syndrome there is no relation between the site of origin of ventricular premature complexes and either the prevalence or severity of coronary artery disease. (Author)

STAR ENTRIES

Articles concerning the selection and training of cosmonauts; evaluation and analysis of accumulated data to facilitate the on-going transition from orbital to interplanetary flights, research aimed at guaranteeing safety on long flights and reliability of the human component of the 'man-spaceship' system, space psychology and physiology, environmental problems and control (spacecraft habitability, effects of radiation and weightlessness, etc.) and telemetry are presented. Author

N78-12651# Joint Publications Research Service, Arlington, Va.

TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY: BIOMEDICAL SCIENCES, NO. 13

31 Oct. 1977 78 p refs Transl. into ENGLISH from Russian journals

(JPRS-70057) Avail: NTIS HC A05/MF A01

Information on aerospace medicine, agrotechnology, bionics and bioacoustics, biochemistry, biophysics, environmental and ecological problems, food technology, microbiology, epidemiology and immunology, marine biology, military medicine, physiology, public health, toxicology, radiobiology, veterinary medicine, behavioral science, human engineering, psychology, psychiatry and related fields, and scientists and scientific organizations in biomedical fields is presented. Author

N78-12652 New Mexico Univ., Albuquerque.

A COMPARISON OF EXERCISE RESPONSES OF MALES AND FEMALES DURING ACUTE EXPOSURE TO HYPOBARIA Ph.D. Thesis

Philip Richard Elliott 1976 153 p

Avail: Univ. Microfilms Order No. 77-16095

This study was designed to investigate the effects of acute altitude exposure on selected pulmonary, cardiovascular, and metabolic variables in men and women during submax and max work. Seventeen male and 20 female physical education students were randomly selected for inclusion in the investigation which took place over an 11-wk period. All testing was conducted in a hypobaric chamber with each subject being tested initially at the terrestrial altitude of 1576 m to which they were acclimated. Subsequent tests were conducted at simulated altitudes of 2743 m and 3962 m. It was concluded that, for the subjects in this study, females tolerated hypoxia better during submax work than did men. During maximal work, the men apparently had a better tolerance for hypoxia than did the women.

Dissert. Abstr.

N78-12653 Kansas Univ., Lawrence.

THE ROLE OF THE ACOUSTIC REFLEX IN THE ACQUISITION OF TEMPORARY THRESHOLD SHIFT Ph.D. Thesis

Clifford Charles Olsen, Jr. 1976 66 p

Avail: Univ. Microfilms Order No. 77-16293

The effects of acoustic reflex activation on the acquisition of temporary threshold shift (TTS) were studied. Acoustic reflex responses were monitored during the presentation of the fatiguing stimulus in the typical TTS experimental paradigm. A measure of TTS was obtained for each session plus a record of acoustic reflex activity elicited by the noise exposure condition producing the TTS. When reflex responses were pooled and averaged, greater reflex activity was found to be elicited by the high band interrupted noise at each off time. For the continuous exposure more reflex activity was elicited by the low band noise. This reversal was attributed to reflex decay in response to the high band continuous noise exposure that was absent in the reflex response to the high band interrupted noise exposure.

Dissert. Abstr.

N78-12654 California Univ., Berkeley.

ON THE SPATIAL BREADTH OF SPATIAL FREQUENCY CHANNELS IN HUMAN VISUAL DETECTION Ph.D. Thesis

Matthew Carl Halter 1976 98 p

Avail: Univ. Microfilms Order No. 77-15709

Human visual detection can be modelled with a series of independent, parallel detection mechanisms called channels. The frequency selectivity and spatial extent of these channels were tested simultaneously. Experimental stimuli contained either one

N78-12647 Johns Hopkins Univ., Baltimore, Md. **PHYSIOLOGICAL STUDIES OF NITROGEN FIXATION BY BLUE-GREEN ALGAE Ph.D. Thesis**

Nancy Moller Weare 1974 194 p

Avail: Univ. Microfilms Order No. 77-16555

In a series of experiments which examined the effects of mechanical blending, oxygen and darkness on nitrogenase activity and photosynthesis in the heterocystous blue green alga, *Anabaena cylindrica*, it was shown that these activities are spatially separated. Photosynthesis occurs in the vegetative cells, but not in the heterocysts, whereas nitrogenase activity is localized in the heterocysts. A model involving the coupling of photosynthetic products from the vegetative cells with nitrogen fixation in the heterocysts was proposed which is consistent with these data as well as other information in the literature. Dissert. Abstr.

N78-12648*# National Aeronautics and Space Administration, Washington, D. C.

THE ORIGIN OF BIOLOGICAL MACROMOLECULES ON THE EARTH. THE HYPOTHESIS OF INORGANIC TEMPLATE

Tzyy-Shen Lu Oct. 1977 19 p refs Transl. into ENGLISH from *Kexue Tongbao* (China), vol. 21, no. 3, 1976 p 112-119 Transl. by Sci. Transl. Serv., Santa Barbara, Calif. Original Doc. prep. by China Inst. of Sci.

(Contract NASw-2791)

(NASA-TM-75176) Avail: NTIS HC A02/MF A01 CSCL 06C

Studies about the origin of life are reviewed. The nonrandom organization of organelles is discussed from a structural and functional point of view. After postulating that the origin of biomacromolecules was not a random event, the paper develops the hypothesis that polypeptides and polynucleotides were formed on an inorganic template. Only information-containing structures can pass natural selection and develop through evolution. Author

N78-12649# Toronto Univ. (Ontario). Inst. for Aerospace Studies.

ACUTE CHANGES IN INNER EARS OF LABORATORY ANIMALS CAUSED BY SIMULATED SONIC BOOMS

Stanislav Reinis Sep. 1976 53 p refs Prepared in cooperation with Waterloo Univ., Ontario

(UTIAS-211; CN-ISSN-0082-5255)

Avail: NTIS

HC A04/MF A01

Inbred mice and chinchillas were subjected to simulated sonic booms of different rise time, intensity, and number of sonic booms. The most important pathological change was found to be bleeding in the basal turn of the scala tympani of the inner ear. A single boom having a rise time of 0.1 msec, peak overpressure of 3.3 psf, and duration of 120 msec was found to cause bleeding. The frequency of the appearance of blood clots was found to increase with the number of booms administered. This was observed even when the booms were administered one every 24 hours. Bleeding usually disappeared within a period of 8 weeks. Mice suffered a rupture of the basilar membrane and destruction of the Corti organ in the basilar membrane and destruction of the Corti organ in the basal turn of the cochlea in 3 out of 20 cases. Author

N78-12650# Joint Publications Research Service, Arlington, Va.

SPACE BIOLOGY AND AEROSPACE MEDICINE, NO. 5, 1977

10 Nov. 1977 127 p Transl. into ENGLISH from Selected Foreign Periodicals (USSR)

(JPRS-70135) Avail: NTIS HC A07/MF A01

or two half-field sinusoidal grating patches. The findings support existing evidence that sinusoids at different frequencies are detected independently. Two adjacent patches at 4.3 cycles per degree appear to be detected independently. Adjacent patches at 12.8 cycles per degree are detected far more easily than can be explained by the independent detection of each patch. This is taken to mean that the individual striations of sinusoidal gratings at this frequency are not detected independently. Instead, it is concluded that there exists some single mechanism which is not only selective for this frequency but also sensitive to several cycles of the grating. Dissert. Abstr.

N78-12655 Ohio State Univ., Columbus.
A STUDY OF PHYSIOLOGICALLY MOTIVATED MATHEMATICAL MODELS FOR HUMAN POSTURAL CONTROL
 Ph.D. Thesis

Peter Carrell Camana 1977 288 p ref
 Avail: Univ. Microfilms Order No. 77-17082

Biped standing posture control systems were studied, including a nonlinear feedback system, a linear feedback technique identified from human motion and a learning controller modelled after the human cerebellum. Studies of the ankle in humans indicate that in both the center of pressure on the foot and the calf muscle stretch reflex, the human postural control system has a measure of the sine of the leg angle. It is shown here that with proper scaling the measure of the sine of the leg angle can be used to linearize and decouple simple biped models. The control method thus uses nonlinear (sine) feedback along with linear feedback to control posture. Simulations on the computer show much better responses and lower torques than the linear-feedback. A human response to perturbations in stance is used with a gradient search routine to find the linear feedback scheme and values that best matched the human and computer model responses. The results show that humans try to use a decoupling technique for control and that the vestibular system can play a significant role in normal postural control. Dissert. Abstr.

N78-12656# Civil Aeromedical Inst., Oklahoma City, Okla.
ALTITUDE TOLERANCE OF GENERAL AVIATION PILOTS WITH NORMAL OR PARTIALLY IMPAIRED SPIROMETRIC FUNCTION

Michael T. Latogola, Marinus Flux, and Peggy J. Lyne Jul. 1977 13 p refs
 (AD-A044557; FAA-AM-77-6) Avail: NTIS HC A02/MF A01 CSCL 06/19

The altitude tolerance of 10 spirometrically impaired (SI) general aviation pilots with an average forced expiratory volume of 65.1 percent was compared to that of 10 spirometrically normal (SN) pilots. Cardiorespiratory parameters assessed at ground level (GL) and at 8,000- and 12,500-ft altitudes were blood pressure, pulmonary ventilation, oxyhemoglobin saturation, temporal artery flow velocity, heart rate, and single-lead electrocardiogram. Although altitude exposure quantitatively displaced the SI group more than the SN group, the differences were not statistically significant at the probability level of 0.05. Unifocal premature ventricular contractions were present at GL in three of the pilots and showed no further changes at altitude. Therefore, the mean FEV 25-75% value of 65 percent of predicted normal for the SI group becomes a reasonable option as an objective screening norm for acceptable tolerance to general aviation altitudes in the ambient-air-breathing range. Author

N78-12657# National Aeronautics and Space Administration, Washington, D. C.
PROVISIONAL STANDARDS OF RADIATION SAFETY DURING FLIGHTS

Oct. 1977 9 p Transl. into ENGLISH of "Vremennyye Normy Radiatsionnoy Besopasnosti pri Kosmicheskikh Poletakh" VNRB-75 Ministry of Public Health, Moscow, 1976 p 1-8 Transl. by Sci. Transl. Serv., Santa Barbara, Calif. (Contract NASw-2791)

(NASA-TM-75051) Avail: NTIS HC A02/MF A01 CSCL 06R
 Radiation effects during space flights are discussed in the context of the sources and dangers of such radiation and the radiobiological prerequisites for establishing safe levels of radiation

dosage. Standard safe levels of radiation during space flight are established. Author

N78-12658*# National Aeronautics and Space Administration, Washington, D. C.

COMPUTERIZED CLASSIFICATION OF AUDITORY TRAUMA: RESULTS OF AN INVESTIGATION ON SCREENING EMPLOYEES EXPOSED TO NOISE

Ingmar Klockhoff Nov. 1977 13 p refs Transl. into ENGLISH from Horselskadeklassifikation med dator: Undersokningsresultat fran screening pa bullerexponerad personal (uppsala), 1974 4 p Transl. by Kanner (Leo) Associated, Redwood City, Calif. Original Doc. prep. by University Hospital, Uppsala (Sweden) (Contract NASw-2790)

(NASA-TM-75062) Avail: NTIS HC A02/MF A01 CSCL 06S

An automatic, computerized method was developed to classify results from a screening of employees exposed to noise, resulting in a fast and effective method of identifying and taking measures against auditory trauma. This technique also satisfies the urgent need for quick discovery of cases which deserve compensation in accordance with the Law on Industrial Accident Insurance. Unfortunately, use of this method increases the burden on the already overloaded investigatory resources of the auditory health care system. Author

N78-12659*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
MEDICAL ULTRASONIC TOMOGRAPHIC SYSTEM
 Final Report

Richard C. Heyser, Dennis H. LeCrisette, Robert Nathan, and Robert L. Wilson (Harbor General Hospital, Los Angeles) 1 Oct. 1977 65 p refs

(Contract NAS7-100; Grant GM-23094-01)

(NASA-CR-155269; JPL-Pub-77-72) Avail: NTIS HC A04/MF A01 CSCL 06B

An electro-mechanical scanning assembly was designed and fabricated for the purpose of generating an ultrasound tomogram. A low cost modality was demonstrated in which analog instrumentation methods formed a tomogram on photographic film. Successful tomogram reconstructions were obtained on in vitro test objects by using the attenuation of the first path ultrasound signal as it passed through the test object. The nearly half century tomographic methods of X-ray analysis were verified as being useful for ultrasound imaging. Author

N78-12660*# Methodist Hospital, Houston, Tex.
AUTOMATED ELECTROENCEPHALOGRAPHY SYSTEM AND ELECTROENCEPHALOGRAPHIC CORRELATES OF SPACE MOTION SICKNESS, PART 4 Final Report

James D. Frost, Jr. 18 Nov. 1977 56 p refs

(Contract NAS9-13870)

(NASA-CR-151560) Avail: NTIS HC A04/MF A01 CSCL 06B

Comparative data for further assessments of the EEG alterations seen during Skylab are elaborated. The variability of alpha, beta, theta, and delta EEG characteristics was analyzed with quantitative computer techniques in a group of six normal individuals over a period of two months, and the EEG effects of a prolonged period of bed rest were evaluated in two subjects. The results confirm that the inflight EEG changes seen during Skylab are statistically significant, but the absolute values obtained for the various parameters do not exceed the maximal range expected in a normal population. Further, the EEG manifestations of extended bed rest do not appear similar to those of space flight. Author

N78-12661# Naval Medical Research Inst., Bethesda, Md.
A PRELIMINARY HUMAN ENGINEERING EVALUATION OF HYPERBARIC CONTROL SYSTEMS

William W. Banks, David M. Heaney, Arthur J. Bachrach, and George S. Loehring Mar. 1977 44 p refs

(AD-A044044) Avail: NTIS HC A03/MF A01 CSCL 05/4.

Past experience in systems design has demonstrated that the use of human factors design criteria can maximize operator/system performance and safety. Yet there has not been adequate communication among operators, investigators, and design engineers. Poor functional interaction between man and machine

has been the result. To minimize this problem in a new hyperbaric research facility, an intensive human factors evaluation has been conducted. GRA

N78-12662# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

AERODYNAMIC FORCES EXERTED ON AN ARTICULATED BODY SUBJECTED TO WINDBLAST Final Report, 14 Jun. - 20 Aug. 1976

Daniel J. Schneck Dec. 1976 61 p refs
(AD-A044217; AMRL-TR-76-109) Avail: NTIS
HC A04/MF A01 CSCL 06/2

A potential flow solution is presented for estimating the pressure distribution around the forearm of a human body subjected to windblast. The forearm is examined in three positions: resting and pressing against an arm rest; resting, but not pressing against an arm rest; and not resting at all against any surface. Results show that a high-speed wind stream approaching the limb at some finite angle of attack has a tendency to dislodge the forearm from a surface with which it is in contact. This is due to the generation of stagnation points in the flow which leads to adverse pressure gradients as high as six times the free-stream dynamic pressure. Moreover, when the inviscid analysis is corrected for the effects of flow separation, it is possible to predict the presence of a pressure drag which acts to throw the forearm outward, away from the thorax. Both of these effects increase with angle of attack and they are mildly dependent on the taper of the forearm geometry. It is anticipated that a straightforward extension of the theory to other limbs of the body will shed some light on the general problem of flail injury occurring during high-speed ejections. Author (GRA)

N78-12663# Health Services Mobility Study, New York.
USING TASK DATA IN DIAGNOSTIC RADIOLOGY. VOLUME 2: CURRICULUM OBJECTIVES FOR RADIOLOGIC TECHNOLOGY Final Report

Eleanor Gilpatrick and Christina Gullion May 1977 547 p refs Sponsored in part by Hunter Coll., N. Y., and City Coll. Res. Foundation, N. Y. 2 Vol.
(Contract DL-82-34-69-34)
(PB-270460/9; DLETA-82-34-69-34-RR8-2-Vol-2) Avail:
NTIS HC A23/MF A01 CSCL 051

Design method in radiologic technology and the task analysis results are reported. Volume two contains job-related, behavioral curriculum objectives for the aide, technician, and technologist levels in diagnostic radiology, including patient care and quality assurance. It presents guidelines for using the curriculum objectives for educational ladders to parallel the job ladders recommended in Volume one. The curriculum objectives are in units that can also be arranged in any other sequence. Basic concepts regarding the educational process, the HSMS method, and suggestions for program design and instruction are also included. GRA

N78-12664# Health Services Mobility Study, New York.
USING TASK DATA IN DIAGNOSTIC RADIOLOGY. VOLUME 1. JOB LADDERS: ASSIGNING TASKS TO JOBS Final Report

Eleanor Gilpatrick May 1977 263 p refs Sponsored in part by Hunter Coll., N. Y., and City Coll. Res. Foundation, N. Y. 2 Vol.
(Contract DL-82-34-69-34)
(PB-270459/1; DLETA-82-34-69-34-RR8-1-Vol-1) Avail:
NTIS HC A12/MF A01 CSCL 051

The method and results, the economic rationales for job restructuring, and the use of job ladders; a career ladder program, cost strategies, trainee selection and a mini-manual for performance evaluation using HSMS task data are described. A state practice and quality assurance program, and a check list for the consumer are included. Author

N78-12665# Joint Publications Research Service, Arlington, Va.

TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY. BIOMEDICAL AND BEHAVIORAL SCIENCES, NO. 14: EFFECTS OF NONIONIZING ELECTROMAGNETIC RADIATION

7 Nov. 1977 93 p refs Transl. into ENGLISH from Russian journals

(JPRS-70101) Avail: NTIS HC A05/MF A01

Information is presented on aerospace medicine, agrotechnology, bionics and bioacoustics, biochemistry, biophysics, environmental ecological problems, food technology, microbiology, epidemiology and immunology, marine biology, military medicine, physiology, public health, toxicology, radiobiology, veterinary medicine, behavioral science, human engineering, psychology, psychiatry and related fields, and scientists and scientific organizations in biomedical fields. Author

N78-12666# Joint Publications Research Service, Arlington, Va.

TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY: BIOMEDICAL AND BEHAVIORAL SCIENCES, NO. 15

16 Nov. 1977 61 p refs Transl. into ENGLISH from Russian journals

(JPRS-70168) Avail: NTIS HC A04/MF A01

For abstract, see N78-12665.

N78-12667 Rochester Univ., N. Y.

PSYCHOPHYSICAL STUDIES OF THE CONTRIBUTION OF CHROMATIC MECHANISMS TO THE VISUAL PERCEPTION OF BORDERS Ph.D. Thesis

Brian Warren Tansley 1976 219 p
Avail: Univ. Microfilms Order No. 77-16253

The contributions of chromatic opponent mechanisms to visual contour perception were investigated using various psychophysical techniques. A description is included of three experiments that demonstrate that the short wavelength sensitive cones do not contribute to the distinctness of borders visible in bipartite fields which have been adjusted to the minimally distinct border point. The specific prediction that border distinctness is related to the activity of the r to g cone response ratio was tested. A quantitative model was developed and applied to data from the investigations. The basic concept was that the r and g cones each signal into a mechanism that is capable of determining the difference in the output of each cone type. This difference reflects the relative response of each cone type to a given photic stimulus. Dissert. Abstr.

N78-12668# Civil Aeromedical Inst., Oklahoma City, Okla.
PERCEIVED ORIENTATION OF A RUNWAY MODEL IN NONPILOTS DURING SIMULATED NIGHT APPROACHES TO LANDING

Henry W. Mertens Jul. 1977 14 p refs
(AD-A044553; FAA-AM-77-12) Avail: NTIS
HC A02/MF A01 CSCL 01/2

The effect of varying levels of motion parallax from both radial and vertical motion on perception of the orientation of a runway relative to the ground was investigated. Under simulated nighttime conditions (only runway and approach lighting were visible), 16 nonpilots adjusted the apparent slant of a model runway to make it appear horizontal as the model moved toward them along a 3 degree approach path from a simulated distance of 4.33 to 1.33 nautical miles. Simulated approach speeds of 62 and 125 knots were used. The rate at which the model rotated during slant adjustments varied between 5 degree and 30 degree per minute. The adjusted slant of the runway model with respect to the approach path (generated approach angle) was the dependent variable. The average generated approach angle for 256 trials was 0.5 degree. This consistent and large deviation from 3 degree (which would represent accurate perception) indicates the presence of strong illusions, is in agreement with the documented tendency of pilots to fly low approaches at night, and is explained in terms of the equidistance tendency and/or errors in perceiving the direction of the model in the visual field. The data also suggest that motion parallax in the runway image is neither a reliable nor an effective cue for the safe judgment of glide path at distances greater than 1.33 miles. Author

N78-12669# Civil Aeromedical Inst., Oklahoma City, Okla.
THE EFFECT OF INCREASED MONITORING LOAD ON

VIGILANCE PERFORMANCE USING A SIMULATED RADAR DISPLAY

Richard I. Thackray, J. Powell Bailey, and R. Mark Touchstone
 Jul. 1977 16 p refs
 (AD-A044558; FAA-AM-77-18) Avail: NTIS
 HC A02/MF A01 CSCL 05/9

The extent to which level of target density influences the ability to sustain attention to a complex monitoring task requiring only a detection response to simple stimulus change was examined. The visual display was designed to approximate a futuristic, highly automated air traffic control radar display containing computer-generated alphanumeric symbols. Forty-eight male subjects, equally divided into three groups, were exposed to density levels of 4, 8, or 16 targets. Ten critical stimuli (signals) were randomly presented during each half-hour of the 2-hour session. Detection latency to the critical stimuli in the 16-target condition was significantly greater than latency to the 4- and 8-target conditions. There was no evidence of performance decrement in the two lower density conditions. The 16-target condition showed a significant progressive increase in mean detection latency, which was primarily the result of an increase in long latencies. The hypothesized decline in attention associated with this condition appeared to be independent of any major change in arousal level. Author

N78-12670*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. SAMPLED DATA ANALYSIS OF A COMPUTER-CONTROLLED MANIPULATOR

B. R. Markiewicz 15 Oct. 1977 40 p ref
 (Contract NAS7-100)
 (NASA-CR-155272; JPL-Pub-77-66) Avail: NTIS
 HC A03/MF A01 CSCL 05E

A comprehensive sampled data analysis of a computer-controlled manipulator is presented in terms of root loci for gain selection and transient responses to step input functions. All parameter values and their derivations where applicable were tabulated. The analysis, while quite specific, uses normalized gain parameters, which allows the results to be applied to any similar system regardless of individual hardware parameter values. Author

N78-12671# McDonnell-Douglas Astronautics Co., St. Louis, Mo.**MANUAL CONTROL IN TARGET TRACKING TASKS AS A FUNCTION OF CONTROL TYPE TASK LOADING AND VIBRATION Final Report, 1 Jun. 1976 - 31 May 1977**

Thomas G. Drennen, James G. Curtin, and Harold D. Warner
 1 Aug. 1977 117 p refs
 (Contract N00014-76-C-0883; NR Proj. 196-143)
 (AD-A043903; MDC-E1713) Avail: NTIS HC A06/MF A01
 CSCL 05/8

An investigation was conducted on the use of fingertip tracking controls which were integrated into an aircraft throttle grip under different levels of task loading and vibration. The experimental variables included two types of control (force and displacement), two levels of task loading (low and high) and four levels of vibration (static, moderate and heavy turbulence and broadband). The low task loading condition required the pilots only to track the displayed targets or to fly the simulated aircraft, while the high task loading condition required simultaneous target tracking and aircraft attitude and airspeed control. The vibrations were random vertical accelerations of 0.11 or 0.35 g(rms) amplitude across the 0.1-20 Hz frequency range. The moderate turbulence condition was 0.11 g(rms) in magnitude with a vibrational response which peaked at 0.2 Hz. The heavy turbulence condition was similar except it had a 0.35 g(rms) intensity. The broadband spectra also had a 0.35 g(rms) intensity but with equal response across the frequency range. In the evaluation, 16 pilots performed the target tracking and aircraft control tasks in a motion base simulator. The dependent measures were pitch, roll and airspeed error for the aircraft control tasks and acquisition time and error, overshoots before acquisition, percent time on target and x-y tracking error for the target tracking tasks. GRA

N78-12672# Human Factors Research, Inc., Goleta, Calif. FUNCTIONAL REQUIREMENTS AND OTHER DESIGN FEATURES OF A MANNED SYSTEM RESEARCH FACILITY Final Report, Oct. 1976 - Jun. 1977

Gregory V. Bailey, Robert T. Hennessy, and C. Dennis Wylie
 Aug. 1977 195 p
 (Contract N00123-76-C-1245)
 (AD-A044234) Avail: NTIS HC A09/MF A01 CSCL 05/8

A study was conducted to describe the functional requirements for the development of a Manned System Research Facility (MSRF) to be located at NPRDC. The MSRF will be a laboratory for the demonstration of and experimentation on advanced concepts of man-machine interaction and the controlled study of operator performance in a system context. The report consists of a section providing an introduction to the MSRF concept, and sections dealing specifically with the recommended MSRF subject work station consoles, computer system, software requirements, voice communications system, physical facility, staffing, and acquisition and development plan. The report contains reviews and/or discussions of manned systems research, display technology, distributed processing systems, computer operating systems, and programming languages. Author (GRA)

N78-12673# Army Environmental Hygiene Agency, Aberdeen Proving Ground, Md.**LASER PROTECTIVE EYEWEAR**

David H. Sliney and Del Valle Aug. 1977 18 p
 (AD-A044105) Avail: NTIS HC A02/MF A01 CSCL 06/17

Laser eye protection often provides the most important control measure in reducing or eliminating ocular hazards from lasers in the laboratory or downrange in a laser target area in field situations. General information on the design characteristics and important parameters to consider in selecting laser eye protection are provided. A list of commercially available laser eye protectors with manufacturer specifications is provided. Author (GRA)

N78-12674# Desmatics, Inc., State College, Pa. PREDICTION OF MOTION SICKNESS INCIDENCE: A STATISTICAL EXAMINATION OF THREE APPROACHES

Dennis E. Smith Aug. 1977 27 p refs
 (Contract N00014-74-C-0154)
 (AD-A044060; TR-102-4) Avail: NTIS HC A03/MF A01 CSCL
 06/19

This report summarizes three approaches which have been suggested for predicting motion sickness incidence (MSI) for actual or simulated broadband ship motion. Two of these approaches are based on the results of MSI models developed for pure sinusoidal motion. The third approach, which uses weights derived by least squares, cannot be based directly on these models. Instead, it would be developed empirically from observed MSI in experiments involving broadband motion. Although only a small amount of empirical MSI data exists for motion other than that produced by a single sinusoid, this data provides strong statistical evidence that the two approaches based on the single sinusoid models fail to produce accurate predictions. Statistical judgments about the least squares weighting approach must be reserved until enough empirical data exists to provide an adequate test. Author (GRA)

N78-12675# Army Natick Research and Development Command, Mass. Clothing, Equipment and Materials Engineering Lab.**EVALUATION OF US AIR FORCE SURVIVAL/ARMOR VEST IN US ARMY OH-58 HELICOPTERS Final Report**

Thomas H. Judge and Michael B. Kulinski Feb. 1976 58 p refs
 (AD-A044842; CEMEL-161; NATICK-TR-7T-3-CEMEL) Avail:
 NTIS HC A04/MF A01 CSCL 06/17

The USAF developed a Survival/Armor Vest concept. This was coordinated with the DoD Tri Service Committee in Aircrew Body Armor with a complete exchange of development information between the services. Four evaluations: Static, Flight, Body Load and Pressure, and Sizing were conducted and these revealed a number of minor design deficiencies. The material used in the vest construction does not provide sufficient retention of the armor insert and carrier. Lack of retention caused the armor insert to rest on the pilots legs creating leg discomfort. The

USAF Survival/Armor Vest requires redesigning to correct the deficiencies presented here. The sizing criteria were also evaluated. New sizing criteria are recommended to improve the sizing. GRA

N78-13721*# National Aeronautics and Space Administration, Washington, D. C.

PRELIMINARY RESULTS OF THE SCIENTIFIC EXPERIMENTS ON THE KOSMOS-936 BIOSATELLITE

Dec. 1977 63 p Transl. into ENGLISH from Predvaritelnyye Rezultaty Nauchnykh Eksperimentov na Biosputnike, Kosmos-936, Russian report (Moscow), 1977 p 1-78 Translated by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Ministry of Health and Interkosmos Council, Academy of Sciences, Moscow

(Contract NASw-2790)

(NASA-TM-75071) Avail: NTIS HC A04/MF A01 CSCL 06C

The scientific equipment and experiments on the Kosmos-936 biosatellite are described, including various ground controls and the lab unit for studies at the descent vehicle landing site. Preliminary results are presented of the physiological experiment with rats, biological experiments with drosophila and higher and lower plants, and radiation physics and radiobiology studies for the planning of biological protection on future space flights. The most significant conclusion from the preliminary data is that rats tolerate space flight better with an artificial force of gravity.

Author

N78-13722# Woods Hole Oceanographic Institution, Mass.

MARINE MICROBIOLOGY: Final Report

Stanley W. Watson 1977 47 p refs

(Contract EY-76-S-02-3565)

(COO-3565-08) Avail: NTIS HC A03/MF A01

Microorganisms of the marine environment were studied with emphasis on the role of bacteria in the nitrogen cycle, specifically concentrating on the organisms responsible for microbiological oxidation of ammonia to nitrite to nitrate. The distribution rates of in situ reactions, fine structure and biochemical properties of these organisms were detailed. Rates of urea, acetate, and glucose decomposition in both inshore and offshore waters were determined using labelled compounds and the significance of these degradations in the hydrosphere was examined. A new test for the determination of bacterial biomass was developed, and using this test in conjunction with more standard techniques it was demonstrated that bacteria comprised up to 50 percent of the total biomass in the oceans.

ERA

N78-13723# Organization for Health Research, TNO, Amsterdam (Netherlands).

[ACTIVITIES OF THE RADIOBIOLOGICAL INSTITUTE, THE INSTITUTE FOR EXPERIMENTAL GERONTOLOGY, AND THE PRIMATE CENTER] Annual Report, 1978

1976 412 p refs

Avail: NTIS HC A18/MF A01

Activities, presented by way of concise articles, cover the following subjects: radiation physics, radiobiology, experimental tumor therapy, tumor induction and tumor biology, immunology, transplantation and immunogenetics, hematology, gerontology, ethology, microbiology and quotobiology, techniques, and animals.

ESA

N78-13725*# Lockheed Missiles and Space Co., Sunnyvale, Calif. Biotechnology Div.

ELECTROLYTIC PRETREATMENT OF URINE

15 Sep. 1977 348 p refs

(Contract NAS1-11662)

(NASA-CR-151566) Avail: NTIS HC A15/MF A01 CSCL 06B

Electrolysis has been under evaluation for several years as a process to pretreat urine for ultimate recovery of potable water in manned spacecraft applications. The conclusions that were drawn from this investigation are the following: (1) A platinum alloy containing 10 percent rhodium has been shown to be an effective, corrosion-resistant anode material for the electrolytic pretreatment of urine. Black platinum has been found to be suitable as a cathode material. (2) The mechanism of the reactions occurring during the electrolysis of urine is two-stage: (a) a

total Kjeldahl nitrogen and total organic carbon (TOC) removal in the first stage is the result of electrochemical oxidation of urea to CO₂, H₂O, and ammonia followed by chloride interaction to produce N₂ from ammonia, (b) after the urea has been essentially removed and the chloride ions have no more ammonia to interact with, the chloride ions start to oxidize to higher valence states, thus producing perchlorates. (3) Formation of perchlorates can be suppressed by high/low current operation, elevated temperature, and pH adjustment. (4) UV-radiation showed promise in assisting electrolytic TOC removal in beaker tests, but was not substantiated in limited single cell testing. This may have been due to non-optimum configurations of the single cell test rig and the light source.

Author

N78-13726# Stanford Research Inst., Menlo Park, Calif.
ASSESSMENT OF FUTURE NATIONAL AND INTERNATIONAL PROBLEM AREAS. VOLUME 2: THE EFFECTS OF STRESS ON INDIVIDUALS AND SOCIETY

Arnold Mitchell Feb. 1977 41 p refs Sponsored by NSF

(SRI-77-206-Vol-2) Avail: NTIS HC A03/MF A01

Models of stressful situations are presented that suggest the great range of the effects of stress and the complexity of its patterns. Stress can be a very positive force if it serves as a stimulus for people or institutions to grow, face challenge, and achieve greatly. But it can also be a highly destructive force by producing a variety of pathogenic, often enervating responses in individuals and anomie, alienation, or activist opposition in the larger society. A section dealing with traditional methods of treating stress seeks to show that many aspects of the total stress syndrome (including several of strong relevance to policy makers) receive too little professional attention despite their great importance; some conventional therapies appear actually to worsen rather than aid stress responses; and a variety of nontraditional methods of coping with stress show considerable promise as therapeutic approaches, but tend to be neglected by conventional medical groups. The paper concludes with brief outlines of several research programs aimed at exploring and documenting some of the views tentatively set forth in the body of the discussion.

Author

N78-13727# National Academy of Sciences - National Research Council, Washington, D. C. Committee on the Life Sciences and Social Sciences.

ASSESSING BIOMEDICAL TECHNOLOGIES. AN INQUIRY INTO THE NATURE OF THE PROCESS

1 Jul. 1977 127 p

(Contract NSF C-310)

(PB-271162/0; NSF/RA-770114)

Avail: NTIS

HC A07/MF A01 CSCL 06E

A critical and interpretive synthesis presented of the discussions, background papers, preparatory analyses, and subsequent comments resulting from the Hanover conference. Technologies selected for study include in vitro fertilization of human oocytes and their subsequent nurture and growth; the predetermination of the sex of children; the retardation of aging; and modification of behavior by neurosurgical, electrical, or pharmaceutical means. Each study attempts: (1) to illustrate the range of questions required for a broad analysis of the physiological, psychological, and social implications of the technology; (2) to illuminate some of the major issues at stake; and (3) to identify areas of ignorance requiring further inquiry.

GRA

N78-13728# Army Personnel Research Establishment, Farnborough (England).

A POCKET SIZE HEART BEAT RADIO TELEMETER AND SIGNAL DECODER

J. B. Peckham Jun. 1977 44 p refs

(AD-A043587; APRE-Memo-43/76)

Avail: NTIS

HC A03/MF A01 CSCL 17/2

A prototype heart beat radio telemetry system has been constructed which is suitable for use on soldiers negotiating the Army Personnel Research Establishment (APRE) Agility Course at their best speed. With only one telemeter in use at least 93% of the total number of heart beats made during an average two minute run time were detected. When two telemeters were in use simultaneously the detection efficiency fell to 63%. Interpolation of recordings, however, would count at least 99%

of the total number of heart beats made. The design of the circuits is described and possible improvements are discussed.

Author (GRA)

N78-13729# Oak Ridge National Lab., Tenn. Industrial Hygiene Dept.

MATERIALS SAFETY DATA SHEETS: THE BASIS FOR CONTROL OF TOXIC CHEMICALS, VOLUME 2

N. E. Bolton, E. E. Ketchen, W. E. Porter, and C. L. Hunt May 1977 558 p refs

(Contract W-7405-eng-26)

(ORNL/TM-5722) Avail: NTIS HC A24/MF A01

For abstract, see N78-13730.

N78-13730# Oak Ridge National Lab., Tenn. Industrial Hygiene Dept.

MATERIALS SAFETY DATA SHEETS: THE BASIS FOR CONTROL OF TOXIC CHEMICALS, VOLUME 1

N. E. Bolton, E. E. Ketchen, W. E. Porter, and C. L. Hunt May 1977 482 p refs

(Contract W-7405-eng-26)

(ORNL/TM-5721-Vol-1) Avail: NTIS HC A21/MF A01

For large industrial and research operations, maintaining reasonable control of all toxic materials used in their operations can be a formidable task. A system utilizing cards has been developed that serves a dual purpose, informing the user regarding hazards of a particular material and also facilitating appropriate workplace surveillance during its use. Selected data, including threshold limit values, routes of absorption, symptoms of exposure, chronic effects, and emergency first-aid procedures, are printed on the card. A portion of the card contains the label that the user detaches and affixes to the container. This label classifies the material according to flammability, toxicity, reactivity, and special properties on a 0 through 4 hazard rating system. This report describes the development and use of such cards, contains the associated toxic material data sheets that provide full backup data for the labels, and furnishes a glossary of biomedical terms used in the data sheets. ERA

N78-13731# Argonne National Lab., Ill. Div. of Biological and Medical Research.

CIRCADIAN DYSCHRONISM AND CHRONOTYPIC ECOPHILIA AS FACTORS IN AGING AND LONGEVITY

Charles F. Ehret, Kenneth R. Groh, and John C. Meinert 13 Apr. 1977 42 p refs Presented at Conf. on Biol. Rhythms and Aging, Bay Pines, Fla., 13 Apr. 1977.

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

(CONF-770412-1) Avail: NTIS HC A03/MF A01

Circadian dyschronism is defined as the absence of a strong daily rhythm in an organism where normally one is found, and ecophilia is defined as satisfaction with one's immediate environment. The hypothesis is presented that a creature with all of its systems in strong circadian synchrony has somehow learned how to live so that environmental amenities and inner appetites mesh in circadian harmony, and this is rewarded by functional proficiency and longevity. Circadian dyschronic, on the other hand, suffer the malaise of poor performance in physiological tests, and the ultimate insult of early death. Molecular and physiological studies at cellular and organismic levels are reviewed that appear to be generally applicable to all higher eukaryotic organisms, including man. Maintenance of mental as well as physical activities characterize those who age successfully. ERA

N78-13732# Los Alamos Scientific Lab., N. Mex. **AUTOMATIC DETECTION OF ALTERNATIONS IN PULMONARY VENOUS PRESSURE**

T. C. Strand (Univ. of Southern Calif., Los Angeles), A. Franklin Turner (LAC-USC Medical Center, Los Angeles), Richard P. Kruger, Harvey I. Meyers (LAC-USC Medical Center, Los Angeles), and Wissam Ahmed (Univ. of Southern Calif., Los Angeles) 1977 7 p refs Presented at the San Diego Biomedical Symp., San Diego, Calif., 2-4 Feb. 1977

(Contract W-7405-eng-36)

(LA-UR-77-531; Conf-770224-1)

Avail: NTIS

HC A02/MF A01

A completely automated computer controlled optical system was developed for early detection and classification of pre-pulmonary edema. Lung vascularity patterns were extracted using the Fraunhofer diffraction pattern sampling unit which samples the Fourier transform and obtains the spatial frequency measurements. A laser is used to illuminate certain zones of the lung, and by passing the image through a thin convex lens the diffraction pattern is produced. An increase in pulmonary venous pressure affects the number of vessels in the upper zone as compared to the number of vessels in the lower zones of the lung and thus change the ring and wedge regions of the transform space. Measurements of the ring and wedge signatures were made on a number of chest radiographs which had been classified by the Turner method as to the presence and extent of pulmonary edema. Preliminary results indicate a classification accuracy on the training data of 90 percent. ERA

N78-13733# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Hamburg (West Germany). Inst. fuer Flugmedizin.

EFFECT OF ACCELERATION ON BRAIN METABOLITES [EINFLUSS DER BESCHLEUNIGUNG AUF STOFFWECHSELMETABOLITEN DES GEHIRNS]

G. Schaefer 1976 9 p refs In GERMAN

(DLR-IB-355-76-05) Avail: NTIS HC A02/MF A01

Acceleration effects (+Gz) were investigated. The fast glutamate depression can be explained only partly by the accompanying gamma amino butyric acid (GABA) increase, the concentration of which depends mainly on enzyme activity converting glutamate into GABA. If one considers that short term heavy hyperoxia at 1 ata. lead to equivalent changes in the concentration of these amino acids, the conclusion may be reached that the oxydative nerve cell normally fixed upon glucose decomposition is based on glutamate as an energy producing substrate by variation of oxygen tension. ESA

N78-13734# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Bad Godesberg (West Germany). Inst. fuer Flugmedizin.

PRELIMINARY INVESTIGATION OF USING THE CENTRIFUGE AND LIGHT AIRCRAFT FOR TRAINING PAYLOAD SPECIALISTS [VORUNTERSUCHUNG UEBER DIE MOEGELICHKEIT DES EINSATZES VON ZENTRIFUGE UND LEICHTFLUGZEUG FUER DAS TRAINING VON WUTZLASTEXPERTEN (NE)]

G. Oser, H. Mertens, L. Vogt, and E. Schwartz 1976 8 p refs In GERMAN

(DLR-IB-355-76-06) Avail: NTIS HC A02/MF A01

The possibility of using a centrifuge and a light aircraft for training Spacelab payload specialists was investigated. A centrifuge with an acceleration profile similar to the shuttle reentry was used. Candidates were subjected to +3 Gz for 1 min and then to +2.1 Gz for up to 15 min. The electrocardiogram was recorded and a 6-min alertness test was carried out towards the end of acceleration exposure. Zero-g simulations were carried out in a Piaggio sports aircraft, allowing a zero-g period up to 15 sec during roller coaster flights. The circulatory reactions under zero gravity as well as under increased acceleration are shown to follow an individual pattern. ESA

N78-13735# Stanford Univ., Calif. Stanford Low Temperature Physics Group.

SUPERCONDUCTING MAGNETOMETRY FOR THE DETECTION OF HEART DISEASE Final Technical Report

William M. Fairbank, Donald C. Harrison, and John P. Wikswo, Jr. 1 Jul. 1977 96 p refs

(Grant NSF APR-72-03447)

(PB-271950/8; SLTP-1977-1; NSF/RA-770197) Avail: NTIS

HC A05/MF A01 CSCL 06B

Instrumentation is discussed that is capable of efficient recording of high-quality vector magnetocardiograms (VMCG), a data processing facility and software that allows detailed analysis, comparison, and display of the VMCG, and a detailed theoretical understanding of the generation, detection, and analysis of the VMCG. A series of calculations and electrolytic tank studies were

performed to clarify the spatial relationship of cardiac current sources to the external magnetic field. A magnetic dipole equivalent source, the magnetic heart vector (MHV), could be determined by a single vector field measurement at a specific point outside the thorax. A sophisticated technique was devised for determining the components and position of the best-fit moving magnetic dipole to study the spatial and temporal variation of the major features of the VMCG. GRA

N78-13736# Columbia Univ., New York. Dept. of Pediatrics. **DEVELOPMENT AND CLINICAL EVALUATION OF BLOOD GAS SENSORS FOR CONTINUOUS MONITORING (ADULT AND NEONATE) Annual Report, May 1976 - Apr. 1977**

L. Stanley James and Leonard Indyk Jul. 1977 25 p refs (Contract N01-HR-5-2948) (PB-271809/6) Avail: NTIS HC A02/MF A01 CSCL 06K

The clinical evaluation of the performance and efficacy of transcutaneous oxygen sensors is reported. The data recording of several physiological variables in addition to the transcutaneous PO₂ have enabled demonstration of different patterns of onset and recovery from apnea than is the current accepted model. The availability of the monitoring scheme is extended so that newborns can be monitored within a few minutes after birth and the length observations extended on individual infants to nearly 12 hours. GRA

N78-13737# Joint Publications Research Service, Arlington, Va.

TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY: BIOMEDICAL AND BEHAVIORAL SCIENCES, NO. 16

7 Dec. 1977 79 p Transl. into ENGLISH from Selected Foreign Periodicals (USSR) (JPRS-70297) Avail: NTIS HC A05/MF A01

Information on aerospace medicine, agrotechnology, bionics, bioacoustics, biochemistry, biophysics, environmental and ecological problems, and food technology was reported. Microbiology, epidemiology and immunology, marine biology, military medicine, physiology, public health, and toxicology were also discussed. Reports on radiobiology, veterinary medicine, behavioral science, human engineering, psychology, psychiatry and related fields, were cited along with scientists and scientific organizations in biomedical fields. Author

N78-13738# Joint Publications Research Service, Arlington, Va.

TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY: BIOMEDICAL AND BEHAVIORAL SCIENCES, NO. 17

15 Dec. 1977 73 p refs Transl. into ENGLISH from various Russian Journals (JPRS-70338) Avail: NTIS HC A04/MF A01

Soviet research papers are presented from the fields of aerospace medicine, microbiology, human performance psychology, genetics, agriculture, and veterinary medicine. J.H.

N78-13739# Naval Air Station, Quonset Point, R.I.

AN INVESTIGATION OF POSSIBLE CORRELATIONS BETWEEN INDIVIDUAL PILOT PERFORMANCE AND NEUROLOGICAL FUNCTIONS Final Report, 1976-1977

Edgar Rogers Enoch 23 May 1977 86 p refs (AD-A045372; USNA-TSPR-84) Avail: NTIS HC A05/MF A01 CSCL 05/9

The purpose of this study is to determine whether a meaningful correlation exists between some quantifiable element of a pilot's neurological activity and his performance at the controls of an aircraft. A new, unique system for quantifying pilot performance was developed using the Singer GAT-1B Link Flight Simulator. A system was also developed for monitoring and recording pilot neurological functions in a cockpit environment. Significant changes in the pilot performance and neurological functions were observed. An apparent trend was observed also relating changes

in pilot performance to changes in a pilot's pre-flight neurological state. Ground work was laid for further investigation into the possibility of predicting pilot performance based on a comparison of the pilot's current neurological state and developing neurologically based criteria for pilot duty cycles. Author (GRA)

N78-13740# Michigan Univ., Ann Arbor. Human Performance Center.

CONSTRAINING NONMETRIC MULTIDIMENSIONAL SCALING CONFIGURATIONS

Elliot Noma and Janice Johnson Aug. 1977 64 p refs (Contract N00014-76-C-0648)

(AD-A045800; TR-60; TR-014523-3-T) Avail: NTIS HC A04/MF A01 CSCL 05/10

The interpretation of multidimensional scaling outputs is usually based on the identification and labeling of geometric structures in space. Some of the most commonly used structures are reviewed. Interpretation of the scaling outputs requires many psychological and mathematical assumptions including the assumption that the configuration with the lowest stress is the output desired. Unfortunately, little is known about the uniqueness of a configuration generated from fallible data and this non-uniqueness also affects the interpretation of the spatial outputs. A scaling method incorporating information in addition to the dissimilarities is proposed and the implications of this approach for the interpretation of a configuration are discussed. Author (GRA)

N78-13741# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Hamburg (West Germany). Abt. Luftfahrtpsychologie.

RESEARCH ACTIVITIES OF THE DFVLR DEPARTMENT OF AVIATION PSYCHOLOGY CONCERNING THE CONSULTANCY CONTRACT OF THE DEUTSCHE LUFTHANSA AG Annual Report, 1975 [JAHRESBERICHT 1975 DER ABT. LUFTFAHRTPSYCHOLOGIE ZUM BERATUNGS-AUFTRAG DER DEUTSCHEN LUFTHANSA AG]

K. Steininger, N. Adam, S. Fichtbauer, K.-M. Goeters, and H. Kirsch 1976 21 p refs In GERMAN

(DLR-IB-355-76-01) Avail: NTIS HC A02/MF A01

Results of psychological aptitude tests for cockpit personnel selection of the Deutsche Lufthansa are reported for the period January 1975 through December 1975. Further development of the selection system is also discussed. ESA

N78-13742# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Hamburg (West Germany). Abt. Luftfahrtpsychologie.

PSYCHOLOGICAL SELECTION OF APPLICANTS FOR A FLYING CAREER [DIE PSYCHOLOGISCHE AUSWAHL VON BEWERBERN FUER DIE FLIEGERISCHE LAUFBAHN]

Helmut Kirsch 1976 16 p refs In GERMAN (DLR-IB-355-76-02) Avail: NTIS HC A02/MF A01

Tests for selection of a flight navigator, mechanic, and dispatcher, from applicants without prior training, are described. These tests are psychologically based in view of the considerable personal demands on trainees. It has been noted that after selection about 94% of the trainees successfully terminate the courses. ESA

N78-13743# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Hamburg (West Germany). Abt. Luftfahrtpsychologie.

INVESTIGATION OF PERSONALITY CHARACTERISTICS OF FLIGHT TRAINEES AND PROFESSIONAL PILOTS [DIE UNTERSUCHUNG VON PERSOENLICHKEITSMERKMALEN BEI FLUGSCHUELERN UND BERUFSPILOTEN]

Helmut Kirsch 1976 40 p refs In GERMAN (DLR-IB-355-76-03) Avail: NTIS HC A03/MF A01

Tests for determining the difference in personality between flight trainees and professional pilots are described. The personality characteristics of typical pilots were found to be: emotional stability, tendency towards performance, tendency towards dominance, enterprise, vitality, average behavioral control, and independence. Technical and sporting natures dominate, whereas musical and literary activities are less. ESA

N78-13744# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Hamburg (West Germany). Abt. Luftfahrtpsychologie.

SELECTION STRATEGY AND PSYCHOLOGICAL TESTS FOR APTITUDE INVESTIGATION OF APPLICANTS FOR PILOT TRAINING AT THE DEUTSCHE LUFTHANSA [SELEKTIONSSTRATEGIE UND PSYCHOLOGISCHE TESTS BEI DER EIGNUNGUNTERSUCHUNG VON BEWERBERN FUER DIE FLIEGERISCHE AUSBILDUNG BEI DER DLH]

Helmut Kirsch 1976 20 p refs In GERMAN (DLR-IB-355-76-04) Avail: NTIS HC A02/MF A01

Selection of applicants for pilot training at the Deutsche Lufthansa is described. This is carried out in several steps, the most important of which are preselection and interview. The preselection is objective and based on degree of aptitude, which results from weighing of separate test results covering cognitive tests, personality scales, and psychomotor tests. The next phase covers the applicant's personality. The last step is an evaluation of the applicant in the following categories: interactive performance, adaptation, stress resistance, and motivation. ESA

N78-13745# Air Force Academy, Colo. Dept. of Life and Behavioral Sciences.

BEHAVIORAL AND PHYSIOLOGICAL CORRELATES OF VARYING NOISE ENVIRONMENTS

Lawrence F. Sharp, John F. Swiney, Mickey R. Dansby, Stephen C. Hyatt, and Dale E. Schimmel Jun. 1977 81 p refs

(EPA-iA-G-D4-0537) (PB-271713/0; EPA-600/1-77-038) Avail: NTIS HC A05/MF A01 CSCL 05J

The research was conceived and conducted to: (1) specifically assess a noise profile to which a large proportion of both urban and suburban dwellers are exposed on a daily basis; (2) examine these effects on a relatively homogeneous population with respect to sex, age, physical fitness, intellectual ability, psychological structure, and environmental stress; and (3) provide more adequate control in terms of research design, of individual differences which could potentially contribute to between group differences in noise responses. GRA

N78-13746*# Cooper (George E.), Saratoga, Calif. **A SURVEY OF THE STATUS OF AND PHILOSOPHIES RELATING TO COCKPIT WARNING SYSTEMS**

George E. Cooper Jun. 1977 47 p refs (Contract NAS2-9117) (NASA-CR-152071) Avail: NTIS HC A03/MF A01 CSCL 05E

A survey was taken to study current cockpit caution and warning (c/w) systems, and to examine industry philosophies regarding c/w system design including current efforts to improve them. Guidelines currently in use were outlined and those which appear to have general acceptance, those which are considered ineffective or erroneous, and those with which there is broad disagreement as to validity, were delineated. Major airplane manufacturers were surveyed and a manufacturer dealing specifically with aircraft instrumentation was consulted. Author

N78-13747*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif. **Biotechnology Dept.**

GENERALIZED ENVIRONMENTAL CONTROL AND LIFE SUPPORT SYSTEM COMPUTER PROGRAM (G189A) CONFIGURATION CONTROL PHASE 2 Final Report

R. E. McEnulty Nov. 1977 18 p refs (Contract NAS9-14877) (NASA-CR-151567; MDC-G7254) Avail: NTIS HC A02/MF A01 CSCL 06K

The G189A simulation of the Shuttle Orbiter ECLSS was upgraded. All simulation-library versions and simulation models were converted from the EXEC2 to the EXEC8 computer system and a new program, G189PL, was added to the combination master program library. The program permits the post-plotting of up to 100 frames of plot data over any time interval of a G189 simulation run. The overlay structure of the G189A simulations were restructured for the purpose of conserving computer core requirements and minimizing run time requirements. Author

N78-13748# Omnemii, Inc., Vienna, Va. **MANNED SYSTEM PERFORMANCE AS A FUNCTION OF DISPLAY CHARACTERISTICS Technical Report, 1 Apr. 1975 - 31 May 1977**

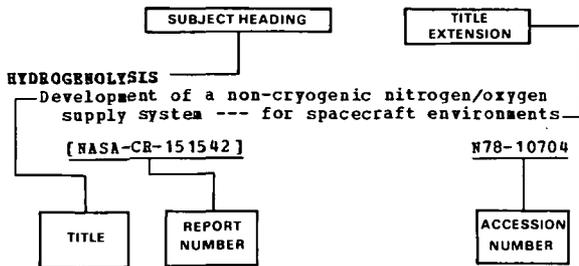
Edward M. Connelly Jun. 1977 89 p refs (Contract N00014-75-C-0810; NR Proj. 197-030) (AD-A045488; OTR-62-77-1) Avail: NTIS HC A05/MF A01 CSCL 09/4

In manned systems, performance can change significantly with changes in display design. With today's computer and display technology, it is possible to provide virtually any display function desired including automating many of the information processing tasks previously performed by the human operator. However, the relationship between display design and total system (man and machine) performance must be known in order to systematically select the display features. A new human operator modeling technique termed 'operator measures and criteria' (OMAC) was used to represent the ship control performance of the Officer of the Deck (OOD). OMAC's are measures and criteria which are determined by calculation to be those optimized by the observed OOD controlled ship responses. OMAC's were determined from data obtained from an experiment in which three different displays were used. With each of those displays, OOD subjects demonstrating superior performance resulted in identical criteria, but an apparently self-imposed constraint called purview (range from own ship within which contacts are processed by the OOD) was shown to be different for each display type. Purview is shown to explain differences in performance with different displays. The proportion of OOD subjects demonstrating superior performance is also shown to be a function of display type.

Author (GRA)

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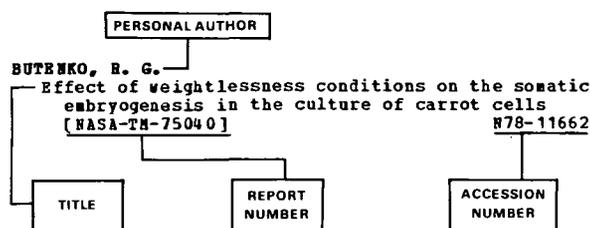
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