NASA SP-7011 (168)

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AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY

WITH INDEXES

(Supplement 168)

JUNE 1977

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ACCESSION NUMBER RANGES

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NASA SP-7011 (168)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 168)

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 May 1977 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 229 reports, articles and other documents announced during May 1977 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 1977 Supplements.

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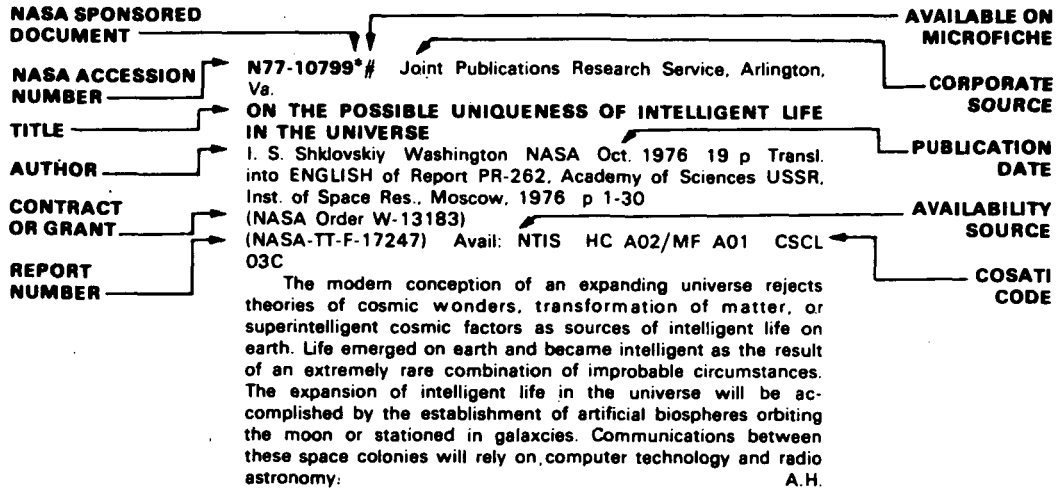

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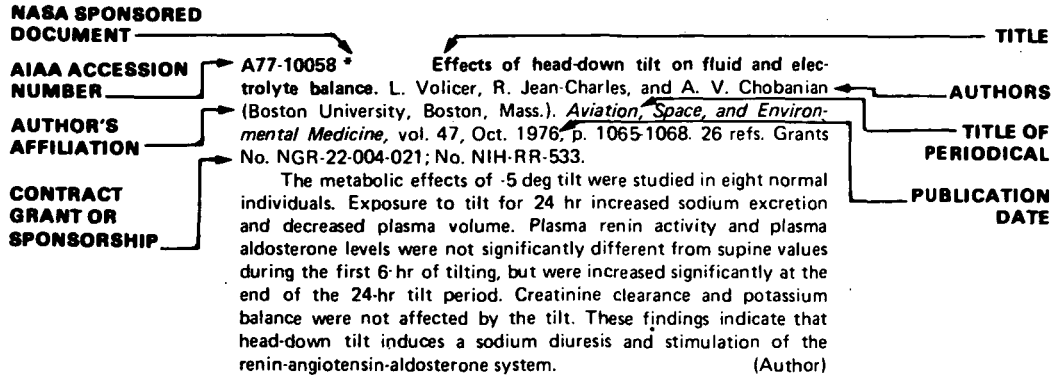

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 168)

JUNE 1977

IAA ENTRIES

A77-23288 **The role of brief hypocapnia in the ventilatory response to CO2 with hypoxia.** L. C. Ou and S. M. Tenney (Dartmouth College, Hanover, N.H.). *Respiration Physiology,* vol. 28, Dec. 1976, p. 333-346. 33 refs. Grant No. PHS-HL-02888.

In conscious cats the ventilatory response curve to physiological range of CO2 is displaced upward by hypoxia (about 45 torr), but it rises, either parallel with, or convergent on, the normoxic curve. Thus, a positive interaction of hypoxia and hypercapnic stimuli is not observed under these circumstances. However, if during the hypoxic exposure, hypocapnia is allowed to develop, the subsequently determined CO2 ventilatory response curve will shift to the left, rise steeply, particularly in the early phase, and demonstrate a positive hypoxic-hypercapnic interaction. A demonstrable interactive effect was dependent on a conditioning period of hypocapnia, and this was shown to be associated with an elevated level of lactic acid to a greater degree in cerebral venous blood than in CSF or arterial blood. The interpretation is discussed without reaching a firm conclusion of mechanism, but the results emphasize how a minor change of experimental protocol affects a basic phenomenon in the chemical control of breathing. (Author)

A77-23289 **Hypoxia and carbon dioxide as separate and interactive depressants of ventilation.** L. C. Ou, S. M. Tenney (Dartmouth College, Hanover, N.H.), and M. J. Miller. *Respiration Physiology,* vol. 28, Dec. 1976, p. 347-358. 25 refs. Grant No. PHS-HL-02888-18.

A77-23290 **Visual conspicuity, visual search and fixation tendencies of the eye.** F. L. Engel (Eindhoven, Technische Hogeschool, Eindhoven, Netherlands). *Vision Research,* vol. 17, no. 1, 1977, p. 95-108. 28 refs.

The cumulative probability of target discovery during search has been related experimentally to the relevant 'conspicuity area', the visual field in which the target can be discovered after a single eye fixation. During search, 'non-targets' were found to be fixated spontaneously in proportion to their conspicuity area. Further small spontaneous eye fluctuations are described that occurred, during determination of the conspicuity areas, in the direction of the target discovered. Their occurrence and delay depended on the target eccentricity and the size of the conspicuity area. The results emphasize the relevance of the conspicuity area to research on visual selection. (Author)

A77-23291 **Visual echoes - The perception of repetition in quasi-random patterns.** C. W. Tyler and J.-J. Chang (Bell Telephone Laboratories, Inc., Murray Hill, N.J.). *Vision Research,* vol. 17, no. 1, 1977, p. 109-116. 16 refs.

Human visual sensitivity was measured for patterns consisting of a repeated strip of spatial random noise. Sensitivity decreased monotonically with repetition width. The sensitivity function was relatively unaffected by eye movement, image magnification or the relative phases of the repetitive elements. The results conformed well to predictions based on a model of the visual system consisting of multiple bandpass channels tuned to different spatial frequencies in the stimulus array. (Author)

A77-23321 * **Tumor localization and beam monitoring - Electrofluorotomography.** N. A. Baily, E. C. Lasser, and R. A. Keller (California, University, La Jolla, Calif.). *Medical Physics,* vol. 3, May-June 1976, p. 176-180. 10 refs. Grant No. NGR-05-009-257.

A77-23418 **Depression of serotonin clearance by rat lungs during oxygen exposure.** E. R. Block and A. B. Fisher (Pennsylvania, University, Philadelphia, Pa.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 42, Jan. 1977, p. 33-38. 29 refs. Research supported by the U.S. Veterans Administration; Grants No. PHS-HL-15013; No. PHS-HL-15061.

Experiments were conducted to evaluate isolated perfused lungs after exposure of rats to oxygen to determine whether serotonin clearance is altered during the early stages of oxygen poisoning. Since vitamin E deficiency potentiates manifestations of oxygen toxicity in other organs, a comparative study is made for serotonin clearance by lungs from oxygen-exposed normal and vitamin E-deficient rats. Serotonin clearance is calculated from the disappearance rate of C-14-serotonin from the perfusate. It is found that the depression of serotonin clearance by the lungs of oxygen-exposed rats occurs as a result of exposure to hyperoxic environment, the degree of depression being a function of the duration of exposure. Depression of serotonin clearance is greater in vitamin E-deficient than in normal animals. Since this depression in normal animals is observed after only 18 hr of oxygen exposure, it is therefore an early manifestation of pulmonary oxygen poisoning. The most likely mechanism for the depression of serotonin clearance is interference with the transport properties of lung endothelium. S.D.

A77-23419 **Arterial lactate responses in dogs made apneic or breathing nitrogen.** S. M. Cain (Alabama, University, Medical Center, Birmingham, Ala.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 42, Jan. 1977, p. 39-43. 15 refs. Grant No. NIH-HL-14693.

Experiments were conducted on ten dogs ranging in weight from 18.8 to 30.5 kg under apnea or nitrogen breathing conditions to determine whether the lactate increase in arterial blood would correspond temporally to other measures of tissue oxygen depletion such as mixed venous PO2 and the calculated changes in oxygen stores. Although both anoxia methods insured nearly instantaneous cessation of oxygen supply from outside the body, apnea left all the oxygen stores intact and available, whereas nitrogen breathing progressively washed out the lung oxygen store first and depleted the total body oxygen stores progressively. Arterial lactate rose sooner

with nitrogen breathing than with apnea, but the mean values for lactate increase for both cases were fitted by a single curvilinear relation with mixed venous PO2. It is shown that the latent period for lactate rise is almost the same as that for the development of tissue hypoxia. S.D.

A77-23420 pH effects on lactate and excess lactate in relation to O2 deficit in hypoxic dogs. S. M. Cain (Alabama, University, Medical Center, Birmingham, Ala.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 42, Jan. 1977, p. 44-49. 21 refs. Grant No. NIH-HL-14693.

A77-23421 Variations in evaporation and body temperatures during sleep in man. R. Henane, A. Buguet, B. Roussel, and J. Bittel (Service de Santé des Armées, Centre de Recherches, Lyons, France). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 42, Jan. 1977, p. 50-55. 26 refs. Research supported by the Direction des Recherches et Moyens d'Essais and Service de Santé des Armées.

A77-23422 Dependency of hypoxic pulmonary vasoconstriction on temperature. J. L. Benumof and E. A. Wahrenbrock (California, University, San Diego, Calif.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 42, Jan. 1977, p. 56-58. 13 refs. Research supported by the American Society of Anethesiologists; Grant No. PHS-HL-19169.

A77-23423 * Fluid and electrolyte shifts during bed rest with isometric and isotonic exercise. J. E. Greenleaf, E. M. Bernauer, H. L. Young, J. T. Morse, L. T. Juhos, W. Van Beaumont (NASA, Ames Research Center, Laboratory of Human Environmental Physiology, Moffett Field; California, University, Davis, Calif.), and R. W. Staley. *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 42, Jan. 1977, p. 59-66. 36 refs. Grant No. UCD-205.

It is difficult to separate the effects of reduction in hydrostatic pressure from that of reduced energy expenditure when investigating the confinement deconditioning problem. Experiments were conducted on seven healthy young men aged 19-21 yr with the purpose of separating these two factors by using isotonic physical exercise during bed rest to provide a daily energy expenditure greater than normal ambulatory levels. Fluid and electrolyte shifts were measured during three two-week bed rest periods, each of which being separated by a three-week ambulatory recovery period. During two of the three bed rest periods they performed isometric and isotonic exercises to compare their effects on fluid and electrolyte shifts during bed rest. It is shown that during bed rest, preservation of the extracellular volume takes precedence over maintenance of the plasma volume and that this mechanism is independent of the effects of isometric or isotonic exercise. S.D.

A77-23424 * Fluid and electrolyte shifts in women during +Gz acceleration after 15 days' bed rest. J. E. Greenleaf, H. O. Stinnett, G. L. Davis, J. Kollias, and E. M. Bernauer (NASA, Ames Research Center, Laboratory of Human Environmental Physiology, Moffett Field; California, University, Davis, Calif.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 42, Jan. 1977, p. 67-73. 20 refs. Grant No. NCA2-OR180-506.

Experiments were conducted on twelve women aged 23-34 yr - a bed rest (BR) group of eight subjects and an ambulatory (AMB) group of four subjects - to determine the effect of bed rest on shifts in plasma volume, electrolytes, and erythrocyte volume during +Gz acceleration on a centrifuge. The BR group underwent the +Gz acceleration during a two-week ambulatory control period, after 15 days of a 17-day BR period, and on the third day of ambulatory recovery. The AMB group underwent the same experimental procedures, but continued their normal daily routine during the BR period without additional prescribed physical exercise. Major conclusions are that (1) the higher the mean control tolerance, the greater the tolerance decline after BR; (2) relative confinement and reduced activity contribute as much to reduction in tolerance as does the horizontal body position during BR; (3) BR deconditioning has no effect on the erythrocyte volume during +3.0 Gz; and (4) about one-half the loss in tolerance after BR can be attributed to plasma volume and electrolyte shifts. S.D.

A77-23425 * Effects of acceleration on thermoregulatory responses of unanesthetized rats. C. A. Fuller, J. M. Horowitz, and B. A. Horwitz (California, University, Davis, Calif.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 42, Jan. 1977, p. 74-79. 22 refs. Grants No. NGR-05-004-099; No. NGR-05-004-008.

An experimental study was carried out to examine the thermoregulatory responses of rats to step changes in ambient temperature during centrifugation. Attention is focused on the analysis of problems as to whether the ability of rats to regulate body temperature during one hour of cold exposure is altered by increasing the acceleration field to 2G, whether prior environmental conditioning can affect the temperature response to the combined stressors of acceleration and cold, and whether the orientation of the animal in the acceleration field modifies the temperature response. The finding that the decline in colonic temperature is accompanied by parallel changes in hypothalamic and spinal cord temperatures indicates that the decreasing heat production with increasing heat loss is an atypical thermoregulatory response of these animals to cooling. Mechanical forces acting on the brain may underline the temperature decrease when inverting the animal during acceleration. S.D.

A77-23426 Experimental study of convective heat transfer coefficient for the human body in water. C. Boutelier, L. Bougues, and J. Timbal (Centre d'Essais en Vol, Laboratoire de Médecine Aérospatiale, Brétigny-sur-Orge, Essonne, France). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 42, Jan. 1977, p. 93-100. 24 refs. Research supported by the Direction des Recherches et Moyens d'Essais.

A77-23427 Superoxide dismutase /SOD/ activity in hypoxic mammalian systems. J. Liu, L. M. Simon, J. R. Phillips, and E. D. Robin (Stanford University, Stanford; U.S. Veterans Administration Hospital, Palo Alto, Calif.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 42, Jan. 1977, p. 107-110. 18 refs. Grant No. NIH-OH-00352.

Two mammalian systems are examined with respect to SOD activities as a function of limited oxygen availability. SOD activities are compared in two mammalian cell types (rabbit peritoneal macrophages and alveolar macrophages) with similar cell function but existing under different ambient oxygen tensions. Also, SOD activities are compared in various tissues of hypoxic mice. The results suggest that low oxygen exposure lead to low SOD activity in accordance with a relationship between SOD activity and oxygen tensions. This in turn supports the statement that SOD plays a physiological role in protecting against oxygen-induced free radical damage. S.D.

A77-23496 # Radiation risk on earth and in space (Radiatsionnyi risk na zemle i v kosmose). E. E. Kovalev. Moscow, Atomizdat, 1976. 256 p. 111 refs. In Russian.

The work is concerned with the elaboration and application of a new approach to the problem of radiation protection of man in space flights. This approach is based on the use of the concept of permissible risk, which makes it possible to establish unified safety criteria for all space vehicle systems. Such an approach possesses sufficient generality and may be applied in other fields of human

activity associated with the use of ionizing radiation sources. Also discussed are radiation risk for man and physical foundations of protection from charged particles. S.D.

A77-23500 # **Cerebellum and gravity (Mozzhechok i gravitatsiia).** A. N. Razumeev and R. A. Grigor'ian. Moscow, Izdatel'stvo Nauka (Problemy Kosmicheskoi Biologii. Volume 29), 1976. 456 p. 774 refs. In Russian.

The work outlines advances in the investigation of the morphology, histochemistry, electrophysiology of the afferent inputs of the cerebellum along with its perception of gravitational impacts. Particular attention is given to the behavior of the cerebellum as a center for the interaction of the gravireceptors of the vestibular and proprioceptive apparatus. Included in the discussion are results of experimental studies on total electrical activity, evoked potentials, impulse activity of various parts of the cerebellum in orthostatic testing, motion sickness, angular acceleration, and related subjects in the rabbit, cat, and monkey. Postural reactions of cerebellum-deprived animals under conditions of short-term weightlessness and natural stimulation of the labyrinth are examined. A hypothesis is advanced that disorder of the integrated role of the cerebellum may be a cause of static discoordination in astronauts in postflight period and of decompensation of vestibular function. S.D.

A77-23546 # **The pilot and the airplane: Aviation ergonomics (Pilot i samolet: Aviatsionnaia ergonomika).** B. P. Bugaev and V. G. Denisov. Moscow, Izdatel'stvo Mashinostroenie, 1976. 112 p. 20 refs. In Russian.

Some aspects of the theory (and practice) of man-machine-environment systems are examined. The principal goals and problems of ergonomics are discussed, along with the methods used in ergonomics. The role of ergonomics in the solution of important problems is illustrated with particular reference to the problem of increasing flight safety. The results of some theoretical and experimental studies of the pilot-aircraft system during landing are reviewed. V.P.

A77-23547 # **Dynamic control characteristics and brain-electric regulation of the vigilance of man during the performance of control tasks (Dynamisches Regelverhalten und hirnelektrische Vigilanzregulierung des Menschen bei der Durchführung von Regelaufgaben).** L. Walz. Berlin, Technische Universität, Fachbereich Verkehrswesen, Dr.-Ing. Dissertation, 1976. 125 p. 38 refs. In German.

The reported investigation had the objective to develop an objective procedure for the measurement of the mental stress to which the driver of a vehicle is subjected. An apparatus for the simulation of driving problems was designed. The simulating device made it possible to present to the subject driving problems of different difficulty levels. The characteristics of the driving problem and its effect on the subject were determined with the aid of an approach involving the simultaneous recording of the EEG and physical-technical test parameters. The results of the investigation show that the EEG in conjunction with an appropriate signal processing method can be used in man-machine control systems as an indicator and monitor of the stress level to which man is subjected. G.R.

A77-23550 # **Procedural selection, construction, design, and application possibility in the case of a measuring device for the human physiological study of the biomechanics of the lower extremity (Verfahrenstechnische Auswahl, Konstruktion, Aufbau und Anwendlungsmöglichkeit einer Messeinrichtung zur human-physiologischen Erforschung der Biomechanik der unteren Extremität).** H.-R. Beierlein. München, Technische Universität, Fachbereich Maschinenwesen, Dr.-Ing. Dissertation, 1976. 223 p. 153 refs. In German.

A description is presented of an immobile test stand for the time-synchronous measurement of the pressure distribution under the sole of the human foot and the three components of the resultant force. About 40,000 individual silicone rubber pyramids on an area of 400 x 400 mm are used to obtain an indication of the vertical pressure distribution by means of the compressed pyramidal trunk areas. A 35-mm film camera with a speed of 60 images/sec is used to record about 3,000 'pressure points' under the foot. Attention is given to the calibration and testing of the stand, development work regarding a mobile test device, and the design of a mathematical model of the human foot on the basis of the finite element method. G.R.

A77-23621 **Measuring device for His-bundle analysis at the heart (Messeinrichtung zur His-Bündel-Analyse am Herzen).** R. Mauser. *Elektronik,* vol. 26, Feb. 1977, p. 51-54. In German.

A medical introduction to the problem is given and an investigative method developed by Scherlag et al. (1972) is considered. Studies conducted by Scherlag et al. included a derivation of the His-bundle electrogram. His-bundle electrography made it possible to obtain new information concerning the physiology and pathophysiology of the human heart. A description is presented of electronic equipment for His-bundle investigations, taking into account details concerning the electronic circuit and the processing of the signal. G.R.

A77-23625 # **Visual conspicuity as an external determinant of eye movements and selective attention.** F. L. Engel. *Philips Research Reports Supplements,* no. 6, 1976. 92 p. 149 refs.

Results are presented for experimental studies on visual conspicuity regarded as an external involuntary determinant of eye movements and selective attention. Conspicuity area is defined as the retinal field in which the relevant object can be discovered in its background without foreknowledge of its retinal location, during a brief presentation of the stimulus pattern. The size of the conspicuity area is introduced as an experimental measure of visual conspicuity. Visiblity and visual conspicuity are shown to be linked by direct attention. The problem of visual conspicuity and selective background interference in eccentric vision is analyzed along with experimental results relating the conspicuity area to the probability of target discovery during a number of search tasks. Implications of new findings are discussed, especially in relation to recent results and theories on human information processing. Organizational principles governing Gestalt perception in eccentric vision is highlighted. S.D.

A77-23768 # **Localization of the lactate dehydrogenase /LDH/ and of the acid phosphatase /AP/ in liver cells of embryos and chickens irradiated with gamma rays.** B. N. Todorov, O. Poliakova-Kr'steva, P. G. Drianovski, and M. Y. Simeonovska (Veterinary Institute on Contagious and Parasitic Diseases; Bulgarian Academy of Sciences, Central Helminthological Laboratory, Sofia, Bulgaria). *Bolgarskaia Akademiia Nauk, Doklady,* vol. 29, no. 11, 1976, p. 1689, 1690. 8 refs.

A77-23833 # **Rotary motion of the body of an astronaut (O vrashchatel'nom dvizhenii korpusa kosmonavta).** Ia. M. Shapiro. *Kosmicheskie Issledovaniia,* vol. 15, Jan.-Feb. 1977, p. 62-70. In Russian.

In the present paper, the human body is treated as a mechanical system consisting of nine links: the body and four two-link members. The ways in which the attitude of the astronaut's body can be changed by moving the arms and legs under conditions of weightlessness are examined. V.P.

A77-24130 ***Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975.*** Meeting and Symposium sponsored by COSPAR, International Union of Physiological Sciences, and International Academy of Astronautics. Edited by P. H. A. Sneath (Leicester, University, Leicester, England). Berlin, East Germany, Akademie-Verlag GmbH, 1976. 372 p.

Attention is given to the biomedical results of the Skylab Program, to the effects of gravity on plant and animal physiology, and the effects of space-flight weightlessness on humans. Also considered in detail are radiation biology, gravitational biology, planetary quarantine, and exobiology.

B.J.

A77-24131 * # **Biomedical results of the Skylab Program.** E. L. Michel, R. S. Johnston, and L. F. Dietlein (NASA, Johnson Space Center, Houston, Tex.). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975.
Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 3-18. 15 refs.

Skylab, the fourth in a logical sequence of USA manned space flight projects following Mercury, Gemini and Apollo, presented life scientists with their first opportunity for an in-depth study of man's response to the space environment. Extensive medical investigations were undertaken to increase our understanding of man's adaptation to the space environment and his readaptation to gravity upon return to earth. The flight durations of the three Skylab missions were progressively increased from 28 days to 59 days and, finally, 84 days. The results of these investigations of the various body systems clearly denonstrated that man can adapt to zero gravity and perform useful work during long-duration space flight. However, definite changes (some unexpected) in the vestibular, cardiovascular, musculoskeletal, renal and electrolyte areas were documented. The most significant were: the occurrence of space motion sickness early in the missions; diminished orthostatic tolerance, both in-flight and post-flight; moderate losses of calcium, phosphorus and nitrogen; and decreased tolerance for exercise post-flight. The mechanisms responsible for these physiological responses must be understood and, if necessary, effective countermeasures developed before man can endure unlimited exposure to space flight. (Author)

A77-24132 # **Considerations of geotropism in plants.** H. Kaldewey (Saarland, Universität, Saarbrücken, West Germany). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975. Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 21-36. 71 refs.

A historical review is presented of the development of research on the reaction of plants to gravity. The earliest period, starting about 1700 and characterized by studies of French and British plant physiologists, demonstrated that gravity influenced the growth direction of plant parts. The second period, begun in 1868 by Frank (who coined the term 'geotropism'), was directed by consideration of the physiology of irritability. The elucidation of the stimulus-reaction chain and the search for geosensors (statolith starch) dominate this period. In the first part of the 20th century, the third period begins with the lateral auxin distribution theory of Cholodny and Went (1926). Modern critical studies using refined methods are described with attention given to the discovery that there might be different principles of georeactions in unicellular geotropic plant organs, i.e., in roots and shoots. B.J.

A77-24133 # **Hormones and the growth of plants in response to gravity.** D. J. Osborne (Cambridge University, Cambridge, England). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975. Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 37-46. 56 refs.

Under conditions of zero gravity, roots and shoots of plants continue to grow in opposite directions and the orientation of laterals with respect to the apex is essentially normal, thus demonstrating the inherent polarity of plant cells and the internal correlative growth regulation that each organ exerts upon its neighbors. The paper discusses the perception of gravity involving statoliths, membranes and 'wound' ethylene, together with the mechanisms by which subsequent growth responses can be mediated by changes in endogeneous hormones. Evidence for how such hormonal changes can lead to modifications of the rate, extent, and reorientation of cell growth is reviewed for several geotropically responding systems. B.J.

A77-24134 # **The evolutionary role of gravity.** N. P. Dubinin and E. N. Vaulina (Akademiia Nauk SSSR, Institut Obshchei Genetiki, Moscow, USSR). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975.
Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 47-55. 52 refs.

Analysis of the part played by gravity in development in the organic world shows that this factor has had an impact on evolution. All terrestrial organisms, including man, have adapted themselves to gravity by developing a number of important features of their composition and functions. Variations of gravitational field in any direction bring about numerous changes in organisms, ranging from metabolism to changes in more conservative systems which also include hereditary structures. Gravitational forces determine the form and the size of organisms, the development of skeletal supporting organs, and energetics. The study of the role of gravity in the variability of the organic world will be of great importance for long-term systems of life support and for work on space orbital stations or at bases on the moon and planets where gravitational forces may differ greatly from those on the earth. (Author)

A77-24135 # **Weight and shape.** S. J. Gould (Harvard University, Cambridge, Mass.). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975.
Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 57-68. 37 refs.

The two major themes of biological scaling theory are examined: (1) that small and large animals live in different adaptive worlds regulated by forces dominant at their size (e.g., surface forces for insects, gravity for large organisms), and (2) that small and large animals have characteristic differences in form and function conditioned by the scaling of surfaces and volumes (e.g., larger animals have relatively smaller brains, thicker legs, lower metabolism, longer life, more convoluted internal surfaces for gas exchange, digestion and circulation). A major issue for space research is the degree of purely genetic determination of adaptation of organic form to body size. If adaptions to large size require the immediate action of gravitational forces, then prolonged weightless flight will provoke reversion by removal of the necessary stimulus. B.J.

A77-24136 * # **Gravity and embryonic development.** R. S. Young (NASA, Washington, D.C.). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975. Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 69-75. 25 refs.

The relationship between the developing embryo (both plant and animal) and a gravitational field has long been contemplated. The difficulty in designing critical experiments on the surface of the earth because of its background of 1 g, has been an obstacle to a resolution of the problem. Biological responses to gravity (particularly in plants) are obvious in many cases; however, the influence of gravity as an environmental input to the developing embryo is not as obvious and has proven to be extremely difficult to define. In spite of this, over the years numerous attempts have been made using a variety of embryonic materials to come to grips with the role of gravity in development. Three research tools are available: the centrifuge, the clinostat, and the orbiting spacecraft. Experimental results are now available from all three sources. Some tenuous conclusions are drawn, and an attempt at a unifying theory of gravitational influence on embryonic development is made. (Author)

A77-24137 # **Physiological effects of sustained acceleration.** L. H. Vogt (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Flugmedizin, Bad Godesberg, West Germany). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975. Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 77-89. 29 refs.

A review is given of the literature concerning the physiological and pathophysiological changes in humans, caused by sustained acceleration. After definition of the acting forces and an introduction into terminology, circulatory and respiratory mechanisms are described which are active under sustained acceleration. The origin of visual disturbances associated with acceleration is discussed. Acceleration tolerance is influenced by magnitude, duration, direction, and rate of application of G-forces together with environmental conditions and the condition of the subject. Acceleration protection may be achieved by technical devices (anti-g suits), voluntary maneuvers and change of posture. (Author)

A77-24138 # **Physiological changes associated with long-term increases in acceleration.** A. H. Smith (California, University, Davis, Calif.). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975. Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 91-100. 67 refs.

The long-term retention of organisms in increased acceleration fields is an experimental approach towards understanding the biological consequences of earth gravity. Such treatment, called chronic acceleration, simulates a change in gravity and requires exposed organisms to adapt physiologically to the new environment. Information from chronic acceleration supplements that from space physiology in understanding gravitational physiology. Many of the responses in long-term exposure to increased acceleration are those which would be anticipated from the imposed symmetrical loading. For example, increased requirements for posture and locomotion induce appropriate changes in musculo-skeletal organs. Displacement of body fluids and increased hydrostatic pressures lead to greater blood volumes and increased tissue hydration. However, there are also specific acceleration effects which cannot be so directly interpreted. Among these are decreases of mature body size and of depot fat, which are proportional in degree to field strength. The role of chronic acceleration research in the development of gravitational biology and its relationship to earth-orbital experiments are considered. The applicability of chronic acceleration studies with human subjects towards planning of deep space exploration is also discussed. (Author)

A77-24139 # **Physiological effects induced by anti-orthostatic hypokinesia.** L. I. Kakurin, M. P. Kuzmin, E. I. Matsnev, and V. M. Mikhailov. In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975.
Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 101-108. 10 refs.

The main purpose of the present investigation was to reproduce some physiological reactions in the sensory system which are similar to those observed during the first day of adaptation to weightlessness. This was achieved by a 5-day bed rest experiment during which the test subjects were kept in the antiorthostatic position at angles of 0, -4, -8, and -12 degrees. Investigations allowed simulation of the acute stage of adaptation to weightlessness and assessment of gravity-induced blood redistribution in the development of the above physiological reactions. (Author)

A77-24140 # **The prevention of motion sickness in orbital flight.** A. Graybiel (U.S. Naval Aerospace Medical Research Laboratory, Pensacola, Fla.). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975.
Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 109-118. 21 refs.

Motion sickness is discussed with reference to manned space flight programs both NASA (Mercury, Gemini, Apollo Command Module, and Apollo Lunar Landing) and Soviet (Vostok, Voskhod, and Soyuz). A brief definition is given of motion sickness from the points of view of etiology, incidence, symptomatology, and diagnosis. The question is raised whether zero gravity qualifies as a motion environment or whether one is dealing simply with 'symptoms characteristic of motion sickness'. The effectiveness of certain antimotion sickness drugs, including d-amphetamine sulfate, dimenhydrinate, ephedrine sulfate, promethazine hydrochloride, and 1-scopolamine hydrobromide, is discussed. B.J.

A77-24141 * # **Mineral and nitrogen metabolic studies on Skylab flights and comparison with effects of earth long-term recumbency.** G. D. Whedon, J. Reid (National Institutes of Health, National Institute of Arthritis, Metabolism, and Digestive Diseases, Bethesda, Md.), L. Lutwak (California, University; U.S. Veterans Administration Hospital, Sepulveda, Calif.), P. Rambaut, M. Whittle, C. Leach, and M. Smith (NASA, Johnson Space Center, Biomedical Research Div., Houston, Tex.). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on

Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975. Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 119-127. 5 refs.

A metabolic study of the effects of space flight on various chemical elements, particularly those with special relevance to the musculo-skeletal system, was carried out on the nine astronauts who participated in the three Skylab flights of 28, 59 and 84 days in 1973-1974. The study required of the cooperating crewmen constant dietary intake, continuous 24-hour urine collections and total fecal collections for 21-31 days before each flight, throughout each flight and for 17-18 days post-flight. Increases in urinary calcium and negative calcium balances during space flight were generally similar to those found in previous immobilization and bedrest studies. The persistence of these alterations in calcium metabolism throughout the flights suggested that calcium losses would continue in weightlessness for a very long time. Significant losses of nitrogen and phosphorus occurred, associated with observed reduction in muscle tissue. Both mineral and muscle losses occurred despite rigorous exercise regimens in flight. It was concluded that unless protective measures can be developed, capable musculo-skeletal function is likely to be impaired in space flights, ultimately to be conducted to Mars, of 1-1/2 to 3 years duration. (Author)

A77-24142 # Human tolerance to acceleration after exposure to weightlessness. A. R. Kotovskaia (Institute of Medical and Biological Problems, Moscow, USSR). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975. Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 129-135. 6 refs.

Laboratory tests demonstrated changes in human tolerance to G-x accelerations of varying duration (from 3 to 100 days) and investigated the effectiveness of different countermeasures. A decrease in tolerance to +G-x was on the average -2.0g. Prolonged simulated weightlessness (from 7 to 100 days) caused no further decrease in +G-x tolerance. The tolerance limit to +G-x accelerations following simulated weightlessness (of the above-noted durations) ranged from 9.5 to 13.0g, averaging 11.6 plus or minus 1.6g. Laboratory results are confirmed by data on astronaut tolerance to deceleration during atmospheric reentry. B.J.

A77-24143 # On the mechanisms of changes in skeletal muscles in the weightless environment. V. S. Oganov and A. N. Potapov (Academy of Sciences, Institute for Medico-Biological Problems, Moscow, USSR). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975.
Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 137-143. 21 refs.

Some characteristics of muscle contraction and mechanical properties of two muscles (M. soleus and M. extensor digitorum longus) in Wistar rats after 22 days of weightlessness have been investigated. On the second day after return to earth, the following changes were evident: slowing of twitch responses of the muscles studied; shortening half tetanic contraction time (defined by point of interactions of the increasing curve with 50% level of the peak value) in soleus; a rise of tension in both muscles as shown by the curve 'length-force'; an increase of twitch/tetanus ratio and fatigability in both muscles. During repeated study of muscle properties, on the 26th day after return to earth, there were no significant changes in values of most of the above mentioned indices except the diminished strength of soleus. (Author)

A77-24144 # Results of medical investigations carried out on board the Salyut orbital stations. O. G. Gazenko, N. N. Gurovskii, A. M. Genin, I. I. Brianov, A. V. Eremin, and A. D. Egorov (Institute of Medico-Biological Problems, Moscow, USSR). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975. Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 145-152.

The goals of biomedical investigation carried out on the Salyut stations were: (1) to study the phenomenology and mechanisms of changes of body functions during prolonged weightlessness, (2) to study human responses at an early stage of adaptation to weightlessness, and (3) to assess the effectiveness of countermeasures against the adverse effects of weightlessness during and after flight. The stations were equipped with the following countermeasure devices: a treadmill for physical exercises, a gravity simulation suit for long wear, a bicycle ergometer, an anti-G suit, and drugs. The system of medical tests included daily recordings of electrocardiography and respiration, and regular physical examinations. B.J.

A77-24145 # Spacelab and its utilization for biomedical experiments. G. Seibert (ESA, Neuilly-sur-Seine, Hauts-de-Seine, France). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975. Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 153-162.

The types of investigations possible in the orbital laboratory Spacelab are considered. A summary of services available to the Spacelab user is given, in which the load carrying capacity and the characteristics of the main subsystems (e.g., thermal control, environmental control, electrical power and energy as well as data management) are briefly described. Life science investigations may be undertaken for two reasons: firstly, to ensure safety and efficiency, and, secondly, for their scientific interest relating to effects of weightlessness or cosmic radiation. Safety of the crew and their genetic cells in relation to cosmic radiation is considered vital; essential knowledge is also required about the performance of the vestibular balancing mechanism and the related problem of 'stomach awareness'. The effect of zero-gravity on the cardiovascular system is studied, and the effect of circulatory changes in the brain, possible psychological stress and effects on exercise tolerance measured. Due to their rapid reproduction, important information may be gained from microorganisms in respect of mutation rates when exposed to radiation. Plants depend, to some extent, on gravity in germination and growth. Of interest here is the relative importance of gravitational and photonic influences. (Author)

A77-24146 # Irradiation of bio-objects aboard the Cosmos 690 biosatellite. Iu. A. Akatov, A. N. Gladilkin, I. V. Ignatov, S. B. Kozlova, A. V. Kolodin, R. A. Kuzin, V. I. Popov, L. N. Seliverstov, V. G. Semenov, and M. A. Sychkov (Institute of Medico-Biological Problems, Moscow, USSR). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975.
Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 165-171.

Animals on the Cosmos 690 were exposed to Cs-137 gamma-radiation of 320 curies. The on-board emitter was a spherical container made of tungsten alloy with a gamma source placed in the center. A special dose filter provided a uniform plus or minus 10% distribution of the dose field. Animal containers were equipped with thermoluminescent dosimeters. Radiation was monitored by an on-board dosimeter and displayed. The emitter was controlled by commands from the ground. On the tenth flight-day, the emitter was turned on and bio-objects were exposed for 34 hours. The dose received by bio-objects located in different areas of the biosatellite varied from 200 to 1000 rad. The flight experiment confirmed entirely the reliability of the radiation system. (Author)

A77-24147 # **Investigation of radiation sensitivity in mammals under long duration weightlessness.** Iu. G. Grigor'ev, E. A. Il'in, Iu. P. Druzhinin, L. V. Serova, V. I. Popov, A. D. Noskin, R. A. Kuzin, Iu. I. Kondrat'ev, M. P. Kalandarova, and G. N. Podluzhnaia (Institute of Medical and Biological Problems, Moscow, USSR). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975. Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 173-177.

Preliminary results of the radiobiological experiments carried out on the biosatellite Cosmos 690 with a radiation exposure unit on board are presented. The duration of the satellite flight was 20.5 days. On the tenth day of the flight 35 rats were exposed on board the satellite to 220 or 800 rads of gamma radiation. Comparison of data obtained in test and control groups of animals has shown that under the influence of space flight factors a somewhat more severe radiation injury develops than in on-ground conditions. (Author)

A77-24148 # **Effect of irradiation in the space environment on the blood-forming system in rats.** M. P. Kalandarova, V. V. Verigo, G. N. Podlyzhnaia, G. P. Rodina, L. V. Serova, and N. A. Chelnaia (Institute of Medico-Biological Problems, Moscow, USSR). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975. Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 179-183.

A special experiment was carried out on board Cosmos 605 in order to study the modifying influence of weightlessness on the radiobiological effect. On the tenth flight day 35 rats were exposed to radiation using an on-board gamma-ray source. They were irradiated for 24 hr at a dose rate of 32 rad/hr with a total dose of 220 plus or minus 25 rads and 800 plus or minus 53 rads. On the 1st and 26th postflight days hemopoiesis in bone marrow determined from myelograms and the total count of myelo-karyocytes was examined and the blood composition was analyzed. The total count of thymocytes and spleenocytes was measured in the thymus and spleen. Identical measurements were made in the control animals exposed to radiation on earth. Hematological findings indicate an enhancement of the radiobiological effect in the rats irradiated in space flight. (Author)

A77-24149 # **Biochemical changes in rats flown on board the Cosmos 690 biosatellite.** I. Ahlers, E. Misurova, M. Praslicka (Univerzita Pavla Josefa Safarika, Kosice, Czechoslovakia), and R. A. Tigranian (Ministerstvo Zdravookhraneniia SSSR, Institut Mediko-Biologicheskikh Problem, Moscow, USSR). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975. Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 185-188. 6 refs.

Results are presented for biochemical analyses of male Wistar rats flown 21 days aboard the Cosmos 690 biosatellite. The objective was to assess the effect of prolonged weightlessness combined with ionizing radiation. The animals were exposed to 24-hr radiation on the 10th flight day, some being exposed to a dose of 220 rad and the rest to a dose of 800 rad. Biochemical analyses were performed on the 1st and 26th postflight days, and the results were compared with the data obtained from two control groups. The biochemical analyses concerned the blood, bone marrow, skeletal muscles, myocardium, liver, spleen, adrenal glands, brain, spinal cord, and white and brown fatty tissue. The changes were an increase in the level of total cholesterol, glucose, urea and corticosterone in the blood plasma; an increase in the concentration of triglycerides in the plasma, liver and bone marrow; a decrease in the DNA and RNA content in the spleen and bone marrow; and potassium depletion and sodium enhancement in the soleus muscle. However, the parameters measured returned to normal on the 26th postflight day. S.D.

A77-24150 # **Study of the biochemical indicators of chronic irradiation in rats.** L. D. Szabo, A. B. Benko, L. Gyenge, and T. Predmerszky (Orszagos Sugarbiologiai es Sugaregeszsegugyi Kutato Intezet, Budapest, Hungary). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975. Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 189-193. 10 refs.

Daily urinary excretion of pseudouridine, creatinine and creatine of chronically irradiated Wistar rats was estimated. The irradiation conditions were: Co-60 gamma source, dose-rate 10 rad/day, total dose 200, 400 and 600 rad. Control groups were kept under similar conditions. Urine samples were taken three times after the end of the irradiation period, It was found that (1) pseudouridine excretion seems more suitable for indicating radiation damage than the creatine/creatinine ratio in chronic irradiation of rats; (2) there are significant changes in dose dependence of pseudouridine excretion in the post-irradiation period, and (3) a new method for pseudouridine estimation gives closely similar data to those of earlier investigations. (Author)

A77-24151 # **Pioneer 10 and 11 Jovian encounters - Radiation dose and biological lethality.** M. W. Miller, G. E. Kaufman, and H. D. Maillie (Rochester, University, Rochester, N.Y.). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975. Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 195-199. 16 refs. ERDA-supported research.

In their recent Jupiter flybys Pioneer 10 and Pioneer 11 passed through a belt of intense particulate radiation. For Pioneer 10 the radiation dose on the craft's outer surface was at least 500,000 rads from electrons plus 1,000,000 rads from protons; the radiation dose inside the craft (0.3 cm aluminum) was approximately 450,000 rads. For Pioneer 11 the surface dose was at least 130,000 rads from electrons plus 300,000 rads fron protons; the interior radiation dose was approximately 120,000 rads. Significant survival of microbial spores would be possible at these calculated doses; however, even the interior dose of Pioneer 11 would be lethal to man and most multicellular biological organisms. (Author)

A77-24152 # **Cytogenetic analysis of seeds of Crepis capillaris /L/ Wallr. exposed on board the earth artificial satellite Cosmos 613.** E. N. Vaulina, L. N. Kostina, and A. L. Mashinskii (Akademiia Nauk SSSR, Institut Obshchei Genetiki, Moscow, USSR). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975. Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 201-204. 7 refs.

Results are presented for a study regarding the effect of space flight factors on air-dry seeds of Crepis capillaris (L) Wallr. and on radiation injury of seeds exposed to gamma radiation (3 krad, 525 rad/min) before and after the flight on the satellite Cosmos 613. Space flight factors induced little increase (which was statistically insignificant) in the rate of chromosome aberrations in cells of the root meristem of Crepis capillaris sprouts, but they enhanced the effect of preliminary irradiation of seeds and decreased their radiosensitivity. Modification of radiation damage was statistically significant. (Author)

A77-24153 # **Role of Cerenkov radiation in the eye-flashes observed by Apollo astronauts.** P. J. McNulty, V. P. Pease (Clarkson College of Technology, Potsdam, N.Y.), and V. P. Bond (Brookhaven National Laboratory, Upton, N.Y.). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on

Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975. Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 205-217. 19 refs. ERDA-sponsored research.

Visual phenomena in the form of colorless flashes of light were observed by astronauts in deep space when their eyes were closed and adapted to darkness. We describe in this paper laboratory experiments and calculations which indicate that many of these flashes are the result of visible light generated within the astronauts' eyeball in the form of Cerenkov radiation when a relativistic HZE particle traverses it. The sensitivity to Cerenkov radiation measured for three subjects exposed to pulses of pions and muons and the visual phenomena observed were found to be consistent with the reports of flashes observed at rates as high as 2 per minute on Apollo missions 11 through 17. (Author)

A77-24154 # **Study with a multi-threshold HZE-particle dosimeter using plastic detectors.** R. Beaujean, W. Enge, W. Herrmann, and K.-P. Bartholomä (Kiel, Neue Universität, Kiel, West Germany). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975. Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 219-224. 7 refs. Research supported by the Deutsche Forschungsgemeinschaft.

During the Apollo 16 and 17 missions two units of the Biostack experiment were exposed to cosmic radiation. In this experiment plastic detector sheets were used for recording and tracing the highly ionizing high-energy (HZE) heavy ions. In some of these sheets the integral energy loss spectrum was measured. The measurements were performed in two different cellulose nitrate materials and in Lexan polycarbonate under 4 g per sq cm and 20 g per sq cm absorber thickness. The individual materials have different energy loss thresholds for the registration of heavy ions. The measured number of particles per sq cm with restricted energy loss REL greater than REL(0) is shown to obey a power law. Calculations shown that more than 70% of the fluence in the measured REL region is coming from particles with Z no less than 20. (Author)

A77-24155 # **Lesional effects of primary cosmic heavy ions on rat brain.** A. Pfister (Hôpital Necker, Paris, France), C. Nogues (Centre de Recherche de Médicine Aéronautique, Laboratoire d'Histologie, Paris, France), and R. Kaiser (CNRS, Centre de Recherches Nucléaires de Strasbourg, Strasbourg, France). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975. Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 225-230. 9 refs.

Heavy ions were detected with nuclear emulsions plates fixed on the skulls of 20 rats which were exposed to cosmic rays at an altitude of 32,000 meters. Eight cases are described of correlations between ions tracks and brain lesions. The passage of heavy ions seems to cause functional rather than destructive alterations in the cells. The metabolic disturbances give a dark aspect to the neurons. The lesions generally appear in wide areas around the track and this fact suggests a physiopathological phenomenon of amplification. An evaluation of this biological hazard during flights of long duration at high altitude will be possible when the mechanism of action of heavy ions on nervous tissue is better known, and particularly if experiments carried out in accelerators confirm the small number of results obtained in flight. (Author)

A77-24156 # ***The Biostack as an approach to high LET research.*** H. Bücker, R. Facius, and M. Schäfer (Frankfurt, Universität, Frankfurt am Main, West Germany). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology; Varna, Bulgaria, May 30, 31, 1975. Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 233-239. 15 refs.

By simple geometric and dosimetric arguments the advantage of an experimental approach to high LET radiation research is demonstrated. The Biostack is capable of recording individual hits of heavy ions on single biological targets. This improved method is compared with the common experimental methods for studying biological effects with high LET radiation and is suggested as a methodological improvement in fundamental research. (Author)

A77-24158 # **Influence of heavy ions on the transforming activity of DNA.** M. I. Minkova, T. P. Pantev (Academy of Medicine, Sofia, Bulgaria), and N. I. Ryzhov (Institute of Medico-Biological Problems, Moscow, USSR). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975. Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 247-250. 9 refs.

Changes in functional activity following treatment of DNA with heavy ions were analyzed by transformation assay. Biological response to exposure to charged particles, B-10, C-12, and Ne-22, was evaluated by the extent of inactivation of ability of DNA to transfer the genetic marker of tryptophane independence. The possibility of protecting the biological activity of DNA was studied using a conventional protective substance, cysteamine hydrochloride, or the preparation cytriphos. Dried samples of donor DNA isolated from a Bacillus subtilis prototroph strain were exposed to doses of 50 krad to 1 Mrad. For the three types of charged particles used, dose response of the inactivation process was defined by an exponential function. Comparison of response curves for the three types of radiation showed the effect to be dependent on LET, being highest for B-10 and lowest for Ne-22. In all three cases, addition of a protective substance failed to produce any change in the biological effect observed. (Author)

A77-24160 # **Amino acid spectrum of human blood plasma during space flight and in antiorthostatic hypokinesia.** A. S. Ushakov and T. F. Vlasova (Institute of Medico-Biological Problems, Moscow, USSR). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975. Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 257-262. 13 refs.

The paper summarizes results of experiments on the influence of space flight and antiorthostatic hypokinesia on the amino acids spectrum of human blood plasma. Our findings give evidence for: (1) a specific norm of the content of free amino acids in plasma during training and (2) consistent changes of plasma aminograms during space flight related to its duration and to individual features of cosmonauts. The content of free amino acids in the plasma of bed-rested subjects varied phasically and tended to increase practically at every experimental stage. The paper discusses the findings and possible mechanisms of the detected changes. (Author)

A77-24161 # **Space flight effect upon the bioenergetics of the skeletal muscles in rats.** E. S. Mailian and E. A. Kovalenko (Institute for Medico-Biological Problems, Moscow, USSR). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975. Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 263-267. 21 refs.

A77-24162 * # **Body composition changes in men and women after 2-3 weeks of bed rest.** N. Pace, A. M. Kodama, B. W.

Grunbaum, D. F. Rahlmann (California, University, Berkeley, Calif.), D. C. Price (NASA, Ames Research Center, Moffett Field, Calif.), and B. D. Newsom (NASA, Ames Research Center, Moffett Field, Calif.). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975. Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 269-274. 8 refs. Grant No. NGR-05-003-470.

Several parameters of body composition were measured in eight men before and after 14 days of continuous recumbency, and in eight women before and after 17 days of recumbency. The parameters measured included body weight, body water, body potassium, plasma volume, and plasma protein concentrations. From these, values were derived for body fat content, lean body mass, body mass, and circulating plasma proteins. In general, the men and women responded similarly to continuous recumbency. Characteristically, there was significant reduction of plasma volume and body potassium in both groups. The women showed a significant reduction in circulating plasma protein, entirely in the albumin fraction; a similar change was observed in the men. The women, but not the men, showed a significant increase in circulating fibrinogen. Both men and women lost body cell mass, while body fat content remained the same or tended to increase slightly. It is expected that similar changes would occur in weightlessness. It is further concluded that women should tolerate the weightlessness of space flight physiologically as well as men. (Author)

A77-24163 # **Antiorthostatic test as a model to study antigravity mechanisms of the cardiovascular system.** Kh. Kh. Iarullin, T. D. Vasil'eva, and D. A. Alekseev (Institute of Biomedical Problems, Moscow, USSR). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975.
Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 275-280. 13 refs.

The paper describes rheographic investigations of regional haemodynamics (brain, lungs, liver and limbs) during antiorthostatic exposures of varying intensity (-15, -30, -45 deg; times of exposure 20, 40 and 60 min). Results show that the pattern and time of the function of compensatory mechanisms preventing excessive vascular compliance under the influence of the hydrostatic blood column depend on the magnitude and length of antiorthostatic state, because prolonged venous congestion results not only in congestive circulatory hypoxia but also in arterial hypoxia due to compensatory limitation of arterial inflow. (Author)

A77-24164 # **Metabolic processes in hypokinetic and rehabilitated men.** V. P. Bychkov and M. V. Markarian (Institute of Biomedical Problems, Moscow, USSR). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975. Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 281-284. 12 refs.

Experiments were conducted on eight male subjects aged 26-40 yr and subjected to -4 deg antiorthostatic hypokinesia during a 49-day period of bed rest to assess the effect of prolonged antiorthostatic hypokinesia on the protein and lipid metabolism, glucose control, and assimilation of major nutrients. Emphasis is placed on the possibility of correcting resultant metabolic changes by a rational diet program. The 49-day test period was preceded by a 12-day control period and followed by a 30-day rehabilitation period. Reduction of anabolic processes under prolonged negative hypokinesia was revealed. Rehabilitation by dietary measures (increase of proteins, polyunsaturated fatty acids, and some minerals in the diet) resulted in a rapid recovery of some parameters of protein metabolism. A tentative one-day diet is included. S.D.

A77-24165 # **Effect of antiorthostatic bed rest on the human body.** T. N. Krupina, B. M. Fedorov, L. M. Filatova, N. I. Tsyganova, and E. I. Matsnev (Institute of Biomedical Problems, Moscow, USSR). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975. Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 285-287.

Head-down (-4 deg) bedrest brings about a more rapid development of changes in hemodynamics, fluid displacement and nervous tone than traditional recumbent bed rest. Changes occurring during head-down hypokinesia have much in common with the changes typical of real weightlessness. They are characterized by phasic changes in the vascular tone. Under these conditions changes in the tone and perfusion of the brain are important for the functional state of the vestibular apparatus. (Author)

A77-24166 # **Deconditioning during prolonged immersion and possible countermeasures.** E. B. Shulzhenko, I. F. Vil-Viliams, M. A. Khudiakova, and A. I. Grigor'ev (Institute of Medico-Biological Problems, Moscow, USSR). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975.
Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 289-294. 10 refs.

Fourteen healthy male subjects covered with a highly-elastic waterproof cloth were exposed to 13-day water immersion up to the neck. They were divided into two equal groups. The first (control) group was exposed to immersion alone and the second (experimental) group was exposed daily to accelerations of 0.6-2 Gz for 60-90 min during the last 6 days of immersion. Before and after immersion all the subjects were exposed to +3 Gz for 5 min. The experiments show that the use of dry immersion allows experimentation during prolonged immersion without concomitant complications. Variations in the physiological parameters (cardiovascular system, fluid-electrolyte balance, blood coagulation system) point to the preventive effect of periodic accelerations during 13-day immersion. (Author)

A77-24167 # **Study of space perception functioning during simulation of certain space flight factors.** I. Ia. Iakovleva, B. B. Bokhov, and L. N. Kornilova (Institute of Biological Problems, Moscow, USSR). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975. Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 295-300.

The results are reported of spatial perception function studies in 130 healthy males of 17-35 years of age and in 33 people with complete or partial inhibition of the function of the labyrinth (deaf-mutes). The comparative magnitudes of gravitational vertical perception impairments were studied during vestibular stimulation (Coriolis and linear acceleration), as well as during clino-orthostatic and antiorthostatic hypokinesia. Hypokinesia to a certain extent permitted the simulation of the blood redistribution in weightlessness. The ability of the subjects to determine the subjective visual vertical was used as the test criterion. The experiments have shown that the magnitude of the observed changes in the human sensory area depends on the physical properties of the vestibular stimulus, on the angle of inclination of the head of the bed during hypokinesia and on the duration of bed rest, but not necessarily on the level of vestibular tolerance. Possible mechanisms of impairment of perception in the space flight environment are discussed. Examinations of spatial perception function are useful during selection procedures for astronauts and airmen. (Author)

A77-24168 # **Cardiac output during physical exercises following real and simulated space flight.** B. S. Katkovskii and Iu. D.

Pomiotov (Institute of Medico-Biological Problems, Moscow, USSR). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975. Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 301-305. 28 refs.

During moderate physical work (after 5 min) the cardiac stroke volume in the cosmonauts who made 2-8-day flights in the Soyuz spacecraft was lower and the pulse rate was higher than the pre-flight level. By the end of the 49-day bed-rest experiment the stroke volume during physical exercises (after 5 min) was lower than at the 5th min of the pre-test period in both the supine and sitting positions. The cosmonauts performed physical exercises in the sitting position. Therefore, it can be assumed that the major factor changing cardiac output may be the effect of the earth's gravity against the background of decreased orthostatic tolerance. Results of simulated experiments give evidence that in both cases one of the major factors responsible for changes in the cardiac output was a decline in the contractile capacity of the myocardium. (Author)

A77-24169 # **Renal osmoregulatory function during simulated space flight.** G. I. Kozyrevskaia, A. I. Grigor'ev, and Iu. V. Natochin (Institute for Medico-Biological Problems, Moscow, USSR). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975. Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 307-311. 5 refs.

Experiments are described on the dynamics of the renal excretion of water and electrolytes, osmotically active substances and osmotically free water during bed rest. In short-term experiments (up to 10-14 days) renal changes are mainly associated with haemodynamic disturbances and fluid redistribution, whereas in longer duration experiments (up to 50 days) they are brought about by metabolic changes. (Author)

A77-24170 # **Characteristics of postural self-regulation in complex spatial environments and after-effects of weightlessness.** V. I. Miasnikov, O. P. Kozerenko, and N. M. Rudometkin (Institute of Medico-Biological Problems, Moscow, USSR). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975.

A77-24171 # **Hypergravitation and sympatho-adrenergic reactivity.** P. Groza, R. Carmaciu, E. Nicolescu, S. Cananau, R. Vrancianu, and D. Bobic (Academia Romana, Institutul de Fiziologie Normala si Patologica, Bucharest, Rumania). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975. Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 319-324. 11 refs.

The sympatho-adrenergic reaction of the organism subjected to hypergravitation was investigated in rats exposed to +6 Gz. The electro- and cardiotachograms recorded telemetrically were correlated with the adrenal catecholamine content. The determinations were made in controls and in rats treated with hexamethonium and atropine administered separately or together. Hexamethonium lowered the resting heart rate, attenuated the initial bradycardia and reduced the consecutive tachycardia. Hexamethonium stored the catecholamines in the adrenals as a result of their increased concentration. Atropin brought about resting tachycardia, elimination of bradycardia from the very beginning of centrifugation and a more accentuated tachycardia. Atropin and hexamethonium administered together diminished the response to acceleration. (Author)

A77-24172 # **A study of the cumulative effects of repeated exposures to radial accelerations.** T. N. Krupina, G. P. Mikhailovskii, A. Ia. Tizul, M. P. Kuzmin, N. I. Tsyganova, and E. B. Shulzhenko (Institute for Medico-Biological Problems, Moscow, USSR). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975. Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 325-327. 6 refs.

After exposure to transverse accelerations of 4-10g changes in the vascular system of the eye and immunobiological resistance of the body persisted from 5 to 15 days. The data give evidence that the state of retinal vessels is the most informative index of the cumulative effect on the body and its recovery. (Author)

A77-24173 # **Heat exchange between the organism and environment under conditions of weightlessness - Methodical approach.** L. Novak (Ceskoslovenska Akademia Vied, Biofyzikalni Ustav, Brno, Czechoslovakia). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975. Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 330-333. 5 refs.

The spontaneous streaming of air around surfaces of warm bodies conditioned by gravitation is missing in the weightless condition. This implies a change in the thickness of the surface air layer and its interference with the heat output of an organism. The paper describes the use of an electric dynamic katathermometer (EDK) for automatic and continuous scanning of heat output and presents results of measuring basic characteristics of the surface layer under defined laboratory conditions, and their relation to heat output. (Author)

A77-24174 # **Effect of extreme factors on micro-organisms used for the control of the effectiveness of sterilization.** V. I. Vashkov, G. V. Scheglova, N. V. Ramkova, E. S. Zavolnaia, K. O. Fedorova, and E. K. Skvortsova (All-Union Scientific Research Institute for Disinfection and Sterilization, Moscow, USSR). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975. Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 337-339.

Survival of microorganisms used for control of sterilization procedures was studied under conditions simulating the Martian environment (daily temperature change from +20 to -20 C in 99.98% CO2 + 0.02% air at 0.13 times 10 to the minus 6th N per sq cm pressure, with ultraviolet radiation spanning the whole range of the solar spectrum 300-350 MkW per sq cm). The test organisms were four strains of Bacillus subtilis and one strain of Bacillus anthracoides, and were inoculated onto four materials, smooth metal, porous plastic, multilayer composition material and powdered limonite. Some organisms survived on all materials, the longest survival being on the limonite. The resistance of the survivors to disinfectants was the same as that of the original cultures. (Author)

A77-24175 # **On methods of detection of extraterrestrial life.** A. A. Imshenetskii, M. D. Evdokimova, and G. G. Sotnikov (Akademiia Nauk SSSR, Institut Mikrobiologii, Moscow, USSR). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975. Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 345-349.

New methods have been developed for detecting microbial growth from the microflora of desert soils. The first is a polarimetric method in which the fall in optical activity due to assimilation of D-glucose is followed. Detectable changes with desert soils were seen in a few hours, and the method can be employed with small amounts of material. The second method is the release of heat from metabolizable substrates as measured by a microcalorimeter. In the presence of glucose a characteristic response from desert soils was found within 24 hours. (Author)

A77-24176 * # **Performance of fungi in low temperature and hypersaline environments.** S. M. Siegel and T. W. Speitel (Hawaii, University, Honolulu, Hawaii). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975. Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 351-354. 5 refs. Grant No. NGL-12-001-042.

A77-24177 # **Effect of space factors on Escherichia coli B/r cells.** H. Bücker, R. Facius, G. Reitz, C. Thomas, and H. Wollenhaupt (Frankfurt, Universität, Frankfurt am Main, West Germany). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975. Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 355-358. 5 refs.

Inactivation of stationary phase cells of Escherichia coli B/r cells subjected to vacuum treatment is reviewed. UV irradiated E. Coli B/r cells exhibit increased UV sensitivity. Results are presented for an investigation directed to determine whether DNA-protein crosslinks are preferentially formed in a vacuum and to assess their importance. It is found that the amount of DNA that becomes crosslinked to proteins increases when stationary phase cells of E. Coli B/r cells are irradiated in high vacuum. To determine the amino acid residues capable of crosslinking with nucleic acids, the protein part of the crosslinked product was hydrolyzed with pronase E, the nucleic acids were isolated both from the pronase E and the hydrolysis products, and the nucleic acids were then hydrolyzed in hydrochloric acid. It is found that almost all amino acid residues in proteins are able to crosslink with nucleic acids. The sensitivity of the cells to X-ray radiation is also discussed. S.D.

A77-24178 # **On micro-organisms of the stratosphere.** A. A. Imshenetskii, S. V. Lysenko, G. A. Kazakov, and N. V. Ramkova (Akademiia Nauk SSSR, Institut Mikrobiologii, Moscow,,USSR). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975. Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 359-362.

Analysis of the stratosphere is highly complicated as any sampling must avoid penetration of extraneous microflora into the sampling device of a rocket-borne analyzer. A technique is described for complete exclusion of any possibility of contamination of analyzers by outside microflora. Identification of colonies reveals that at an altitude ranging between 48 and 77 km selected microorganisms comprise fungi Circinella muscae, Penicillium notatum, Aspergillus niger, Papulaspora anomala, as well as non-sporeforming bacteria Micrococcus albus and Mycobacterium luteum. S.D.

A77-24179 * # **Geomycology.** N. J. Puerner and S. M. Siegel (Hawaii, University, Honolulu, Hawaii.). In: Life sciences and space research XIV; Proceedings of the Open Meeting of the Working Group on Space Biology, May 29-June 7, 1975, and Symposium on Gravitational Physiology, Varna, Bulgaria, May 30, 31, 1975. Berlin, East Germany, Akademie-Verlag GmbH, 1976, p. 363-366. 10 refs. Grant No. NGL-12-001-042.

Fungi have long been known to have capabilities for reduction and alkylation of arsenate and selenate but their general capabilities for solubilizing and accumulating metallic substances have been given serious attention only in recent years. Common members of the Aspergillaceae cultured on boron, copper, lead and other metals or oxides can solubilize and concentrate the elements or their compounds. To account for biosolubilization of the metals, we have set up a model study, incubating selected metals, e.g., mercury, in solutions of various metabolites including L-lysine and citric acid. Results of 100-300 days incubation showed that many metals can in fact be readily solubilized, and in some cases more effectively at pH 6-7 than at pH 1.5-2. (Author)

A77-24310 **Some effects of infrasound on task performance.** K. Kyriakides and H. G. Leventhall (Chelsea College, London, England). *Journal of Sound and Vibration,* vol. 50, Feb. 8, 1977, p. 369-388. 35 refs.

Some effects of moderate levels of infrasound on the performance of a complex task have been investigated using two experimental designs. A comparison between these effects and those due to alcohol, audio frequency noise, and combinations of infrasound-alcohol and alcohol-audio frequency noise is also presented. The complex task adopted for these experiments consisted of (1) a centrally located high priority pointer following task which had to be performed continuously and (2) the response to the onset of any one of four lights two of which were situated in front of the subject and two on his periphery of vision. The task was performed over a period of 36 minutes. Our results indicate that although performance in the infrasound condition does not suffer significant decrements in either the primary task or the central and peripheral components of the secondary task, the effects through time, both within the infrasound condition and in relation to the control, produce changes which are of a different nature to those of audible noise. In audible noise performance is maintained through time, whereas with infrasound and alcohol it appears to be degraded. (Author)

A77-24355 **Muscle glycogen repletion after high-intensity intermittent exercise.** J. D. MacDougall, G. R. Ward, D. G. Sale, and J. R. Sutton (McMaster University, Hamilton, Ontario, Canada). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 42, Feb. 1977, p. 129-132. 21 refs.

A77-24356 **Causes of high blood O2 affinity of animals living at high altitude.** D. Petschow, I. Würdinger, R. Baumann, J. Duhm, G. Braunitzer, and C. Bauer (Medizinische Hochschule, Hanover; Pädagogische Hochschule, Hildesheim; München, Universität, Munich; Max-Planck-Institut für Biochemie, Martinsried, West Germany). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 42, Feb. 1977, p. 139-143. 34 refs.

To elucidate possible mechanisms by which high oxygen affinity of the blood can be caused in highland animals, an experimental study was conducted to investigate the oxygen-binding properties of blood and hemoglobin solutions as well as the concentration of organic phosphates in the erythrocyres of highland animal species such as the bar-headed goose (Anser indicus) and the guanaco (Lama guanicoe). Same measurements were carried out for the blood of two goose species that live at sea level and for the human blood. It is found that the much higher oxygen affinity of the blood of the bar-headed goose as compared to that of the sea-level geese can be largely accounted for by a reduced interaction of the hemoglobin with organic phosphates rather than by differences in intrinsic oxygen affinity or by a distinctly lower concentration of organic phosphates inside the red blood cell. S.D.

A77-24357 * **Spinal cord thermosensitivity and sorting of neural signals in cold-exposed rats.** C. A. Fuller, J. M. Horowitz, and B. A. Horwitz (California, University, Davis, Calif.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 42, Feb. 1977, p. 154-158. 23 refs. Grant No. NGR-05-004-099.

A77-24358 **Role of ketone bodies in nonshivering thermogenesis in cold-acclimated rats.** H. Maekubo, K. Moriya, and T. Hiroshige (Hokkaido University, Sapporo, Japan). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 42, Feb. 1977, p. 159-165. 36 refs.

A77-24359 **Metabolic and cardiovascular responses to norepinephrine in trained and nontrained human subjects.** J. LeBlanc, M. Boulay, S. Dulac, M. Jobin, A. Labrie, and S. Rousseau-Migneron (Université Laval, Quebec, Canada). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 42, Feb. 1977, p. 166-173. 58 refs.

A77-24360 **Lung mast cell density and distribution in chronically hypoxic animals.** A. Tucker, I. F. McMurtry, A. F. Alexander, J. T. Reeves, and R. F. Grover (Colorado, University, Medical Center, Denver; Colorado State University, Fort Collins, Colo.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 42, Feb. 1977, p. 174-178. 17 refs. Research supported by the Colorado Heart Association; Grant No. NIH-HL-14985.

Changes in the density and distribution of pulmonary mast cells were determined in six mammalian species exposed to hypobaric hypoxia at 435 torr for 19-48 days. Control animals were studied at 1,600 m (635 torr). Total lung mast cell hyperplasia was observed only in calves exposed to high altitude. Pigs, rats, and sheep exhibited small, but insignificant, increases in mast cell density. Perivascular mast cell proliferation adjacent to 30-500 micron diam vessels was seen in both calves and pigs. Bronchial, alveolar septal, and systemic tissue (tongue) mast cell hyperplasia was not observed in any of the species. Three indices of pulmonary hypertension (right ventricular hypertrophy, medial thickness of pulmonary arteries, and pulmonary arterial pressure) correlated with perivascular mast cell density. The findings indicate that perivascular mast cell proliferation may relate more to the morphological pulmonary vascular changes and to pulmonary hypertension than to hypoxia, so that mast cells increase in number in response to hypertension. (Author)

A77-24361 **Lung elasticity and airway dynamics in Peruvian natives to high altitude.** J. S. Brody, S. Lahiri, M. Simpser, E. K. Motoyama, and T. Velasquez (Boston University, Boston, Mass.; Pennsylvania, University, Philadelphia, Pa.; Yale University, New Haven, Conn.; Universidad Nacional Mayor de San Marcos de Lima, Lima, Peru). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 42, Feb. 1977, p. 245-251. 31 refs. Grants No. NIH-HL-15880; No. NIH-HL-15063.

Experiments were conducted on a group of young adult Peruvian highland natives aged 17-20 yr to assess lung pressure-volume characteristics and maximum expiratory flow-volume curves with a view toward evaluating the role of genetic and environmental factors in the genesis of large lungs in highlanders. Results are compared with measurements in lowlanders of comparable genetic background and age. It is shown that the large lungs of highlanders result from postnatal environmental hypoxic stimulation of lung growth and that genetic factors play a minor role in this form of pulmonary adaptation. Importance of 'dysynaptic' lung growth in determining patterns of adult lung function is highlighted. S.D.

A77-24362 * **Fluid shifts during thermal stress with and without fluid replacement.** L. G. Myhre (Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex.) and S. Robinson (Indiana University, Bloomington, Ind.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 42, Feb. 1977, p. 252-256. 17 refs. Contracts No. NAS9-12572; No. DA-49-193-MD-2449.

Six unacclimatized men rested for 4 hr in a hot, dry environment without fluid replacement (DH). Another group of six men were exposed to the same thermal stress, replacing evaporative fluid loss with warm 0.1% NaCl solution (FRP). Total grams of circulating hemoglobin, determined by CO immediately prior to and again during the last minutes of heat exposure, increased an insignificant 1.6 and 1.3% during DH and FRP, respectively. With DH, body weight loss of 2.6% was accompanied by a 7.8% reduction in calculated plasma volume (PV). Even when body weight was maintained (FRP), PV decreased 2.9% during the heat exposure. Total circulating serum protein did not change as a result of the heat stress with either DH or FRP. In a test-retest series of experiments on four men, DH was not detrimental to sweat rate. It is shown that hemodilution is not a general response to acute heat exposure. The disproportionately large reduction in PV during thermal dehydration is confirmed. (Author)

A77-24363 **cAMP in temperature- and ADH-regulating centers after thermal stress.** I. Kornbluth, R. A. Siegel, N. Conforti, and I. Chowers (Hadassah University Hospital, Jerusalem, Israel). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 42, Feb. 1977, p. 257-261. 31 refs. Research supported by the U.S. Israel Binational Foundation.

Experiments were conducted on male rats weighing between 180 and 240 g to determine whether cyclic adenosine 3',5'-monophosphate (cAMP) is one of the molecular factors involved in the activity of temperature-regulating centers (TRCs). Concentration of cAMP were measured in specified brain areas along with plasma osmololity following acute thermal stress for periods of 10, 20, and 30 min. The brain areas studied were the preoptic area, the posterior medial hypothalamus, the paraventricular nuclei, and the supraoptic nuclei. The study provides evidence that cAMP is involved in the mechanisms of thermoregulation in the TRCs of the central nervous system and in the neurohypophysis at the cellular level. However, the whole chain of metabolic events and the exact function of cAMP in this chain remain to be elucidated. S.D.

A77-24364 **Cardiac responses to moderate training in rats.** M. A. Codini, T. Yipintsoi, and J. Scheuer (Montefiore Hospital and Medical Center; Albert Einstein College of Medicine, Bronx, N.Y.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 42, Feb. 1977, p. 262-266. 25 refs. Grants No. PHS-HL-15498; No. PHS-HL-17809; No. PHS-HL-07071.

Results are presented for an experimental study designed to assess cardiac responses in open-chest respired rats conditioned by swimming, in which left ventricular pressure and the rate of left ventricular pressure rise were measured during ejection and isovolumetric contractions, during sinus rhythm and during atrial pacing. Sedentary rats were used as controls. In each animal, measurements were made with the aorta unobstructed and during gradual aortic occlusion to produce essentially isovolumetric contractions. Group comparisons were made to obtain statistical significance using the Student test. Results indicate that although baseline cardiac performance may be the same in rats conditioned by a moderated swimming program and in sedentary animals, physical conditioning of rats conditioned by swimming produces intrinsic alterations in the myocardium which are independent of hypertrophic response and bradycardia. The cardiac reserve could only be improved by the applied physical stress. S.D.

A77-24365 **Hypoxia-induced metabolic and core temperature changes in the squirrel monkey.** D. H. Horstman and L. E. Banderet (U.S. Army, Research Institute of Environmental Medicine, Natick, Mass.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 42, Feb. 1977, p. 273-278. 14 refs.

A77-24366 **Interaction of lung volume and chemical drive on respiratory muscle EMG and respiratory timing.** S. G. Kelsen, M. D. Altose, and N. S. Cherniack (Pennsylvania, University, Philadelphia, Pa.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 42, Feb. 1977, p. 287-294. 24 refs. Grant No. PHS-HL-08805.

Fifteen spontaneously breathing dogs weighing 15-22 kg were studied to assess the influence of vagal stimulation applied throughout the respiratory cycle on inspiratory (diaphragm) and expiratory (external oblique) muscle activity under conditions of changing chemical stimulus. The electromyogram was measured rather than ventilation since the mechanical effects on the chest bellows produced by FRC (Functional Residual Capacity) changes could by themselves decrease ventilation even if respiratory neuron activity were unaffected. Progressive hypercapnia and hypoxia were produced by rebreathing techniques in order to allow wide variations in chemical drive. Vagal reflexes were stimulated by applying positive pressure to the airway to increase lung volume (FRC). Results suggest that tonic vagal stimulation produced by increases in FRC modifies the change in respiratory muscle electrical activity and timing produced by increasing chemical drive. It seems possible that the influence of vagal afferent activity on the central respiratory neurons decreases as chemical drive increases. S.D.

A77-24367 **Effects of cold exposure and dehydration on renal function in black-tailed prairie dogs.** J. D. Hamilton and E. W. Pfeiffer (Montana, University, Missoula, Mont.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 42, Feb. 1977, p. 295-299. 22 refs. Research supported by the University of Montana.

A77-24368 **Ventilatory and gas exchange dynamics in response to sinusoidal work.** R. Casaburi, B. J. Whipp, K. Wasserman, W. L. Beaver, and S. N. Koyal (Harbor General Hospital; California, University, Torrance, Calif.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 42, Feb. 1977, p. 300-311. 38 refs. Grants No. NIH-HL-14967; No. NIH-HL-11907; No. NIH-HL-17107.

Frequency analysis techniques were used to determine the dynamic relationships between ventilation and gas exchange variables in subjects exercising on a bicycle ergometer against a workload which varies sinusoidally. The work regimen was so designed that the sinusoidal fluctuation of workload would not involve anaerobiosis, with the result that a linear model is capable of adequately describing the underlying processes. The response characteristics are found to be well described by first-order linear dynamics with time constants for the heart rate and minute ventilations of expired air, carbon dioxide, and oxygen averaging 0.8, 1.4, 1.2, and 0.8 min, respectively. The results lead to the conclusion that exercise hyperpnea is linked to metabolism via carbon dioxide production. The fact that ventilatory response is precisely matched to the rate at which carbon dioxide reaches the lung suggests that the sensory system is located not at the site of metabolism but more centrally in the lungs or perhaps in the arterial circulation. S.D.

A77-24425 # **Introduction to the study of a mathematical model of a pilot (Introduction à l'étude d'un modèle mathématique de pilote).** J.-C. Wanner (ONERA, Châtillon-sous-Bagneux, Hauts-de-Seine, France). *(Colloque sur la Biomécanique du Pilotage, 2nd, Toulouse, France, Nov. 24-26, 1976.) ONERA, TP* no. 1976-118, 1976. 12 p. In French.

A discussion of the safety of a piloted vehicle revealed that an accident occurs when one of the parameters characterizing the functioning of a piloted vehicle departs from a permissible range of values as a result of a sequence of events related to vehicle handling, maneuverability, and sensitivity to perturbations. Theoretical analysis of handling events requires the introduction of a mathematical model of a pilot in the piloting loop. A detailed study is conducted concerning the physical and mental behavior of a pilot. It is shown that a pilot does not behave like a conventional servomechanism, but performs separately and successively the required mental and physical operating of piloting. Conditions to be satisfied by the mathematical model of a pilot are identified. S.D.

A77-24453 **Evaluation of the toxicity of combustion products.** F. Saito (Ministry of Construction, Building Research Institute, Tokyo, Japan). *Journal of Combustion Toxicology,* vol. 4, Feb. 1977, p. 32-55. 7 refs.

Toxicity of combustion products to the human organism during fire outbreaks is discussed in terms of detrimental heat, smoke, and gases produced. Symptoms caused by typical gases other than CO are identified along with pertinent physiological effects. Relation between time to death and toxicity of single gases and gas mixtures is analyzed. Attention is directed to the experimental evaluation of gas toxicity on mice by means of different techniques. Quantitative analysis of toxicity is provided using suitable formulas. The specific toxicity of various materials is determined. S.D.

A77-24455 **Acute combined effects of HCN and CO, with special reference to a theoretical consideration of acute combined effects on the basis of the blood cyanide and COHb analyses.** K. Yamamoto (Kyoto University, Kyoto, Japan). *Journal of Combustion Toxicology,* vol. 4, Feb. 1977, p. 69-78. 17 refs.

On the assumption that the acute toxicities of HCN and CO are proportional to their concentration-exposure time (CT) products and that blood concentrations of cyanide and CO depend upon their CT products, an equation relating acute combined effects of HCN and CO with their blood concentrations was derived. In deriving the equation, death of the animal was used as an index of the acute toxicity. The application of the equation to the data on the blood CO and cyanide levels of rats acutely exposed to the combustion products from various combinations of polyacrylonitrile-gauze mixtures was discussed. (Author)

A77-24501 **Visual field contraction during G stress at 13, 45, and 65 deg seatback angles.** K. K. Gillingham and G. B. McNaughton (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aviation, Space, and Environmental Medicine,* vol. 48, Feb. 1977, p. 91-96. 7 refs.

Two groups of six experienced subjects, operating a high-resolution visual field limit tracker, were exposed to gradual-onset (0.067 G/s) G stress to a 7-G maximum on a human centrifuge. Data obtained from one group described the G-induced vertical visual field contraction, and that from the other described horizontal visual field contraction - as they occurred in relaxed subjects in seats with 13, 45, and 65 deg seatback angles. Curves of peripheral vision remaining against G level indicated a statistically significant difference in tolerance provided by the 65 deg seat over that provided by the 13 and 45 deg seats in the 5- to 7-G range, and a significant difference in tolerance provided by the 45 and 65 deg seats over that provided by the 13 deg seat in the 4- to 5-G range. Two-dimensional reconstructions of the superior half of mean binocular vision remaining at the various levels of G stress showed complete visual loss near 5 G in the 13 deg seat, complete loss near 6 G in the 45 deg seat, and substantial peripheral vision remaining at 7 G in the 65 deg seat. (Author)

A77-24502 **Effective temperature scale useful for hypo- and hyperbaric environments.** Y. Nishi (John B. Pierce Foundation Laboratory, New Haven, Conn.) and A. P. Gagge (Yale University, New Haven, Conn.). *Aviation, Space, and Environmental Medicine,* vol. 48, Feb. 1977, p. 97-107. 24 refs. Grant No. NIH-ES-00354.

Basic physics of man's heat exchange by radiation, convection, evaporation, and conduction through clothing is used to define and establish a Standard Effective Temperature Scale (SET), with which sensory and physiological responses of sedentary and active personnel can be related. The standard environment chosen is the Effective Temperature Scale, i.e., the temperature of an isothermal enclosure at sea level with 50% rh and still air (0.1-0.15 m/s) in which a clothed sedentary subject would exchange the same total sensible and insensible heat as in the actual test environment. Mean skin temperature and skin wettedness can be associated at sea level with thermal comfort and neutrality and with heat exchange. For hypo- and hyperbaric environments, thermal equivalence between SET and any test environment occurs when mean body temperature for each is identical. Comprehensive data, developed for a 2-node model of human temperature regulation and of the associated partitional calorimetry, demonstrate the expected interaction between SET and the basic environmental and clothing factors over the barometric range 0.33 to 30 ATA. (Author)

A77-24503 **Combined effect of space flight and radiation on skeletal muscles of rats.** E. I. Il'ina-Kakueva and V. V. Portugalov (Ministerstvo Zdravookhraneniia SSSR, Institut Mediko-Biologicheskikh Problem, Moscow, USSR). *Aviation, Space, and Environmental Medicine,* vol. 48, Feb. 1977, p. 115-119. 13 refs.

Skeletal muscles of rats flown for 20.5 days aboard the biosatellite Cosmos-690 and irradiated with a dose of 800 rad on the 10th flight day were studied. The radiation exposure aggravated the severity of atrophic and dystrophic processes in m. soleus and atrophic process in m. gastrocnemius that developed under the conditions of weightlessness and hypokinesia. At the same time, an exposure to penetrating radiation did not affect the muscles where no flight-induced pathologies occurred. The radiation affected the pattern of reparation in those regions of the soleus muscle that developed pathology inflight, slowed down resorption of the connective tissue formed during the pathological process, and inhibited the course of the reparative process. (Author)

A77-24504 * **Reversal of bedrest-induced orthostatic intolerance by lower body negative pressure and saline.** K. H. Hyatt and D. A. West (U.S. Public Health Service Hospital, San Francisco, Calif.). *Aviation, Space, and Environmental Medicine,* vol. 48, Feb. 1977, p. 120-124. 18 refs. NASA Order T-40-B.

Six healthy male volunteers underwent two 1-week periods of bedrest, each preceded and followed by 2-week control and recovery periods. The daily metabolic diet contained 150 mEq of sodium. Following one 7-day bedrest period, each man was subjected to LBNP at a level of -30 mm Hg for 4 hr while consuming 1000 ml of beef bouillon containing 154 mEq of sodium. After the other bedrest period, each man simply consumed the bouillon without LBNP treatment during 4 hr of continued bedrest. Measurements of plasma volume and orthostatic tolerance were made before and after each treatment period. After combined LBNP and saline therapy, plasma volume and response to LBNP testing showed a return to pre-bedrest levels. Saline consumption alone had a lesser effect. With continuation of bedrest in three subjects, the beneficial effects of these measures appeared to be largely gone after 18 hr. (Author)

A77-24505 **Changes in orthostatic tolerance in man at an altitude of 3500 meters.** M. S. Malhotra and W. S. Murthy (Defence Institute of Physiology and Allied Sciences, Delhi, India). *Aviation, Space, and Environmental Medicine,* vol. 48, Feb. 1977, p. 125-128. 8 refs.

Orthostatic tolerance was measured in 20 lowlander Indian soldiers (sojourners) by recording responses of heart rate (HR), blood pressure and mean skin temperature to 70 deg head-up passive tilt, initially at Delhi (260 m altitude) and thereafter at 3500 m at weekly intervals for 3 weeks. For comparison, observations were also made once on 10 acclimatized lowlanders (AL) and 10 high-altitude natives (HAN) at the same altitude. Among sojourners, the percentage of subjects showing orthostatic intolerance (OI) during tilt increased at high altitude in the first and second weeks; six subjects fainted in the first week as compared to one who fainted at sea level (SL). There was no incidence of fainting among AL or HAN and the percentage of subjects showing OI was very small. The magnitude of cardio-acceleration to tilt was higher in sojourners at high altitude (HA) and relatively less in AL and HAN. Skin temperature drop was observed during tilt, which was of a lesser magnitude at HA. Results indicate that there is a reduced orthostatic tolerance at high altitude during the first week, due to hypocapnia, after which it is improved as a result of relative sympathetic hyperactivity and adaptation of the vasomotor center to reduced $PaCO_2$ level. (Author)

A77-24506 * **Induction of illusory self-rotation and nystagmus by a rotating sound-field.** J. R. Lackner (Brandeis University, Waltham; MIT, Cambridge, Mass.). *Aviation, Space, and Environmental Medicine,* vol. 48, Feb. 1977, p. 129-131. 13 refs. Research supported by the Rosenstiel Sciences Foundation and Spencer Foundation; Grant No. NGL-22-009-308.

Subjects seated in darkness often experience illusory self-rotation when exposed to a rotating sound field. Compelling illusions of a self-rotation are generally accompanied by nystagmoid movements of the eyes with the slow phase in the direction opposite that of the experienced self-rotation. These phenomena are related to the functioning of a spatial constancy mechanism by which a stable distinction is normally maintained between movements of self and movements of the environment. The appearance of nystagmus during illusory self-rotating indicates that apparent body orientation can influence oculomotor control. (Author)

A77-24507 * **Cardiovascular responses of men and women to lower body negative pressure.** L. D. Montgomery, P. J. Kirk, P. A. Payne, R. L. Gerber, S. D. Newton, and B. A. Williams (NASA, Ames Research Center, Moffett Field, Calif.). *Aviation, Space, and Environmental Medicine,* vol. 48, Feb. 1977, p. 138-145. 36 refs.

Changes in blood flow and blood redistribution were measured by impedance plethysmography in the pelvic and leg regions of six male and four female subjects during three 5-min exposures to -20, -40, and -60 mm Hg lower body negative pressure (LBNP). Female subjects demonstrated significantly higher mean heart rate and lower leg blood flow indices than the male subjects during the recumbent control periods. Men had slightly higher mean resting systolic and diastolic blood pressures and higher mean control pelvic blood indices. Women demonstrated significantly less blood pooling in the legs and slightly less in the pelvic region than the men. All of the 18 tests with male subjects at -60 mm Hg were completed without initial signs of syncope, while only two of the tests with women were completed successfully without the subject exhibiting presyncopal conditions. Results indicate that impedance plethysmography can be used to measure segmental cardiovascular responses during LBNP and that females may be less tolerant to -60 mm Hg LBNP than males. (Author)

A77-24508 **Maximal aerobic power in women cadets at the U.S. Air Force Academy.** R. W. Cote, III, J. B. Bomar, Jr., G. E. Robertshaw, and J. C. Thomas (U.S. Air Force Academy, Colorado Springs, Colo.). *Aviation, Space, and Environmental Medicine,* vol. 48, Feb. 1977, p. 154, 155. 16 refs.

A sample of 17 women cadets of the U.S. Air Force Academy's Class of 1980 was assessed to determine their maximal oxygen consumption and per cent body fat. The sample was selected using the ponderal index to insure a stratified sample of body types. The Short Balke protocol was used to determine maximal oxygen consumption, and the Siri and the Keys and Brozek equations were used to find per cent body fat. The Katch and McArdle equation was employed to determine body density. The average maximal oxygen consumption for the women cadets was 46.1 ml/kg/min (SD = 4.0). Correcting for altitude, this value compares quite favorably with other reported values. The 24.8% mean body fat places these subjects well within the normal range for college age females. The female cadets of the Class of 1980 appear to be above their contemporaries in civilian life in circulo-respiratory fitness. (Author)

A77-24509 **Impairment of flying efficiency in anancastic pilots.** L. R. C. Haward (Surrey, University, Guildford, England). *Aviation, Space, and Environmental Medicine*, vol. 48, Feb. 1977, p. 156-161. 32 refs.

The records of six anancastic and ten dysthymic pilots were examined for differences in level of psychophysiological arousal, flying skill in a simulator, and performance on a concomitant psychomotor task under conditions of emotional stress and channel capacity overload. Excessive rumination and arousal induced by sympathetic nervous system were the predominant characteristics of the anancastic and dysthymic groups, respectively. Significant qualitative and quantitative differences between the two groups were discussed. The dysthymic pilots showed the greatest impairment of flying skill, but improved as flying continued. The anancastic pilots showed less performance decrement in flying but also showed no improvement with time. In particular, the dysthymic pilots were overaroused and tended to overcompensate in their movements of the control column, but were quick to see changes in the cockpit display and to respond to them. The anancastic pilots were much more controlled in keeping to the flight path but made much more errors of omission. The anancastic personality has much to contribute to safe flying. Excessive rumination can be suppressed by suitable medication, of which sodium diphenylhydantoinate appears the most potent. S.D.

A77-24510 **Coronary risk factors in flying personnel - A progress report.** W. H. King, L. F. Owens, and J. A. Fadusko (USAF Hospital Dover, Dover AFB, Del.). *Aviation, Space, and Environmental Medicine*, vol. 48, Feb. 1977, p. 162, 163.

Since October 1974, the Flight Surgeon's Office at the USAF Hospital Dover has implemented a program of early detection and treatment of coronary risk factors in aircrew personnel. The program is integrated with USAF periodic physical examinations with interval follow-up of members found to have possible risk factors. A report of initial (baseline) findings was presented at the Aerospace Medical Association meeting in May 1975. During the past year, the base did experience one death due to myocardial infarction in an aircrew member, while two others were grounded due to serial ECG changes, consistent with silent myocardial infaction, confirmed by review at the USAF-SAM ECG Library. (Author)

A77-24511 **Inexpensive technique to record respiration during flight.** J. D. Rugh, H. Wichman, and W. O. Faustman (Claremont Graduate School; Claremont Men's College, Claremont, Calif.). *Aviation, Space, and Environmental Medicine*, vol. 48, Feb. 1977, p. 169-171.

This paper describes the development and use of a small (19 x 11 x 18 cm) tape recording system designed to monitor respiratory patterns during flight. This lightweight (1.85 kg) system was developed for less than $200 using commercially available subassemblies. Respiratory patterns are detected via a comfortable intranasal thermometer, amplified, and converted to an FM signal for taping. The device will also convert the tape recorded signal to a graphic display on a laboratory strip chart recorder. Reliable recordings of respiratory rate and respiratory regularity have been made in ambient temperatures of up to 43 C. Chart recordings of student pilots' respiratory patterns at different stages of flight are presented. With modifications to the transducer assembly and amplifier, the basic recording system may be used to monitor other biological functions such as EMG, GSR, EEG, and ECG. Environmental variables have a frequency of less than 250 Hz (wind velocity, temperature, noise, etc.) may also be recorded with proper transducers. (Author)

A77-24618 * **Variation in stable carbon isotopes in organic matter from the Gunflint Iron Formation.** E. S. Barghoorn, A. H. Knoll (Harvard University, Cambridge, Mass.), H. Dembicki, Jr., and W. G. Meinschein (Indiana University, Bloomington, Ind.). *Geochimica et Cosmochimica Acta*, vol. 41, Mar. 1977, p. 425-430. 34 refs. NSF Grant No. DES-73-06514; Grant No. NGL-22-007-069.

Results are presented for an isotopic analysis of the kerogen separated from 15 samples of the Gunflint Iron Formation, Ontario, and the conformably overlying Rove Formation. Reasons for which the Gunflint Iron Formation is suitable for such a study of a single Precambrian formation are identified. The general geology of the formation is outlined along with sample selection, description, and preparation. Major conclusions are that the basal Gunflint algal chert and shale facies are depleted in C-13 relative to the chert-carbonate and taconite facies, that differences in the delta C-13 values between Gunflint facies correlate with marked differences in their biological source materials as evidenced by their respective microbiotas, that the anthraxolites are anomalously depleted in C-13 relative to the kerogen of their encompassing cherts and shales, and that the effects of igneous intrusion and concomitant thermal alteration are shown by a marked loss of C-12 at the contact. The demonstration that not all kerogens are isotopically alike stresses the importance of facies data to the interpretation of C-13/C-12 ratios of ancient organic matter. S.D.

A77-24696 **Visual performance and image coding.** P. G. Roetling (Xerox Webster Research Center, Webster, N.Y.). In: Image processing; Proceedings of the Seminar, Pacific Grove, Calif., February 24-26, 1976. Palos Verdes Estates, Calif., Society of Photo-Optical Instrumentation Engineers, 1976, p. 195-199. 6 refs.

The paper examines the problem of how visual performance characteristics can be related to the average number of bits per pixel (picture element) in a sampled and quantized image. Particular attention is given to the selection of sampling interval and quantization levels based on visual performance. An approach is described in which visual data for modulation transfer function of the eye can be utilized to determine the useful information in an image. At a sample interval of 20 samples per millimeter, the visually useful information is found to be about 2.8 bits per pixel. The shape of the visual performance curve reveals that more levels need to be represented at lower spatial frequencies and less levels at higher spatial frequencies. It is shown that halftone or texture codes, although simple, represent image information in a manner which tends to be compatible with visual system characteristics. S.D.

A77-24699 **Visual processing of repetitive images.** C. W. Tyler (Smith-Kettlewell Institute, San Francisco, Calif.) and J.-J. Chang (Bell Telephone Laboratories, Inc., Murray Hill, N.J.). In: Image processing; Proceedings of the Seminar, Pacific Grove, Calif., February 24-26, 1976. Palos Verdes Estates, Calif., Society of Photo-Optical Instrumentation Engineers, 1976, p. 216-222. 13 refs.

The paper is concerned with visual detection of complex two-dimensional patterns composed of repeated stripes of random texture. Experiments were conducted in free viewing of the display screen at a distance of 2 m except where other conditions were noted, and the experimental procedure was a modified method of limits. The effects of width of the repeated segment on sensitivity (reciprocal of signal-to-noise ratio) for the repetitive pattern were assessed. It is shown that the two-dimensional Fourier spectrum gives a condensation of the information in the patterns, which has good descriptive value for the processing capacity of the human visual system. Although it is not yet known whether the visual system actually performs an operation that could be considered equivalent to a Fourier analysis of the stimulus, the Fourier description of complex pattern stimuli is suitable for experimental analysis of the visual system. S.D.

A77-24737 * Computerized X-ray reconstruction tomography in stereometric analysis of cardiovascular dynamics. R. A. Robb, L. D. Harris, and E. L. Ritman (Mayo Foundation, Rochester, Minn.). In: Applications of optics in medicine and biology; Proceedings of the Seminar, San Diego, Calif., August 26, 27, 1976. Seminar sponsored by the Society of Photo-Optical Instrumentation Engineers. Palos Verdes Estates, Calif., Society of Photo-Optical Instrumentation Engineers (SPIE Proceedings. Volume 89), 1977, p. 69-82. 35 refs. Grants No. NIH-HL-04664; No. NIH-RR-0007; No. NIH-CB-53857; No. NGR-24-003-001; Contract No. F44620-71-0069.

A computerized technique is proposed for obtaining cross-sectional images of the dynamic spatial distribution of X-ray attenuation covering the entire anatomic extent of the thorax and its contents in living dogs with a resolution of 1 mm and at time intervals of 1/60 sec. Use is made of an X-ray imaging chain which is a new high-performance video-fluoroscopic system, unique in its design and construction and called SSDSR for single source dynamic spatial reconstructor. This dynamic spatial reconstruction system is shown to provide the temporally and spatially coherent multiple cross sections required to obtain the full three-dimensional anatomic and simultaneous hemodynamic information necessary for detailed quantitative analyses of regional cardiopulmonary and vascular functions in both basic investigations of animals and clinical diagnostic applications to patients. Numerous photographs supplement the text. S.D.

A77-24738 * Computer analysis of arteriograms. R. H. Selzer, J. H. Armstrong, E. B. Beckenbach (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.), D. H. Blankenhorn, D. W. Crawford, S. H. Brooks, and M. E. Sanmarco (South California, University, Los Angeles, Calif.). In: Applications of optics in medicine and biology; Proceedings of the Seminar, San Diego, Calif., August 26, 27, 1976. Seminar sponsored by the Society of Photo-Optical Instrumentation Engineers. Palos Verdes Estates, Calif., Society of Photo-Optical Instrumentation Engineers (SPIE Proceedings. Volume 89), 1977, p. 129-134. Grant No. NIH-HL-14138.

A computer system has been developed to quantify the degree of atherosclerosis in the human femoral artery. The analysis involves first scanning and digitizing angiographic film, then tracking the outline of the arterial image and finally computing the relative amount of roughness or irregularity in the vessel wall. The image processing system and method are described. (Author)

A77-24738 * Computer analysis of arteriograms. R. H. Selzer, J. H. Armstrong, E. B. Beckenbach (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.), D. H. Blankenhorn, D. W. Crawford, S. H. Brooks, and M. E. Sanmarco (South California, University, Los Angeles, Calif.). In: Applications of optics in medicine and biology; Proceedings of the Seminar, San Diego, Calif., August 26, 27, 1976. Seminar sponsored by the Society of Photo-Optical Instrumentation Engineers. Palos Verdes Estates, Calif., Society of Photo-Optical Instrumentation Engineers (SPIE Proceedings. Volume 89), 1977, p. 129-134. Grant No. NIH-HL-14138.

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A77-24830 New method of artificial motion synthesis and application to locomotion robots and manipulators. M. Vukobratovic, D. Hristic, D. Stokic, and N. Gluhajic (Institut za Automatizaciju i Telekomunikaciju, Belgrade, Yugoslavia). In: Symposium on Automatic Control in Space, 7th, Rottach-Egern, West Germany, May 17-21, 1976, Preprints. Volume 2. Düsseldorf, VDI/VDE-Gesellschaft. Mess- und Regelungstechnik, 1976, p. 680-700. 13 refs.

Artificial motion synthesis is performed with respect to the complete dynamics of an artificial gait or manipulator system. The dynamic control procedure consists in a twofold division of the system into a system performing prescribed motions and a system performing prescribed and compensating motions. Control is suboptimal. Large perturbations are reduced to small perturbations by transferring the system to the nearest precalculated state (synergy), bringing it to a predetermined endpoint. P.T.H.

A77-24831 Semi-auto manipulator control systems and their dynamic analysis with computer. V. S. Kuleshov, A. G. Leskov, V. S. Medvedev, and A. S. Iushchenko. In: Symposium on Automatic Control in Space, 7th, Rottach-Egern, West Germany, May 17-21, 1976, Preprints. Volume 2. Düsseldorf, VDI/VDE-Gesellschaft Mess- und Regelungstechnik, 1976, p. 701-716. 8 refs.

The paper examines a semi-automatic control system for manipulators, where the human operator plays an active part in the control process, and the computer is used to automate repetitious and tiresome tasks. The operator observes directed movements performed in the automatic mode of operation and is prepared to assume manual control in unexpected situations. The problem of choosing control modes for the manipulator is considered and a dynamic investigation of the control system is carried out. B.J.

A77-24832 Algorithms for combined and supervisor robot and manipulator control. E. P. Popov, A. F. Vereshchagin, V. L. Generosov, S. L. Zenkevich, and V. B. Kucherov. In: Symposium on Automatic Control in Space, 7th, Rottach-Egern, West Germany, May 17-21, 1976, Preprints. Volume 2. Düsseldorf, VDI/VDE-Gesellschaft Mess- und Regelungstechnik, 1976, p. 717-723.

The hierarchical structure of a robot control system is considered with primary attention given to control algorithms relating to cases when the human operator enters and interrupts the automatic operation of the manipulator-robot at a high level of the hierarchical control system. The problem of the inverse operator and the linear programming of movement are considered. B.J.

A77-24856 # Instructional systems development - A new approach to flight-crew proficiency. J. C. McLachlan (U.S. Navy, Washington, D.C.). *Naval Research Reviews*, Jan. 1977, p. 26-32.

A ground-based simulator program for low-cost training of a crew of four (pilot, copilot, sensor operator, tactical coordinator) to operate the S-3A carrier-based ASW aircraft is described. Didactic tasks incorporated into the ISD (instructional systems development) simulator for the S-3A are described, along with auxiliary programs (videotape, computer-assisted instruction). A new PLATO IV (Programmed Logics for Automated Teaching Operations) designed to supplement the training program and fill in gaps discovered is described; this interactive computer training system proved highly effective. R.D.V.

A77-24998 **Synthesis of phospholipids and membranes in prebiotic conditions.** W. R. Hargreaves, S. J. Mulvihill, and D. W. Deamer (California, University, Davis, Calif.). *Nature,* vol. 266, Mar. 3, 1977, p. 78-80. 23 refs. NSF-supported research.

A description is given of the abiotic synthesis of various lipids, including membranogenic phospholipids. The reported work has implications concerning the possible origin of life on earth. The investigations show that both fatty acid and fatty aldehyde react rapidly with glycerol in the absence of catalysts to form the precursors of membrane lipids, and that phospholipids and lipid-membrane vesicles can assemble in possible prebiotic conditions. It is suggested that silicates other than kaolin are likely to have promoted such syntheses. G.R.

A77-25072 * **Use of human engineering standards in design.** J. G. Rogers and R. Armstrong (Alabama, University, Huntsville, Ala.). *Human Factors,* vol. 19, Feb. 1977, p. 15-23. 6 refs. Grant No. NGL-01-008-001.

Results are presented for a research study intended to assess the impact of present human engineering standards on product design. The approach consisted of three basic steps: a comparison of two display panels to determine if, in fact, products designed to the same standards are truly standardized; a review of two existing standards to determine how well their information can be used to solve design problems; and a survey of human factors specialists to assess their opinions about standards. It is shown that standards have less than the desired influence on product design. This is evidenced by a lack of standardization between hardware designed under common standards, by deficiencies within the standards that detract from their usefulness and encourage users to ignore them, and by the respondents of the survey who consider standards less valuable than other reference sources for design implementation. Recommendations aimed at enhancing the use of standards are set forth. S.D.

A77-25073 **Broadbent and Gregory revisited - Vigilance and statistical decision.** A. Craig (Medical Research Council, Perceptual and Cognitive Performance Unit, Brighton, England). *Human Factors,* vol. 19, Feb. 1977, p. 25-36. 16 refs.

Broadbent and Gregory (1963) have shown that the equal-variance model of signal detection theory (SDT) offers a reasonable account of vigilance performance in the sense that receiver operating characteristics (ROCs) obtained from vigilance data were of the curved form predicted by the model. Earlier studies have been directed toward examining the within-session changes in the parameters of the ROC curves for groups of subjects, although attention should be paid to the ROCs of the individuals who comprise the groups. The present paper analyzes 200 individual ROCs obtained from four vigilance experiments. The fact that about half of the individual ROC functions are of the curved form predicted by the equal-variance SDT model corroborates the hypothesis that vigilance performance can be interpreted in terms of this theoretical model of decision making. A substantial proportion (30%) of the individual ROC functions, however, are found to be of a particular form which is hardly interpretable within the SDT framework. Other appropriate models are discussed. S.D.

A77-25074 **Formatting and organization of a human engineering standard.** J. G. Rogers and C. D. Pegden (Alabama, University, Huntsville, Ala.). *Human Factors,* vol. 19, Feb. 1977, p. 55-61. 7 refs.

A detailed item-by-item analytical review of two existing government human engineering standards and the results of a users' survey on human engineering standards revealed formatting and organization problems in current human engineering standards which detract from their utility to the designer. Problems identified and recommended solutions are presented. The recommended solutions are primarily directed at improving the ability to retrieve data from the standards and as a result increasing the degree to which the human engineering discipline has an effect on design. (Author)

A77-25075 **Multiple images as a function of LEDs viewed during vibration.** T. M. Riley (Bunker-Ramo Corp., Electronic Systems Div., Dayton, Ohio). *Human Factors,* vol. 19, Feb. 1977, p. 79-82. Contract No. F33615-73-C-0391.

If a refreshed light emitting diode (LED) display is moved relative to the observer with such severity that the display cannot be fixated, multiple images of the display may appear. To determine the threshold refresh rate of this perceptual phenomenon, subjects evaluated the relative multiple imaging of nine LED refresh rates while under whole body vibration. (Author)

A77-25147 * **Reduction in plasma vasopressin levels of dehydrated rats following acute stress.** L. C. Keil (NASA, Ames Research Center, Moffett Field, Calif.) and W. B. Severs (M. S. Hershey Medical Center, Hershey, Pa.). *Endocrinology,* vol. 100, Jan. 1977, p. 30-38. 27 refs.

Results are presented for an investigation directed to substantiate and extend preliminary findings of stress-induced reduction in plasma arginine vasopressin (pAVP). Since normally hydrated rats have very low levels of pAVP, it is difficult to measure reliably any decrease in pAVP that may result from stress. To overcome this problem, the pAVP levels of the tested rats were raised by dehydration prior to application of stress. A radioimmunoassay for pAVP is described and used to determine the levels of vasopressin in the plasma of nondehydrated and dehydrated rats after exposure to ether or acceleration stress. Plasma pAVP is also determined in rats following nicotine administration. It is shown that exposure of nondehydrated rats to ether or acceleration stress does not elicit any significant alterations in circulating pAVP levels while nicotine injections stimulate a marked increase. In particular, ether and acceleration stress produce a rapid reduction in the pAVP level of dehydrated rats, the decrease being observed in both large and small animals. The mechanism for this reduction in pAVP level following stress is yet unknown. S.D.

A77-25170 **A two-dimensional model for the cochlea. II - The heuristic approach and numerical results.** M. A. Viergever (Delft, Technische Hogeschool, Delft, Netherlands). *Journal of Engineering Mathematics,* vol. 11, Jan. 1977, p. 11-28. 15 refs.

An alternative is given for the approach to a two-dimensional boundary-value problem for the cochlea. Because of the mathematical simplicity of this alternative, several extensions of the model are possible. The compressibility of the perilymph and variations of the scala height are considered; other extensions are briefly discussed. Numerical calculations lead to the following conclusions: (1) the results of one- and two-dimensional models show large quantitative but hardly any qualitative differences; (2) Von Bekesy's (1960) conclusions concerning the influence of the scala height on the motion of the partition are incorrect; (3) the quantitative discrepancies between the model's results and the experiments of Rhode (1971) can be eliminated by a large reduction of the scala height; (4) the phase difference as a function of frequency and phase velocity shows no qualitative disparities with experimental data; and (5) models with few sections, such as the hybrid computer model of Hubbard and Geisler (1972) are inaccurate. (Author)

A77-25217 **An experimental validation of mathematical simulation of human thermoregulation.** S. Konz, C. Hwang, B. Dhiman, J. Duncan, and A. Masud (Kansas State University of Agriculture and Applied Science, Manhattan, Kan.). *Computers in Biology and Medicine,* vol. 7, Jan. 1977, p. 71-82. 16 refs. NSF Grant No. ENG-73-03676.

An experimental validation of Stolwijk's mathematical model of thermoregulation is presented. Although the model seems to be accepted widely, very little experimental data for validation exists in the open literature. Experimental data for transient conditions of rectal, head skin, trunk skin, arm skin, leg skin, mean skin and mean body temperature as well as cardiac output and evaporative heat loss under heat stress are presented and compared with simulation output

for the model. In general, the predictions of the model are good; the difference between experimental data and the model averaged 0.2 C for mean body temperature. A version of Stolwijk's thermoregulatory model is described briefly. The controller equations are given as well as a short discussion of the rationale for each. Tables give coefficients for the controller equations, and, for the 25 compartments, heat capacitance, thermal conductance, basal metabolic heat production, basal evaporative heat loss, and basal effective blood flow. (Author)

A77-25300 * **Two mechanisms of rephasal of circadian rhythms in response to a 180 deg phase shift /simulated 12-hr time zone change/.** C. W. DeRoshia, C. M. Winget (NASA, Ames Research Center, Biomedical Research Div., Moffett Field, Calif.), and G. H. Bond (Syntex Research, Palo Alto, Calif.). *Journal of Interdisciplinary Cycle Research,* vol. 7, no. 4, 1976, p. 279-286. 16 refs.

A model developed by Wever (1966) is considered. The model describes the behavior of circadian rhythms in response to photoperiod phase shifts simulating time zone changes, as a function of endogenous periodicity, light intensity, and direction of phase shift. A description is given of an investigation conducted to test the model upon the deep body temperature rhythm in unrestrained subhuman primates. An evaluation is conducted regarding the applicability of the model in predicting the type and duration of desynchronization induced by simulated time zone changes as a function of endogenous periodicity. G.R.

A77-25325 # **Life support of space crews after forced landing on ground or water (Zhizneobespechenie ekipazhei letatel'nykh apparatov posle vynuzhdennogo prizemleniia ili privodneniia).** V. G. Volovich. Moscow, Izdatel'stvo Nauka (Problemy Kosmicheskoi Biologii. Volume 30), 1976. 333 p. 1258 refs. In Russian.

The present work is concerned with the pressing problem of human survival after aircraft or spacecraft accidents requiring forced landing in an uninhabited inaccessible location under various critical climatic conditions where the victim must sustain his own existence. Particular attention is given to a description of the various physicogeographical regions on the earth, to an analysis of the features of detrimental influence of environmental factors on the human organism, and to the existing methods of protection and prevention. Survival in the Arctic, desert, jungle, and ocean is examined. S.D.

A77-25345 # **Thermoregulatory responses in animals in a helium-oxygen atmosphere under elevated pressure (Termoreguliatornye reaktsii u zhivotnykh v gelio-kislorodnoi atmosfere pod povyshennym davleniem).** G. V. Troshikhin and Zh. A. Donina (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR,* vol. 63, Jan. 1977, p. 146-149. 12 refs. In Russian.

Experiments were conducted on male Wistar rats maintained for 1 hr in an altitude chamber filled first with air at 28 C and then with a normal-oxygen-tension (0.21 kgf per sq cm) mixture of helium and oxygen under an elevated pressure of 40 kgf per sq cm at 30, 31, 32, and 33 C. The objective was to determine the range of comfortable temperatures. A stay of the rats in the helium-oxygen mixture under elevated pressure over the temperature range 31-32 C resulted in minimum increase of the gas exchange level and in constant body temperature, with a slight enhancement of muscular electrical activity as revealed by EMG. The temperature range of 31-32 C is inferred to be comfortable. Enhancement of the electrical activity of skeletal muscles, under these conditions, appears to be due to the narcotic action of helium under elevated pressure. S.D.

A77-25416 # **Response of the vestibular apparatus to prolonged caloric stimulation of the labyrinths (Reaktsii vestibuliarnogo apparata na dlitel'noe kaloricheskoe razdrazhenie labirintov).** G. I. Gorgiladze. *Fiziologiia Cheloveka,* vol. 3, Jan.-Feb. 1977, p. 112-117. 24 refs. In Russian.

A77-25417 # **Adaptation of vestibular responses to galvanic stimulation of the labyrinths (Privykanie vestibuliarnykh reaktsii na gal'vanicheskoe razdrazhenie labirintov).** G. I. Gorgiladze, G. I. Samarin, and Iu. V. Kreidich. *Fiziologiia Cheloveka,* vol. 3, Jan.-Feb. 1977, p. 118-123. 28 refs. In Russian.

A77-25418 # **Automatic control of decompression on the basis of the impedance signal of the body (Avtomaticheskoe upravlenie dekompressiei po impedansnomu signalu organizma).** A. A. Shurubura, I. A. Aleksandrov, Iu. E. Zhmur, N. V. Ivanova, and A. A. Minaev (Nauchno-Issledovatel'skii Institut Skoroi Pomoshchi; Akademiia Nauk SSSR, Institut Evoliutsionnoi Fiziologii i Biokhimii, Leningrad, USSR). *Fiziologiia Cheloveka,* vol. 3, Jan.-Feb. 1977, p. 183-186. 10 refs. In Russian.

The study focuses on an earlier hypothesis on the development of gas bubbles in the body during decompression, whose onset is the appearance of the first bubbles in the pulmonary circulation. To ensure decompression based on this hypothesis, a device is described for automatic control of decompression on the basis of the impedance signal of the body. It is assumed that the decompression process regulated by the body is a result of the dynamics underlying the development of gas bubbles in the blood. The device is such that the impedance of the pulmonary circulation is measured with a rheograph, whose output signal is applied to a filter and an integrator. The filter is intended for isolating the invariable component of the impedance signal, while the integrator sums up the variable components of the impedance signal into an integrated variable. Results are presented for automatic decompression in terms of the impedance signal of the pulmonary circulation as related to two rabbits and one dog following a stay under a pressure of 35 kgf per sq cm for 10 hr. Highly quick-response regulation of the total volume of gas bubbles in the body is obtained, thereby providing a safe decompression. S.D.

A77-25424 # **Pathophysiological mechanisms of the effect of hyperoxia on the function of the lungs in man (Patofiziologicheskie mekhanizmy vliianiia giperoksii na funktsii legkikh cheloveka).** M. A. Tikhonov and E. V. Loginova. *Akademiia Nauk SSSR, Izvestiia, Seriia Biologicheskaia,* Jan.-Feb. 1977, p. 38-43. 13 refs. In Russian.

A77-25425 # **Effect of space flight factors and elevated temperatures on seeds of diploid and tetraploid buckwheat (Vliianie faktorov kosmicheskogo poleta i povyshennoi temperatury na semena diploidnoi i tetraploidnoi grechikhi).** R. N. Platonova, V. P. Ol'khovenko, G. P. Parfenov, A. A. Lukin, and V. G. Chuchkin. *Akademiia Nauk SSSR, Izvestiia, Seriia Biologicheskaia,* Jan.-Feb. 1977, p. 65-72. 23 refs. In Russian.

Cytological analysis performed on meristematic cells of seeds of diploid and autotetraploid buckwheat flown aboard the Salyut 1 spacecraft for 72 days revealed a small but significant increase in the rearrangement frequency of chromosomes in comparison with the control. This increase is due to the rearrangement of the chromosome type. After flight, stimulated germination was noted. It is suggested that the observed effects can be accounted for by temperature changes during the experiment. Experiments showed that elevated temperature may induce changes in both cytogenetic structures and in seed germination processes. P.T.H.

A77-25629 # **Investigation of the function of external respiration in flying personnel (Issledovanie funktsii vneshnego dykhaniia u letnogo sostava).** V. I. Kopanev, S. N. Akimov, and I. N. Artamonov. *Voenno-Meditsinskii Zhurnal,* Dec. 1976, p. 61-65. In Russian.

Spirographic experiments were conducted to study the range of normal fluctuations for the indicators of external respiration in flying personnel and the functional state of the respiratory system in the case of common respiratory diseases in pilots, with particular reference to age-related changes in external respiration. Among the 78 subjects tested, 52 were healthy and 26 were afflicted with common respiratory diseases. The results can be used for professional selection and aviation physical examination purposes. S.D.

A77-25746 # **Vehicle/manipulator/packaging interaction - A synergistic approach to large erectable space system design.** R. T. Mayer (General Electric Co., Re-Entry and Environmental Systems Div., Philadelphia, Pa.). In: Structures, Structural Dynamics and Materials Conference, 18th, March 21-23, 1977, and Aircraft Composites: The Emerging Methodology for Structural Assurance, San Diego, Calif., March 24, 25, 1977, Technical Papers. Volume A. New York, American Institute of Aeronautics and Astronautics, Inc., 1977, p. 176-185. (AIAA 77-394)

The position is taken that mechanical manipulators in one form or another will be employed to assemble and erect Large Space Systems in orbit. Various generic types and parameters effecting their applicability are discussed. More specifically, limitations at their current stage of development are considered and the hypothesis advanced that much can be achieved by a systematic approach which imposes restrictions and caveats on vehicle design, packaging and erection procedures which would simplify the roll of the manipulator, moderate its complexity and hasten its use. Attention is focused on the relatively near term wherein the first wave of moderate size erectable systems will be deployed and space manipulator system development is still in the exploratory stage. (Author)

A77-26052 **Shuttle era waste collection.** C. F. Whitaker (Rockwell International Corp., El Segundo, Calif.), R. W. Murray, and J. D. Schelkopf (General Electric Co., Fairfield, Conn.). In: Environmental technology '76; Proceedings of the Twenty-second Annual Technical Meeting, Philadelphia, Pa., April 26-28, 1976. Mount Prospect, Ill., Institute of Environmental Sciences, 1976, p. 257-260.

An overview of the biowaste-management techniques used in the Apollo and Skylab programs is given, the system being designed for the Shuttle Orbiter is described, and techniques that will be employed in advanced manned spacecraft are outlined. The Shuttle Orbiter waste-collector design provides for male and female astronauts who may not be specially trained, and all waste processing is automatic. Air flows are utilized to entrain and transport wastes so that phase separators are required in the waste collectors to separate the air from waste material. Future capabilities discussed include subsystems for automatic sampling and measurement of biowaste as well as an integrated waste-management system capable of water recovery through a distillation technique powered by radioisotope heaters. F.G.M.

A77-26074 **Experiments on the locus of induced motion.** J. N. Bassili (Toronto, University, West Hill, Ontario, Canada) and J. M. Farber (Cornell University, Ithaca, N.Y.). *Perception and Psychophysics*, vol. 21, no. 2, Feb. 1977, p. 157-161. 9 refs.

Two experiments examined the locus of induced motion effects. The first used a subjective technique to test for the presence of retinal slippage due to systematic eye movements when an observer fixates a test spot in the center of a horizontally moving rectangle. The second experiment tested for 'local' retinal effects by presenting test and inducing figures dichoptically. There was no evidence of retinal slippage under conditions where induced motion was not discriminable from real motion. Moreover, good induction was produced across eyes. Implications for the locus of induced motion effects are discussed. (Author)

A77-26101 # **Nutrition hygiene for flying personnel in prolonged flights (Gigiena pitaniia letnogo sostava pri dlitel'nykh poletakh).** I. G. Popov. *Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina*, vol. 11, Jan.-Feb. 1977, p. 3-10. 28 refs. In Russian.

Problems encountered in developing hygienically-acceptable adequate nutrition for flying personnel engaged in long-term flights since the year 1935 are outlined. Nutritive value of flight rations and methods of preserving the high quality of food during flight are stressed. Nutrition hygiene in high-altitude flights is discussed. New directions in the investigation and quality improvement of flight rations are highlighted. S.D.

A77-26102 # **Long-term space flights and human habitat (Dlitel'nye kosmicheskie polety i sreda obitaniia cheloveka).** O. G. Gazenko and E. Ia. Shepelev. *Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina*, vol. 11, Jan.-Feb. 1977, p. 10-13. 7 refs. In Russian.

The paper discusses the necessity of developing a habitat which would meet more adequately the human biological requirements evolving during man's adaptation to the biosphere as applied to manned space flights of long duration. Such a habitat should have additional functional effects on the physiological systems of the human organism during hypokinetic activity in space flight. Attention must be directed to a constructive analysis of environmental models for use in standardizing the physical parameters of the atmosphere, the composition of food rations, and the quality of potable water in spacecraft. S.D.

A77-26103 # **Effect of space flight on skeletal bones in rats /light- and electron-microscopic investigation/ (O vliianii kosmicheskogo poleta na kosti skeleta krysy /Svetoopticheskoe i elektronno-mikroskopicheskoe issledovanie/).** V. S. Iagodovskii, L. A. Triftanidi, and G. P. Gorokhova. *Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina*, vol. 11, Jan.-Feb. 1977, p. 14-20. 21 refs. In Russian.

Light and electron microscopy is applied to long tubular bones in white Wistar rats examined on the 2nd postflight day after a 22-day space flight. The objective of electron microscopy of skeletal bones was to examine the submicroscopical structure of osteocytes, osteocyte cavities (lacunae), and bone substance. Moderate and rarely significant depletion of the spongy osseous tissue in the metaphyses is revealed, along with wide osteocyte cavities associated with perilacunar osteolysis. Histological examination of skeletal bones on the 27th postflight day showed that this time interval is insufficient to normalize the resultant changes. S.D.

A77-26104 # **Effect of space-flight factors on skeletal muscles in rats (Vliianie faktorov kosmicheskogo poleta na skeletnuiu muskulaturu krys).** E. I. Il'ina-Kakueva, V. V. Portugalov, and N. P. Krivenkova. *Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina*, vol. 11, Jan.-Feb. 1977, p. 20-25. 7 refs. In Russian.

Morphological and histochemical examinations of skeletal muscles of rats in space flight demonstrated atrophic and dystrophic developments in m. soleus, which were followed by metabolic disorders in the muscular tissue. The changes were reversible, although they did not disappear entirely on the 27th postflight day. Early signs of atrophic developments were found in m. gastrocnemius, m. quadriceps, m. extensor digitorum longus and m. biceps brachii on the 2nd postflight day. Comparative study of simultaneous data on flight and ground-based rats showed that muscular disorders developed as a result of hypodynamics and were enhanced by weightlessness. (Author)

A77-26105 # **Potassium and phosphorus content and Ca-45 inclusion in bones and teeth of rats after a 22-day space flight aboard the biosatellite Cosmos 605 (Soderzhanie kal'tsiia, fosfora i vkliuchenie Ca-45 v kostiakh i zubakh krys posle 22-sutochnogo kosmicheskogo orbital'nogo poleta na korable-sputnike 'Kosmos-605').** A. A. Prokhonchukov, R. A. Tigranian, A. G. Kolesnik, L. L. Novikov, N. T. Timofeeva, N. A. Zhizhina, A. I. Volozhin, G. V. Neustroev, and V. P. Matvienko. *Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina,* vol. 11, Jan.-Feb. 1977, p. 26-30. 22 refs. In Russian.

A77-26106 # **Influence of accelerations, additional weight load and hypokinesia on protein catabolism in the Japanese quail /Coturnix Coturnix Japonica/ (Vliianie uskorenii, dopolnitel'noi vesovoi nagruzki i gipokinezii na katabolizm belkov u perepela iaponskogo /Coturnix Coturnix Japonica/).** M. Gazho, I. Iankela, V. Sabo, and K. Bodia. *Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina,* vol. 11, Jan.-Feb. 1977, p. 30-32. In Russian.

A77-26107 # **Changes in fluid balance during prolonged hypokinesia with antiorthostatic posture (Izmeneniia vodnogo obmena pri dlitel'noi gipokinezii s antiortostaticheskim polozheniem tela).** V. P. Krotov, A. A. Titov, E. A. Kovalenko, V. V. Bogomolov, L. L. Stazhadze, and V. P. Masenko. *Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina,* vol. 11, Jan.-Feb. 1977, p. 32-37. 28 refs. In Russian.

Variations in the total content of body fluid and intravascular fluid were measured during a 49-day bedrest experiment and a 25-day recovery period. During the experiment the subjects maintained a head-down position at an angle of -4 deg. The diminished motor activity led to a decrease of the absolute and, to a greater extent, of the relative content of water in the body which was associated with intravascular losses. The major changes in fluid balance occurred during the first two weeks of bedrest, most probably due to the head-down position of the subjects. (Author)

A77-26108 # **Comparative evaluation of studies of the effect of hypoxia of different levels on immunobiological status in man (Sravnitel'naia otsenka issledovanii deistviia razlichnogo urovnia gipoksii na immunobiologicheskii status cheloveka).** T. N. Krupina, M. M. Korotaev, Ia. I. Pukhova, N. I. Tsyganova, N. P. Likhacheva, and M. P. Reutova. *Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina,* vol. 11, Jan.-Feb. 1977, p. 38-43. 18 refs. In Russian.

Sixteen subjects were tested to assess the effect of hypoxic hypoxia on specific immunity factors during a 30-day stay at an altitude ranging between 2100 and 4200 m above sea level. Altitude-chamber experiments were also conducted on 28 subjects who exercised on a bicycle ergometer at different altitudes at a workload level of 450-900 kgm/min. It is shown that hypoxic hypoxia results in consistent changes in the human immunobiological status, directly correlated with the level of hypoxia. The changes include a decrease in acquired antiviral and antitoxic immunity, activation of the autoimmune process, and increase in the phagocyte activity of neutrophils. S.D.

A77-26109 # **Some parameters of phosphocreatine metabolism in man during increased and decreased energy expenditures (Nekotorye pokazateli fosfokreatinovogo obmena pri povyshennykh i ponizhennykh energotratakh u cheloveka).** V. V. Poliakov, A. N. Agureev, T. F. Vlasova, and A. S. Ushakov. *Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina,* vol. 11, Jan.-Feb. 1977, p. 43-47. 13 refs. In Russian.

Changes in phosphocreatine metabolism (creatinine excretion in the urine and arginine content in plasma) were studied in 40 male subjects who performed increased or decreased work and consumed standard protein food. It was shown that there was a correlation between creatinine excretion in the urine and the content of arginine in plasma, on the one hand, and the amount of nitrogen consumed, on the other. It was also found that at increased or decreased energy expenditures, creatinine excretion and arginine content increased. These data are indicative of changes in phosphocreatine metabolism in response to environmental effects. (Author)

A77-26110 # **Indicators of nitrogen, carbohydrate and lipid metabolism in man during prolonged stay under hyperbaric conditions (Pokazateli azotistogo, uglevodnogo i lipidnogo obmenov pri dlitel'nom prebyvanii cheloveka v usloviiakh giperbarii).** V. A. Petrovykh, O. A. Shovkoplias, D. A. Mikhel'son, and E. N. Aronova. *Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina,* vol. 11, Jan.-Feb. 1977, p. 48-50. 8 refs. In Russian.

A77-26111 # **Hemodynamics of healthy individuals under various regimes of lower body negative pressure (Gemodinamika zdorovykh liudei pri razlichnykh rezhimakh otritsatel'nogo davleniia vokrug nizhnei poloviny tela).** L. Ia. Andriiako, V. G. Voloshin, and V. A. Degtiarev. *Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina,* vol. 11, Jan.-Feb. 1977, p. 50-54. 24 refs. In Russian.

An experimental study was conducted on 30 healthy male athletes lying in a recumbent position and subjected to lower body negative pressure (LBNP) ranging from -40 to -80 mm Hg. The parameters measured were the heart rate, arterial blood pressure, ventricular blood ejection, vascular tone, and other hemodynamic parameters. It is found that cardiac output stabilized, while other cardiovascular parameters underwent significant changes. Mechanisms for the development of compensatory responses under LBNP are discussed along with pertinent tolerance criteria. S.D.

A77-26112 # **Motor activity of mice in a magnetic field of varying strength (Dvigatel'naia aktivnost' myshei v magnitnom pole raznoi napriazhennosti).** L. A. Andrianova and N. P. Smirnova. *Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina,* vol. 11, Jan.-Feb. 1977, p. 54-58. 7 refs. In Russian.

Results are presented for an experimental study in which 144 mice weighing 18-23 g were exposed to a constant magnetic field of a strength ranging from 250 to 4,000 Oe and to an alternating magnetic field of 100 Oe and a frequency of 100 Hz for an exposure time varying between 10 and 30 min. The objective was to evaluate changes in motor activity in a high-strength magnetic field, with special emphasis on their dependence on magnetic field strength. It is found that the motor activity is slightly activated during exposure to a constant magnetic field of 500 Oe and immediately following exposure to a constant magnetic field of 4000 Oe and to the cited alternating magnetic field. Exposure to a constant magnetic field of 1000 Oe resulted in significant inhibition of the mice's motor activity. S.D.

A77-26113 # **Characteristics of changes in the body state of dogs during failure of the environmental control system in a sealed chamber (Zakonomernosti izmeneniia sostoianiia organizma sobak pri vykhode iz stroia sistemy regeneratsii atmosfery v germoob'eme).** E. A. Kovalenko, V. L. Popkov, N. G. Lakota, and S. L. Kantor. *Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina,* vol. 11, Jan.-Feb. 1977, p. 58-63. 12 refs. In Russian.

Experiments were carried out on dogs kept in a sealed chamber. Changes in the O2 and CO2 concentrations as well as variations of physiological functions, the so-called survival curves, were studied under conditions of used-up O2 supply and CO2 utilization. The criteria of investigation, mathematical and physiological analysis were chosen from the point of view of predicting hazardous states during failure of the environmental control system. Tolerance limits during slow and rapid changes of the environment, phases of changes of the body state and mechanisms of a combined effect of increasing hypercapnia and hypoxia were considered. (Author)

A77-26114 # **Prevention of decompression sickness during short-term flights in a depressurized cabin at high altitudes (Preduprezhdenie vysotnoi dekompressionnoi bolezni v usloviiakh neprodolzhitel'nykh poletov v razgermetizirovannoi kabine na bol'shikh vysotakh).** I. N. Cherniakov, I. V. Maksimov, and V. A. Glazkova. *Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina,* vol. 11, Jan.-Feb. 1977, p. 63-67. 8 refs. In Russian.

Forty altitude chamber experiments were carried out in which 18 subjects participated. The objective was to prevent decompression sickness in a pilot using a pressurized suit and an oxygen mask. It was demonstrated that oxygen breathing on the ground and at an altitude of 8 km for 20 and 50-60 min eliminated severe symptoms and lowered the frequency of occurrence of mild symptoms of decompression sickness during the subsequent 10-20 and 60-120 min exposures to altitudes of 40,000 and 11,000 m respectively. An increase in the absolute pressure to 240-290 mm Hg in the pressurized suit prevented decompression sickness symptoms at altitudes of 11,000-15,000 m and eliminated them when occurring at lower barometric pressure. (Author)

A77-26115 # **State of hemopoiesis during irradiation simulating radiation exposure in prolonged space flight (Sostoianie krovetvoreniia pri obluchenii, imitiruiushchem radiatsionnoe vozdeistvie v usloviiakh dlitel'nogo kosmicheskogo poleta).** T. E. Burkovskaia. *Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina,* vol. 11, Jan.-Feb. 1977, p. 68-73. 9 refs. In Russian.

Results are presented for studies on the peripheral blood and bone marrow in 36 male dogs exposed to 3-yr chronic gamma radiation (from Co-60 source) at a dose rate of 0.17 rad per day, combined with acute irradiations. The animals received 360 and 564 rad in total. The leukoblastic system showed inhibition and decreased reactivity in case of irradiation with a higher dose. The red blood cell balance remained stable over a long period of time due to enhanced erythropoiesis. (Author)

A77-26116 # **Some personality characteristics of pilot trainees with different levels of achievement (Nekotorye osobennosti lichnosti kursantov s razlichnym urovnem letnoi uspevaemosti).** N. F. Luk'ianova. *Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina,* vol. 11, Jan.-Feb. 1977, p. 73-77. 5 refs. In Russian.

An appropriate psychological assessment methodology is used to identify the personality features of pilot trainees with different levels of achievement in their studies. Linear discrimination analysis is applied to differentiate the groups of excellent and poor trainees on the basis of their personality features. A statistically optimal criterion is derived for quantitative prediction of progress in flight training. S.D.

A77-26117 # **Effect of electrostimulation of the hypothalamus and limbic structures on vestibulo-somatic reflexes (Vliianie elektrostimuliatsii gipotalamusa i limbicheskikh obrazovanii na vestibulo-somaticheskie refleksy).** I. V. Raitses. *Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina,* vol. 11, Jan.-Feb. 1977, p. 78-81. 8 refs. In Russian.

Studies were conducted under conditions of chronic experiment on male adult rabbits with implanted electrodes in the lateral and ventromedial regions of the hypothalamus, ventral and dorsal hippocampus, and nuclei of the amygdaloid complex according to the coordinates of a stereotactic atlas. It is shown that electrostimulation of these cerebral structures, which produced different emotional and behavioral responses during preliminary tests, results in a distinct modulating effect on the vestibular (rotatory and post-rotatory) nystagmus and labyrinthine postural-tonic reflexes. S.D.

A77-26118 # **Dependence of the species composition of a mixed culture of microalgae on illumination and supply rate of nutrients (Zavisimost' vidovogo sostava smeshannoi kul'tury mikrovodoroslei ot osveshchennosti i skorostei postupleniia elementov pitaniia).** N. S. Abrosov and B. G. Kovrov. *Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina,* vol. 11, Jan.-Feb. 1977, p. 81-85. 7 refs. In Russian.

The paper is concerned with a theoretical analysis of conditions for coexistence of a few species of microalgae in a continuous polyculture, with special emphasis on methods of controlling species composition. It is shown that if the growth of some species is limited by the same nutrients, competition among species is won by the one which has the highest coefficient of adaptation to the underlying limiting factor. Dependence of the species structure of coexistence on illumination and supply rate of nutrients is demonstrated. S.D.

A77-26119 # **Resonance effect of vibration on living structure of various organizational levels (Rezonansnyi effekt deistviia vibratsii na zhivye struktury razlichnykh urovnei organizatsii).** S. N. Romanov. *Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina,* vol. 11, Jan.-Feb. 1977, p. 85-87. 6 refs. In Russian.

A77-26120 # **Some indicators of natural immunity in rabbits following exposure to increased pressure for 10 days (Nekotorye pokazateli estestvennogo immuniteta u krolikov posle deistviia povyshennogo davleniia v techenie 10 sut).** L. G. Ogorodnikova. *Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina,* vol. 11, Jan.-Feb. 1977, p. 87-89. 22 refs. In Russian.

A77-26121 # **Effect of acceleration growth rate on the response of the external respiratory system (Vliianie skorosti narastaniia peregurzki na reaktsii sistemy vneshnego dykhaniia).** Iu. N. Kamenskii, E. B. Shul'zhenko, and V. G. Andreeva. *Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina,* vol. 11, Jan.-Feb. 1977, p. 89-91. 10 refs. In Russian.

Ten healthy male adults were tested on a 14.50-m diam centrifuge to assess the characteristics of the response of external respiration upon exposure to +10 g(x) accelerations attained at different growth rates. Four acceleration growth rates were considered: 0.05, 0.1, 0.2, and 0.4 g/sec. It is found that the initial values of the ventilation parameters varied within the limits of physiological fluctuations, and that the differences between them were not significant (P greater than 0.5). The responses of external respiration occurred in the same direction in all the testing regimes. It is concluded that the response of external respiration under a stressful acceleration of +10 g(x) depends on the total time of exposure which, under otherwise identical conditions, is determined by the duration of the centrifuge acceleration. S.D.

A77-26224 # **Electrical activity of the layers of an isolated cortex when falling asleep and in various stages of sleep (Elektricheskaia aktivnost' sloev izolirovannoi kory pri zasypanii i raznykh stadiiakh sna).** M. M. Bogoslovskii and S. V. Al'bertin (Akademiia Meditsinskikh Nauk SSSR, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR,* vol. 62, Dec. 1976, p. 1753-1759. 10 refs. In Russian.

An experimental study was conducted on cats with isolated cortex and implanted electrodes in different layers of this isolated cortex with a view toward assessing electrical changes when falling asleep and during the various stages of sleep. It is shown that, as in the intact cortex, the first electrographic changes occur in the lower layer of the isolated cortex. Three to four months after cortex isolation, changes in the electrical activity are found to occur simultaneously in the cortex of both hemispheres during development of sleep and sequence of its stages. Awakening is found to desynchronize the electrical activity in all cortical layers of both hemispheres. S.D.

A77-26225 # **Interaction of the regulatory systems for muscle-contraction thermogenesis and external respiration (Vzaimodeistvie sistem regulirovaniia sokratitel'nogo termogeneza i vneshnego dykhaniia).** Iu. V. Lupandin and G. I. Kuz'mina (Petrozavodskii Gosudarstvennyi Universitet, Petrozavodsk, USSR). *Fiziologicheskii Zhurnal SSSR,* vol. 62, Dec. 1976, 1848-1855. 25 refs. In Russian.

An experimental study was conducted on adult cats to examine the EMG of the muscles of the trunk and limbs during cold-induced shivering, with special emphasis on evaluating the effect of reflex respiratory changes on the course of cold-induced shivering. It is shown that the diaphragm and the rhythmic neuromotor units of intercostal muscles are not involved in shivering. In contrast, the static neuromotor units of intercostal muscles are found to participate in the development of cold-induced shivering. Reflex respiratory changes did not produce any significant changes in the thermoregulatory activity in the muscles of the trunk and limbs. S.D.

A77-26241 **Arrhythmias documented by 24 hour continuous electrocardiographic monitoring in 50 male medical students without apparent heart disease.** M. Brodsky, D. Wu, P. Denes, C. Kanakis, and K. M. Rosen (Illinois, University, Chicago, Ill.). *American Journal of Cardiology,* vol. 39, Mar. 1977, p. 390-395. 36 refs. Grant No. NIH-18794-01.

A77-26242 **Transient asymptomatic S-T segment depression during daily activity.** S. J. Schang, Jr. (U.S. Navy, Naval Regional Medical Center, Philadelphia, Pa.) and C. J. Pepine (Florida, University, Gainesville, Fla.). *American Journal of Cardiology,* vol. 39, Mar. 1977, p. 396-402. 18 refs. Research supported by the Merrell National Laboratories. Navy Project 206-612.

A77-26244 * **Computerized tomography using video recorded fluoroscopic images.** A. C. Kak, C. V. Jakowatz, Jr. (Purdue University, West Lafayette, Ind.), N. A. Baily, and R. A. Keller (California, University, San Diego, Calif.). *IEEE Transactions on Biomedical Engineering,* vol. BME-24, Mar. 1977, p. 157-169. 39 refs. Contract No. F30602-75-C-0150; Grant No. NGR-05-009-257.

The use of video-recorded fluoroscopic images as input data for digital reconstruction of objects from their projections is examined. The fluoroscopic and the scanning apparatus used for the experiments are of a commercial type already in existence in most hospitals. It is shown that for beams with divergence up to about 15 deg, one can use a convolution algorithm designed for the parallel radiation case with negligible degradation both quantitatively and from a visual quality standpoint. This convolution algorithm is computationally more efficient than either the algebraic techniques or the convolution algorithms for radially diverging data. Results from studies on Lucite phantoms and a freshly sacrificed rat are included. S.D.

A77-26267 # **Stereocarotid angiography of the ophthalmic artery (Vyiavlenie glaznichnoi arterii metodom stereo-karotidnoi angiografii).** I. N. Beradzė (Tbilisskii Gosudarstvennyi Institut Usovershenstvovaniia Vrachei, Tiflis, Georgian SSR). *Akademiia Nauk Gruzinskoi SSR, Soobshcheniia,* vol. 84, Nov. 1976, p. 473-475. In Russian.

A77-26270 # **New aspects of the study of the respiratory function of the blood during adaptation to hypoxia (Novye aspekty izucheniia dykhatel'noi funktsii krovi pri adaptatsii k gipoksii).** Z. I. Barbashova (Akademiia Nauk SSSR, Institut Evoliutsionnoi Fiziologii i Biokhimii, Leningrad, USSR). *Uspekhi Fiziologicheskikh Nauk,* vol. 8, Jan.-Mar. 1977, p. 3-18. 51 refs. In Russian.

The paper examines various channels of adaptation of the respiratory function of the blood of man and animals during prolonged stay under hypoxic conditions. Possible explanations are proposed for the existing discrepancies in studies of the morphological composition of red blood and of the oxygen-transport properties of hemoglobin. The hypothesis is established that the absence of erythrocytose during hypoxia adaptation, observed in a number of cases, by no means indicates the constancy of the oxygen volume of the blood, since in investigating the blood the number of erythrocytes and the hemoglobin content are determined only per unit volume of blood and not per unit body weight, which would be more significant. P.T.H.

A77-26271 # **The role of chemoreceptors in the adaptation of an organism to hypoxia (O roli khemoretseptorov v adaptatsii organizma k gipoksii).** N. A. Agadzhanian and A. I. Elfimov. *Uspekhi Fiziologicheskikh Nauk,* vol. 8, Jan.-Mar. 1977, p. 44-54. 79 refs. In Russian.

On the basis of literature data and original results of physiological investigations performed on different kinds of animals, the fundamental role of the maintenance of afferentation from sinocarotid chemoreceptors in the adaptation of animals to oxygen deficiency in both prolonged and short-time hypoxia is revealed. The role of arterial chemoreceptors in the formation of ventilator reactions is discussed. P.T.H.

A77-26275 **A nonlinear model for the spatial characteristics of the human visual system.** C. F. Hall (Southern California, University, Los Angeles, Calif.) and E. L. Hall (Tennessee, University, Knoxville, Tenn.). *IEEE Transactions on Systems, Man, and Cybernetics,* vol. SMC-7, Mar. 1977, p. 161-170. 52 refs. Contracts No. F08606-72-0008; No. F33615-77-C-1016. ARPA Order 1706.

The paper develops a mathematical model of the human visual system (HVS) which can take into account the nonlinearities associated with the spatial frequency characteristics of the system. A model consisting of a logarithmic nonlinearity followed by linear independent frequency channels is shown to be able to account for the phenomenon of brightness constancy, but this model is inconsistent with findings which indicate a distortion of signals at high, but not low, spatial frequencies. Therefore a new model is proposed, which places a low-pass filter in front of the nonlinearity. The major implication of this model is that the HVS is analogous to a variable bandwidth filter controlled by the contrast of the input image. As input contrast increases, the bandwidth decreases in an attempt to maintain maximum signal-to-noise ratio. P.T.H.

A77-26569 # **Evoked responses of visual cortex under stimulation of hypothalamic formations (Viklikani reaktsii neironiv zorovoi kori pri stimuliatsii gipotalamichnikh utvoren').** R. R. Velikaia and V. M. Il'in (Akademiia Nauk Ukrains'koi RSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal,* vol. 23, Jan.-Feb. 1977, p. 28-32. 13 refs. In Ukrainian.

The effect of electric stimulation of the hypothalamus preoptic area (PA), the anterior hypothalamic areas (AHA) and mammilary bodies (MB) on the responses of visual cortex neurons to light flashes were studied in immobilized rabbits. After stimulation of AHA or MB, the neuronal responses to flashes increased, the long-latency responses being predominantly increased. The effect of PA stimulation was more complex and variable. The response changes depended on the correlation between the evoked and the background activity of the same neuron. It was mainly the short-latency response which increased. It is suggested that PA and AHA or MB affect different levels of the visual analyzer. P.T.H.

A77-26570 # **Apparatus for transmitting physiological data (Pristrii dlia peredachi fiziologichnoi informatsii).** V. S. Sautkin (Donets'kii Medichnii Institut, Donetsk, Ukrainian SSR). *Fiziologichnii Zhurnal,* vol. 23, Jan.-Feb. 1977, p. 129, 130. 6 refs. In Ukrainian.

The paper gives and discusses the equivalent circuit for a piece of equipment for telemetric transmission of physiological data from a human subject who is able to move freely. The circuit is based on a field effect transistor and silicon transistors. The data are transmitted by FM, and the range of the transmitter for a receiving sensitivity of 10 mV is 100 m. P.T.H.

A77-26571 # **Electronic device for studying high-speed reactions (Elektronnii prilad dlia doslidzhennia shvidkisnikh reaktsii).** O. N. Lebid' and V. P. Didenko (Voroshilovgrads'kii Medichnii Institut, Voroshilovgradsk, Ukrainian SSR). *Fiziologichnii Zhurnal*, vol. 23, Jan.-Feb. 1977, p. 130-133. 5 refs. In Ukrainian.

A procedure is described for studying the development of artificial fatigue from the dynamics of change of the time of response reactions to arrhythmic light or sound stimuli. A special electronic device was made for this - the reflexointervalograph, with which one can induce artificial fatigue by continuous feeding of an arrhythmic stimulator with simultaneous recording of the response reactions. Experiments showed that the total time of response reactions varies in a wave-like fashion with increasing amplitude during fatigue, which can be used in quantitative estimates of artificial fatigue. P.T.H.

A77-26578 # **Visual conspicuity as an external determinant of eye movements and selective attention.** F. L. Engel. Eindhoven, Technische Hogeschool, Doctor in de technische Wetenschappen Thesis, 1976. 98 p. 149 refs.

Selective processes are considered along with external and internal determinants and questions related to visual conspicuity, directed attention, and retinal locus. Aspects of visual conspicuity and selective background interference in eccentric vision are discussed, taking into account stimuli and apparatus, procedures, observers, terminology, the influence of the diameter, the influence of luminance, and the combined effect of the two factors. Topics related to visual conspicuity, visual search, and fixation tendencies of the eye are explored. Attention is given to experimental details, conspicuity area determinations, spontaneous eye movements, search time, spontaneous fixations, experimental findings, processing models, the degree of visual prominence, and exploratory eye movements. G.R.

A77-26582 * **Renal electrolyte circadian rhythms - Independence from feeding and activity patterns.** M. C. Moore-Ede and J. A. Herd (Harvard University, Boston and Southboro, Mass.). *American Journal of Physiology*, vol. 232, Feb. 1977, p. F128-F135. 34 refs. Contract No. NAS9-14249; Grants No. NIH-HL-13872; No. NIH-HL-14150.

Experiments were conducted on six unanesthetized chair-acclimatized adult male squirrel monkeys (Saimiri sciureus) weighing 600-900 g to determine whether internal synchronization is the result of simple passive dependence of renal excretory rhythms on endogenous rhythms of those variable that influence electrolyte excretion such as dietary intake and muscular activity. Independence of the urinary rhythms from diurnal variations in feeding, drinking, and activity was secured by depriving the animals of food, water, and training them to perform a two-hourly schedule of feeding, drinking, and activity throughout day and night. Results indicate that the internal synchronization which is normally observed between the behavioral and urinary rhythms cannot be explained by any direct dependence of renal function on behavioral patterns. The most probable mechanism for circadian internal synchronization is that the various behavioral and renal rhythms are controlled by potentially independent separate oscillators which are normally kept in synchrony with one another. S.D.

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STAR ENTRIES

N77-18724*# Baylor Univ., Houston, Tex. Immunohematology Research Lab.
ANTI-Ig AUTOANTIBODY AND COMPLEMENT-MEDIATED DESTRUCTION OF NEOPLASTIC CELLS Summary Report, 1 Oct. 1975 - 31 Mar. 1976
Jeremiah J. Towmey 16 Jul. 1976 23 p refs
(Contract NAS9-14820)
(NASA-CR-151206) Avail: NTIS HC A02/MF A01 CSCL 06C

Some immune response are effected through immunoglobulins (Ig), of which five classes have been recognized, namely, IgA, IgD, IgE, IgG, and IgM. Auto-antibodies associated with rheumatoid arthritis, termed rheumatoid factors (RF) react with antigenic determinants on IgG heavy chains. RF has predominant but not complete IgM specificity. This auto-antibody response was not detected in treated patients with primary brain tumors (where tissue is sequestered from the immune system by an intact bloodbrain barrier) or with multiple myeloma where humoral immunity is usually impaired. In addition, the prevalence of RF is not increased with solid tumors prior to initiation of chemotherapy or radiotherapy. It is proposed that RF is related to prior chemotherapy or radiotherapy of tumors anatomically accessible to immunologic tissues capable of antibody responses. A primary IgG response occurs, antigen-antibody complexes form, complexed IgG becomes immunologic, and an RF response results. Author

N77-18725*# Baylor Univ., Houston, Tex. Immunohematology Research Lab.
BIOPROCESSING DEVELOPMENT: IMMUNE/CELLULAR APPLICATIONS: ANTI-Ig AUTOANTIBODY AND COMPLEMENT-MEDIATED DESTRUCTION OF NEOPLASTIC CELLS Final Report, 16 Oct. 1975 - 15 Oct. 1976
Jeremiah J. Twomey 15 Nov. 1976 45 p refs
(Contract NAS9-14820)
(NASA-CR-151207) Avail: NTIS HC A03/MF A01 CSCL 06C

This space bioprocessing contract effort was comprised of four general objectives. These were: (1) the evaluation of current separation processes, (2) the identification of problems relevant to the separation of important biologicals, (3) the identification of ground-based assay methods needed for pre- and postflight analysis of space bioprocessing separation technology; and (4) the establishment of methods to determine the efficiency of space bioprocessing separation procedures. Immunology was deemed advantageous to study the diversity of cells and cell products involved and the extensive interest being given to their separation. Upon recognition of a cellular or molecular agent as foreign to the body, the immune system becomes activated to produce cells whose function is to destroy that agent and cell products whose function is to inactivate the agent and assist in its destruction. Long after the agent is removed from the body, some cells remain in a state of readiness to continue these destructive actions specifically against that agent should further exposure to it occur. This is the basis of acquired immunity to disease. Author

N77-18726# Hohenheim Univ., Stuttgart (West Germany). Dept. of Animal Health.
RAPID BACTERIOLOGICAL DIAGNOSIS SYSTEMS ON PHYSICAL BASIS, NOTING SPLENIC FEVER PROOF [UNTERSUCHUNGEN UEBER BAKTERIOLOGISCHE SCHNELLDIAGNOSE-SYSTEME AUF PHYSIKALISCHER BASIS UNTER BESONDERER BERUECKSICHTIGUNG DES MILZBRAND-NACHWEISES]
Dieter Strauch Bonn DOKZENTBw 1976 175 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Verteidigung
(BMVg-FBWT-76-15) Avail: NTIS HC A06/MF A01; DOKZENTEw DM 40

A short survey of rapid-diagnosis systems is given. Factors which might have an influence on the spectra of direct-fluorochromated bacteria were compiled from literature. Of the various chambers for measuring bacteria which were tested in preliminary studies, the EDER system proved to be the most effective. The optimal combination of filters for measuring with the micro-spectrograph was determined. The significance and importance of the following factors was examined: background, breadth of slot, focusing, duration of measurement, and the shape and position of the bacteria in the measuring field. Preliminary studies on infrared spectroscopy of bacteria were completed, and samples of these and of the gaschromatic experiments were prepared. Author (ESA)

N77-18727# Haskins Labs., New Haven, Conn.
ALGAL METABOLITE INFLUENCE ON BLOOM SEQUENCE IN EUTROPHIED FRESHWATER PONDS Final Report
Kathleen Irwin Keating Jul. 1976 159 p refs
(Grant EPA-R-801387)
(PB-258445/6; EPA-600/3-76-081) Avail: NTIS HC A08/MF A01 CSCL 08H

Preliminary tests indicate that the inhibition of diatom growth by blue-green algal metabolites may be widespread in freshwater lakes. When the elimination of excessive nutrient inflow is not practical, bioligical management, or programming, of blooms in eutrophied lakes should be attempted. An hypothetical plan is offered to modify the unsatisfactory conditions in one lake which would cost approximately $500 per annum while providing a more satisfactory lake from both aesthetic and food chain points of view. GRA

N77-18728*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SPECULATIONS ON THE CONSEQUENCES TO BIOLOGY OF SPACE SHUTTLE-ASSOCIATED INCREASES IN GLOBAL UV-B RADIATION
M. M. Averner and R. D. MacElroy Jan. 1977 17 p refs
(NASA-TM-X-73200; A-6896) Avail: NTIS HC A02/MF A01 CSCL 06R

Various aspects of the impact of ozone depletion on the biosphere are assessed and discussed. Speculations on the factors which determine the extent and nature of biological damage due to an increased flux of ultra violet light are presented. It is concluded that a complete assessment must consider both direct effects (organisms) as well as indirect effects (ecosystems). The role of computer simulation of ecosystem models as a predictive tool is examined. Author

N77-18729*# Beckman Instruments, Inc., Fullerton, Calif. Advanced Technology Operations.
FEASIBILITY OF A FETAL MEASUREMENT ELECTRODE SYSTEM Final Report
Jan. 1977 25 p refs
(NASA Order T-4777-E)
(NASA-CR-151175; FR-1217-101) Avail: NTIS HC A02/MF A01 CSCL 06B

Findings of the study are summarized and conclude that all monitoring requirements are not currently satisfied. An approach is presented to provide a multiparametric monitoring system through combinations of existing transducers. This monitoring system would be appropriate, not only for intrapartum monitoring, but also for neonatal and adult blood gas evaluations. A literature search was conducted to provide an insight into current state-of-the-art in fetal monitoring. Author.

N77-18730*# Martin Marietta Corp., Denver, Colo.
CARDIOVASCULAR INSTRUMENTATION FOR SPACEFLIGHT
Roger T. Schappell, John T. Polhemus, and Nicholas J. Ganiaris Dec. 1976 84 p refs
(Contract NAS2-9062)
(NASA-CR-151935) Avail: NTIS HC A05/MF A01 CSCL 06B

The observation mechanisms dealing with pressure, flow, morphology, temperature, etc. are discussed. The approach taken in the performance of this study was to (1) review ground and space-flight data on cardiovascular function, including earlier related ground-based and space-flight animal studies, Mercury, Gemini, Apollo, Skylab, and recent bed-rest studies, (2) review cardiovascular measurement parameters required to assess individual performance and physiological alternations during space flight, (3) perform an instrumentation survey including a literature search as well as personal contact with the applicable investigators, (4) assess instrumentation applicability with respect to the established criteria, and (5) recommend future research and development activity. It is concluded that, for the most part, the required instrumentation technology is available but that mission-peculiar criteria will require modifications to adapt the applicable instrumentation to a space-flight configuration. Author

N77-18731*# Scientific Translation Service, Santa Barbara, Calif.
ULTRASTRUCTURAL AND FUNCTIONAL ANATOMY OF THE VESTIBULE
H. Spoendlin Washington NASA Mar. 1977 21 p refs Transl. into ENGLISH from Rev. Med. (France), v. 17, no. 27, 5 Jul. 1976 p 1439-1448
(Contract NASw-2791)
(NASA-TT-F-17405) Avail: NTIS HC A02/MF A01 CSCL 06P

The elements of the vestibular apparatus comprise two groups of receptors: one for the reception of angular or rectangular acceleration, and the other, the secondary structures whose function is still little known. The vestibular receptors are so organized that they transform the physical message into electrical information of the vestibular nervous flux. This several stage information transfer is discussed. Author

N77-18732*# Battelle Pacific Northwest Labs., Richland, Wash. Dept. of Occupational and Environmental Safety.
REGIONAL MEASUREMENT OF BODY NITROGEN Final Report, 1 Feb. - 31 Oct. 1976
H. E. Palmer 31 Oct. 1976 21 p refs
(Contract NAS9-14248)
(NASA-CR-151200) Avail: NTIS HC A02/MF A01 CSCL 06P

Studies of methods for determining changes in the muscle mass of arms and legs are described. N-13 measurements were made in phantom and cadaver parts after neutron irradiation. The reproducibility in these measurements was found to be excellent and the radiation dose required to provide sufficient activation was determined. Potassium-40 measurements were made on persons who lost muscle mass due to leg injuries. It appears that K-40 measurements may provide the most accurate and convenient method for determining muscle mass changes. Author

N77-18733*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DETECTION OF MICROBIAL INFECTION IN BLOOD AND ANTIBIOTIC DETERMINATIONS Patent Application
Christian G. Schrock (New Engl. Med. Center Hospitals), Jody W. Deming (New Engl. Med. Center Hospitals), Grace L. Picciolo, and Emmett W. Chappelle, inventors (to NASA) Filed 19 Jan. 1977 26 p
(NASA-Case-GSC-12045-1; US-Patent-Appl-SN-760795) Avail: NTIS HC A03/MF A01 CSCL 06B

A method for the rapid detection of bacteria in blood and quick determination of the susceptibilities of various unidentified bacteria contained in blood to one or more antibiotics is described. A bacterial adenosine triphosphate (ATP) assay is carried out after the elimination of interfering cellular elements in blood and non-bacterial ATP to determine whether an infection exists. If an infection does exist, a portion of a blood culture is further processed, including subjecting parts of the portion to one or more antibiotics. Change in bacterial ATP in the parts is determined, again by an ATP assay, to determine whether the unidentified bacteria in the sample are susceptible to the antibiotic or antibiotics under test. Author

N77-18734*# Scientific Translation Service, Santa Barbara, Calif.
PRINCIPLES OF AVIATION AND SPACE MEDICINE
A. A. Lavnikov Washington NASA Mar. 1977 319 p Transl. into ENGLISH of the book "Osnovy Aviats. i Kosmich. Med.," (Moscow), 1975 p 1-359
(Contract NASw-2791)
(NASA-TT-F-17511) Avail: NTIS HC A14/MF A01 CSCL 06E

The effects on the human body of various flight factors are discussed as well as the physiological and hygienic features of aircraft cockpits and breathing equipment. Special treatment is given to features of space flight. Other topics included are matters of hygiene during different climatic conditions, and safe practices in servicing aircraft and materials handling. Author

N77-18735# Texas Inst. for Rehabilitation and Research, Houston. Biostereometrics Lab.
MASS DISTRIBUTION OF THE HUMAN BODY USING BIOSTEREOMETRICS Final Report
R. L. Herron, J. R. Cuzzi, and J. Hugg Wright-Patterson AFB, Ohio AMRL Jun. 1976 203 p refs
(Contracts F33615-74-C-5121; DOT-HS-017-2-315-1A; AF Proj. 7184)
(AD-A029402; AMRL-TR-75-18) Avail: NTIS HC A10/MF A01 CSCL 06/14

Biostereometrics is the spatial and spatio-temporal analysis of biological form and function based on principles of analytic geometry. When applied to humans, it constitutes a modern approach to anthropometry. A suitable stereometric sensor is used to locate the three dimensional coordinates of points distributed over the body surface. The coordinates serve as input to a digital computer which is programmed to yield permutations of numerical or analog (graphical or physical) outputs as the application requires. In the present study, stereophotogrammetry was used to obtain stereometric data in the form of Cartesian coordinates of six segmented human cadavers. Density data provided by the contractor (AMRL) were then used in conjunction with the stereometric data to generate mass, volume, center of mass and principal moments of inertia about the principal axes of inertia with the aid of an IBM 360-50 digital computer. This study was undertaken to further explore the viability of computing mass distribution from biostereometric data and the best available human density values. GRA

N77-18736# School of Aerospace Medicine, Brooks AFB, Tex.
ENDOCRINE-METABOLIC EFFECTS IN SHORT-DURATION, HIGH-WORKLOAD MISSIONS: FEASIBILITY STUDY Final Report, Oct. 1974 - Dec. 1975
William F. Storm, Bryce O. Hartman, Gabriel P. Intano, and Gregory L. Peters Aug. 1976 13 p refs
(AF Proj. 7930)
(AD-A030524; SAM-TR-76-30) Avail: NTIS HC A02/MF A01 CSCL 05/5

A study was conducted at the USAF Instrument Flight Center to test an augment assembly of measures for assessing the relative merits of various flight instrumentation systems. The USAF School of Aerospace Medicine (SAM) stress battery was included. Although the study was not designed so as to permit an optimized evaluation of the SAM stress battery, the following results were noted: anticipatory stress, mild flight stress, and no habituation across missions. The SAM battery appears to be a useful addition to the flight instrumentation research program. Author (GRA)

N77-18737# Illinois Univ., Urbana-Champaign. Dept. of Psychology.
THE VOCABULARY OF BRAIN POTENTIALS: INFERRING COGNITIVE EVENTS FROM BRAIN POTENTIALS IN OPERATIONAL SETTINGS Progress Report, 1 Jul. 1975 - 1 Jul. 1976
Emanuel Donchin Aug. 1976 227 p refs
(Contract N00014-76-C-0002; ARPA Order 3053; NR Proj. 201-195)
(AD-A029452) Avail: NTIS HC A11/MF A01 CSCL 05/10

This report outlines the experimental progress of the biocybernetics project in FY 1976, describes the facilities of the Cognitive Psychophysiology Laboratory, and outlines directions of current and future research. The separate components of the event related potential (ERP) are described, emphasizing the relation to task relevance, event expectancy, and information content. Also the ability to employ single trial extraction techniques for ERP classification utilizing discriminant analysis is demonstrated. Experimental reports describing these research efforts are included. GRA

N77-18738# San Jose State Univ., Calif. Dept. of Speech-Communication.
DESCRIPTIVE COMMUNICATION STRUCTURE METRICS: A PRELIMINARY LOGICAL AND EMPIRICAL ANALYSIS
Jane A. Edwards and Peter R. Monge Dec. 1975 41 p refs
(Contract N00014-75-C-0445; NR Proj. 170-763)
(AD-A030512; TR-4) Avail: NTIS HC A03/MF A01 CSCL 05/10

A systematic analysis of the descriptive communication structure metrics is seen as a necessary prelude to relating them in research to each other and to non-communication variables. In the absence of such an analysis research involving them would seem to run the risk of either (a) potentially misleading results, or (b) suboptimal use of data. This paper presents a logical and empirical analysis of three structural metrics used to describe the communication behavior of the individual group member. The logical portion of the analysis applies some general issues of index construction to the specific metrics under examination, and questions the utility of the individual connectedness metric for comparisons involving individuals belonging to groups of differing sizes. The empirical portion reports the results of a commonality analysis, showing the degree to which each of the metrics reflects the unique or common effects of the individual's total number of reciprocated links, the individual's total number of reciprocated within group links, the proportion of the individual's total that are within group links and the number of people in the group to which the individual belongs. Author (GRA)

N77-18739*# Martin Marietta Corp., Denver, Colo.
PAYLOAD CREW ACTIVITY PLANNING INTEGRATION. TASK 2: INFLIGHT OPERATIONS AND TRAINING FOR PAYLOADS
F. R. Hitz 23 Dec. 1976 78 p refs
(Contract NAS9-14676)
(NASA-CR-151187) Avail: NTIS HC A05/MF A01 CSCL 05E

The primary objectives of the Payload Crew Activity Planning Integration task were to: (1) Determine feasible, cost-effective payload crew activity planning integration methods. (2) Develop an implementation plan and guidelines for payload crew activity plan (CAP) integration between the JSC Orbiter planners and the Payload Centers. Subtask objectives and study activities were defined as: (1) Determine Crew Activity Planning Interfaces. (2) Determine Crew Activity Plan Type and Content. (3) Evaluate Automated Scheduling Tools. (4) Develop a draft Implementation Plan for Crew Activity Planning Integration. The basic guidelines were to develop a plan applicable to the Shuttle operations timeframe, utilize existing center resources and expertise as much as possible, and minimize unnecessary data exchange not directly productive in the development of the end-product timelines. Author

N77-18740*# Massachusetts Inst. of Tech., Cambridge. Man-Vehicle Lab.
INTEGRATION OF VISUAL AND MOTION CUES FOR FLIGHT SIMULATOR REQUIREMENTS AND RIDE QUALITY INVESTIGATION Semiannual Progress Report, Jun. - Dec. 1976
L. R. Young Dec. 1976 107 p
(Grant NGR-22-009-701)
(NASA-CR-149667) Avail: NTIS HC A06/MF A01 CSCL 05E

Investigations for the improvement of flight simulators are reported. Topics include: visual cues in landing, comparison of linear and nonlinear washout filters using a model of the vestibular system, and visual vestibular interactions (yaw axis). An abstract is given for a thesis on the applications of human dynamic orientation models to motion simulation. Author

N77-18741*# Life Systems, Inc., Cleveland, Ohio.
TECHNOLOGY ADVANCEMENT OF THE STATIC FEED WATER ELECTROLYSIS PROCESS Annual Report
F. C. Jensen and F. H. Schubert Jan. 1977 59 p refs
(Contract NAS2-8682)
(NASA-CR-151934; LSI-ER-265-11) Avail: NTIS HC A04/MF A01 CSCL 06K

Some results are presented of a research and development program to continue the development of a method to generate oxygen for crew metabolic consumption during extended manned space flights. The concept being pursued is that of static feed water electrolysis. Specific major results of the work included: (1) completion of a 30-day electrode test using a Life Systems, Inc.-developed high performance catalyst. During startup the cell voltages were as low as 1.38 V at current densities of 108 mA/sq cm (100 ASF) and temperatures of 355 K (180 F). At the end of 30 days of testing the cell voltages were still only 1.42 V at 108 mA/sq cm, (2) determination that the Static Feed Water Electrolysis Module does not release an aerosol of the cell electrolyte into the product gas streams after a break-in period of 24 hours following a new electrolyte charge, and (3) completion of a detailed design analysis of an electrochemical Oxygen Generation Subsystem at a three-man level (4.19 kg/day (9.24 lb/day) of oxygen). Author

N77-18742# National Swedish Road and Traffic Research Inst., Linkoeping.
THE RATING AND MEASURING OF ROAD ROUGHNESS

Georg Magnusson and Peter W. Arnberg 1976 50 p refs Sponsored by Natl. Swed. Road Admin.
(VTI-83-A) Avail: NTIS HC A03/MF A01

A study has been carried out aiming, in part, to elucidate the significance of road roughness for road-users' experience of comfort and, in part, to find an objective method for measuring road roughness, giving data which are directly comparable with the road-users' experience of comfort. Thirty subjects in the preliminary experiment and forty in the main experiment rated their experience of comfort on twenty road sections representing varying degrees of smoothness to roughness conditions. The ratings were carried out in passenger cars, trucks and in a bus. Two kinds of ratings were made: an estimation of the general experience of discomfort when the road sections were compared with one another and a general estimation of what was considered to be an acceptable level of discomfort in different specified situations (e.g., on different types of roads, while traveling at different speeds, and while traveling for different lengths of time). The results of the ratings were partly used to evaluate the appropriateness of the ISO comfort standard in connection with road use and partly to evaluate four different kinds of road meters. Three of the four road meters which were used produced results well in accordance with the results from the subjective ratings. Due to measuring and evaluating techniques, however, only one of these can be recommended for more extensive measurements involving road building and road maintenance.
Author (ESA)

N77-18743# Institut fuer Informationsverarbeitung in Technik und Biologie, Karlsruhe (West Germany).
PERFORMANCE OF AN OBSERVER IN REAL TIME RECONNAISSANCE [UNTERSUCHUNG DER LEISTUNGS-FAEHIGKEIT EINES BEOBACHTERS BEI ECHTZEITAUF-KLAERUNG]
Alwin Guedesen and Hans Joachim Reinig Bonn DOKZENTBw 1976 132 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Verteidigung
(BMVg-FBWT-76-5) Avail: NTIS HC A07/MF A01; DOKZENTBw DM 40

TV-operator efficiency in real time reconnaissance missions was investigated. Efficiency is defined as recognition error rate and recognition time. Both variables depend on various parameters of which the most important were examined. Those are picture resolution, influence of contrast, and disturbing backgrounds. Quantitative results and influences of parameters on operator efficiency are presented graphically. Recognition experiments were carried out by 20 untrained test persons. Their increasing performance by continuous training is considerable. This was studied quantitatively. Experiments were started using fixed scenes first. The influence of moving pictures on operator efficiency was also studied. No decrease in efficiency is obtained if objects are presented on a TV screen at least one second. The results obtained are discussed in regard to reconnaissance missions by remotely piloted vehicles. The dependence between recognition results and flight parameters was studied and is presented graphically.
Author (ESA)

N77-18744# National Aerospace Lab., Amsterdam (Netherlands) Flight Div.
HUMAN PILOT DESCRIBING FUNCTION, REMNANT AND ASSOCIATED INFORMATION FOR PITCH ATTITUDE CONTROL: RESULTS FROM IN-FLIGHT AND GROUND-BASED TRACKING EXPERIMENTS
M. F. C. VanGool and H. A. Mooij Sep. 1975 86 p refs refs HCA05/MF A01
(Contract NIVR-RB-1745)
(NLR-TR-75062-U) Avail: NTIS

Servo-analysis techniques, using mathematical models of human control behavior, are effectively used in studies of the system formed by the human pilot and the flight control system/aircraft combination. Measurement and data analysis techniques for the determination of pilot describing function, remnant, and associated information needed in servo-analysis, are described. Results obtained from three compensatory tracking experiments (in-flight and ground based) are presented. Comparisons with results of similar investigations, published in the literature, are made.
Author (ESA)

N77-18745# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.
INVESTIGATION ON A PASSENGER RIDE-COMFORT IMPROVEMENT SYSTEM WITH LIMITED CONTROL SURFACE ACTUATOR PERFORMANCE FOR A FLEXIBLE AIRCRAFT
L. J. J. Erkelens and J. Schuring 28 Nov. 1975 85 p refs (Contract NIVR-1752)
(NLR-TR-75140-U) Avail: NTIS HC A05/MF A01

For the low wing-loading aircraft, considered in this investigation, vertical acceleration appeared to be an important factor concerning passenger comfort. To reduce vertical motions, a ride-comfort improvement system was introduced. Determination of parameters of the system, like gains and allowable performance limitations, required analog simulation because of strong nonlinearities. Symmetric aircraft dynamics, ride-comfort improvement system, and atmospheric turbulence were represented by mathematical models. The aircraft's model consisted of two rigid body and three structural modes. The ride-comfort improvement system comprised fast-moving auxiliary flaps, over the entire flap span, commanded by a vertical acceleration sensor. The driving actuators were subject to acceleration, rate, and displacement limits. Vertical atmospheric turbulence was modelled according to the Dryden spectrum. A phugoid instability, appearing in the simulation, required a simple attitude-hold system. A more serious problem was posed by a limit cycle instability due to interference of the wing bending mode with the actuator rate limitation. Decoupling of wing bending motion and flap action was provided by relocation of the acceleration sensor. An optimization of the ride-comfort improvement system was carried out by means of parameter variation and resulted in a satisfactory performance. Reductions in vertical acceleration up to about 50% were obtained, in heavy turbulence, realistic actuator characteristics being included.
Author (ESA)

N77-18746# Royal Aircraft Establishment, Farnborough (England).
THE EFFECTS OF 3 HOURS OF VERTICAL VIBRATION AT 5 Hz ON THE PERFORMANCE OF SOME TASKS
R. Gray, R. T. Wilkinson, K. R. Maslen, and G. F. Rowlands Jan. 1976 66 p refs
(RAE-TR-76011; BR52057) Avail: NTIS HC A04/MF A01

A laboratory experiment was conducted to investigate the effect on eight subjects of 3-hour exposures to vertical vibration, and to compare the results with the recommendations for maintaining efficiency of the international standard ISO 2631: Guide for the evaluation of human exposure to whole-body vibration. The vibration used was 5 Hz vertical, with an acceleration level of 1.2 m/sq sec rms, corresponding to the ISO recommended maximum durations of 1 hour for fatigue decreased proficiency and 3 hours for safe exposure. The duration of each session was approximately 3 hours, and four series of four sessions were conducted using two subjects at a time. Four tasks were used, audio vigilance, visual search, compensatory tracking by hand and handwriting. Effects on sight and hearing were checked at the beginning and end of each session. Based on average results, little evidence was found to support the time-dependency of the limits specified for 5 Hz in the international standard in that little fatigue effect was discovered. There was, however, an immediate appreciable decrement in performance of three out of the four tasks as a direct effect of the vibration, suggesting that the short-term nominal limit specified (2.8 m/sq sec rms for 1-4 min) is too high, for the particular tasks used.
Author (ESA)

N77-18747# Navy Experimental Diving Unit, Panama City, Fla.
MODIFIED COLLINS PEDAL-MODE ERGOMETER: DEVELOPMENT AND MEDICAL TESTS Technical Report, 1971 - 1975
Thomas W. James 15 Jun. 1976 51 p
(AD-A028355; NEDU-1-76) Avail: NTIS HC A04/MF A01 CSCL 06/12

Modifications made to the Collins Pedal-Mode Ergometer by NEDU and Battelle from 1971 to 1975 are described, along with a discussion of two predecessor ergometers used by NEDU from the mid 1950's to roughly 1970. Modifications to the commercially available Collins ergometer were performed in order to make the unit watertight and suitable for use at high ambient pressures. This work was accomplished in two phases: first, by NEDU for 1971 to 1972 and later by Battelle from 1973 to 1975. Battelle's final design featured a completely redesigned housing, Bal-Seals and a stainless steel shaft. Medical test conducted with the prototype and final designs are summarized, highlighting the importance of a standard, reliable ergometer in imposing specific diver workloads for a wide array of NEDU equipment and physiological tests. Information on the ergometer control unit, bicycle frames and calibration unit is also provided. GRA

N77-18748# Michigan Univ., Ann Arbor. Highway Safety Research Inst.
AN EVALUATION OF THE 1974 AND 1975 RESTRAINT SYSTEMS Special Report, Jan. 1974 - May 1976
Robert E. Scott, Jairus D. Flora, and Joseph C. Marsh, IV May 1976 178 p refs Sponsored by the Motor Vehicle Manufacturers Assoc. of the US, Inc..
(PB-258585/9; UM-HSRI-76-13) Avail: NTIS HC A09/MF A01 CSCL 13F

Restraint systems in cars demonstrated a substantial capability to reduce the incidence of moderate or worse injury when they were used. Lap belts alone reduce the probability 27% compared to no restraint. The lap and upper torso belts together reduce the probability 21%, compared to no restraint. GRA

N77-18749# Sierra Engineering Co., Sierra Madre, Calif.
ANTHROPOMETRIC TEST DUMMY, MODEL 825-50, DESIGN, DEVELOPMENT AND PERFORMANCE Final Report, 1 Dec. 1972 - 28 Feb. 1975
J. L. Roshala Aug. 1976 245 p
(Contract DOT-HS-254-3-568)
(PB-257179/2; TR-825-900; DOT-HS-801-971) Avail: NTIS HC A11/MF A01 CSCL 13F

The development, manufacture, testing, and evaluation of two (2) 50th percentile male anthropomorphic test dummies are outlined. The objective was to develop a test dummy which could be used for compliance tests with appropriate Federal Motor Vehicle Safety Standards in the evaluation of protection systems for vehicle occupants during real and simulated impact conditions. A further objective was to generate a corresponding test dummy data package which could be made available to any source interested in manufacturing, checking, comparing with other dummy configurations and otherwise verifying the accuracy and precision of the various details. GRA

N77-18750# Hughes Aircraft Co., Culver City, Calif. Dept. of Display Systems and Human Factors.
HUMAN PERFORMANCE EVALUATION OF MATRIX DISPLAYS: LITERATURE AND TECHNOLOGY REVIEW Final Technical Report, Apr. 1974 - Sep. 1975
L. A. Scanlan and W. L. Carel Jun. 1976 205 p refs
(Contract F33615-74-C-4083; AF Proj. 7184)
(AD-A029932; HAC-P75-468; HAC-D1755) Avail: NTIS HC A10/MF A01 CSCL 09/5

In recent years a number of different types of flat-panel displays have been developed which utilize large arrays of discrete display elements for the presentation of symbolic and sensor information. These displays offer several advantages over the conventional cathode ray tube, including reductions in display volume, weight, and power requirements. Included in this class of matrix displays are light emitting diode (LED) arrays, flat panel cathode ray tubes (e.g., the Digisplay). AC plasma and liquid crystal displays. This spectrum of displays allows the designer a new freedom in selecting the most appropriate display type for a given task and environment. To make such decisions successfully, designers need data relating specific display design parameters to measures of system performance. The most critical information that a designer needs concerns those parameters that affect the performance of the operator using the displays. The operator must be able to obtain from the display the information he needs to perform his task(s), to some minimum level of acceptability, under the poorest expected operational circumstances. Little of the mass of literature on display design parameters and human performance research has been oriented to this new class of matrix displays. GRA

N77-18751# Johns Hopkins Univ., Baltimore, Md. Dept. of Psychology.
CONDITIONS FOR IMPROVING VISUAL INFORMATION PROCESSING Final Report
Howard E. Egeth 31 Aug. 1976 20 p refs
(Contract N00014-67-A-0163-0012; NR Proj. 197-017)
(AD-A030425; TR-88) Avail: NTIS HC A02/MF A02 CSCL 05/5

The mission of this contract was to determine how performance in information processing tasks may be optimized. The research spanned five major topics: 1. Performance in visual search and detection tasks. These studies have demonstrated substantial capacity for parallel processing of display elements. 2. Perceptualizing data displays. The use of some unconventional formats for the representation of complex sets of data has been explored. 3. Selective attention. This research on attention is consistent with the notion that attention does not operate at the earliest stages (sensory or perceptual) of information processing, but is restricted to later stages such as memory scanning or response selection. 4. Factors affecting stimulus comparison. The major findings have to do with strategies for comparing stimuli. 5. Short-term memory. Two experiments examined factors that affect the retrieval of well-learned items (digits) from short-term memory. GRA

N77-18752# Johns Hopkins Univ., Baltimore, Md. Dept. of Psychology.
CONDITIONS FOR IMPROVING VISUAL INFORMATION PROCESSING
Howard E. Egeth, H. H. Brownell, L. C. Sager, A. Caramazza, P. Sommers, L. D. Geoffrion, G. C. Gilmore, and P. Whitehouse Aug. 1976 51 p refs
(Contract N00014-67-A-0163-0012; NR Proj. 197-017)
(AD-A029898; TR-84; TR-85; TR-86; TR-87) Avail: NTIS HC A04/MF A01 CSCL 05/10

Four experiments concerned with human information processing are reported. In TR 84 the authors test the proposal that the comparison of a pair of stimuli may in certain circumstances be mediated by the detection of overall vertical symmetry of the pair. The data do not support the conjecture. In TR 85 the authors analyze the frequently reported 'dominance' of visual stimuli over auditory stimuli and find the effect to be nonsensory in origin. In TR 86 the authors apply an incidental memory paradigm in the context of a visual search task to try to determine if processing is exhaustive or self-terminating during search. In TR 87 the authors examine the spatial limits of the ability to attend to relevant information and ignore nearby irrelevant information. GRA

N77-18753# Defense Documentation Center, Alexandria, Va.
PERFORMANCE MEASUREMENTS Report Bibliography, May 1961 - Apr. 1976
Sep. 1976 549 p refs
(AD-A029850; DDC/BIB-76/08) Avail: NTIS HC A23/MF A01 CSCL 05/10

This bibliography contains studies which aid in measuring and assessing data relevant to human performance. Training

devices, aptitude and achievement tests, special clothing and equipment are all employed to establish the criteria used in these studies. There are also references on environmental, physical and stress factors, which not only evaluate performance, but under certain conditions may predict it. Corporate Author-Monitoring Agency, Subject, Title and Personal Author are provided. Author (GRA)

N77-18754# Anacapa Sciences, Inc., Santa Barbara, Calif.
AIRCREW TRAINING REQUIREMENTS FOR NAP-OF-THE-EARTH FLIGHT Final Report
Charles A. Gainer and Dennis J. Sullivan Aug. 1976 57 p refs
(Contract DAHC19-73-C-0059; DA Proj. 2Q1-62107-A-745; DA Proj. 2Q7-64715-A-757)
(AD-A030420; ARI-RR-1190; Rept-203-1) Avail: NTIS HC A04/MF A01 CSCL 05/9

In nap-of-the-earth (NOE) flight a helicopter moves at less than treetop height and at variable airspeeds, using natural features for concealment--a dangerous procedure requiring great skill in flying and in navigation. This report identifies specific areas in which NOE training might be improved. Information from agencies and operational units provided data for analysis of NOE mission requirements, aircrew task analyses, and performance requirements for emergencies. Training objectives derived from the analyses were verified, compared with existing NOE training programs, and used to suggest improvements. Problems in navigation and orientation are the major hazard in NOE flight, and training improvements should concentrate in these areas. Suggestions for ground-based training aids are visual (cinematic) simulation, a map-interpretation manual for NOE use, and techniques of ground-level orienteering. Suggestions for flight-based training are procedures such as more practice in re-orientation, equipment such as map displays, and policies such as flying over more varied terrain. Results of the analyses were validated by ARI's field research program and used as the basis for developing the experimental Map Interpretation Terrain Analysis Course (MITAC) now being evaluated at the Army Aviation School, Fort Rucker, Alabama. Author (GRA)

N77-18755# Air Force Human Resources Lab., Brooks AFB, Tex.
ADVANCED SIMULATION IN UNDERGRADUATE PILOT TRAINING: AN OVERVIEW Final Report, Mar. 1971 - Jul. 1975
Don R. Gum, William B. Albery, and James D. Basinger Dec. 1975 28 p refs
(AF Proj. 1192)
(AD-A030224; AFHRL-TR-75-59(1)) Avail: NTIS HC A03/MF A01 CSCL 05/9

An overview of the entire Advanced Simulation in Undergraduate Pilot Training (ASUPT) program is presented to provide the reader with a general introduction to the research system. The three major components of the ASUPT are summarized, including the basic simulators, visual displays, and computer image generation (CIG) system, and interested readers are referenced to the six other volumes of this technical report for more specific and detailed information. This volume touches upon the highlights of the ASUPT design, development, and testing and includes the general progress of the program from its genesis in 1967 to the final acceptance of the simulator in January 1975. GRA

N77-18756# Kaman Sciences Corp., Colorado Springs, Colo.
STATIC EVALUATION OF AIR CUSHION DEPLOYMENT EFFECTS ON THE MEMORY RETENTION OF THE SOLID STATE DIGITAL RECORDER SYSTEM Final Report
Sep. 1976 29 p ref
(Contract DOT-NHTSA-6-5377)
(PB-259006/5; K-76-64U(R); DOT-HS-802-040) Avail: NTIS HC A03/MF A01 CSCL 13F

A part 572 anthropomorphic dummy containing the solid state digital recorder was subjected to static laboratory air cushion inflation test series. It was determined that over the range of conditions tested, no interaction of electric and magnetic fields generated during the inflation required and the dummy's recorder system occurred. Voltage measurements on and near the air cushion during the inflation required were also made. GRA

N77-18757# Construction Engineering Research Lab. (Army), Champaign, Ill.
CONCEPTUALIZATION OF HABITABILITY EXPRESSIONS FOR THE HABITABILITY DATA BASE Interim Report
T. A. Davis Aug. 1976 62 p refs
(DA Proj. 4A7-62719-AT-03)
(AD-A029661; CERL-TR-D-68) Avail: NTIS HC A04/MF A01 CSCL 13/13

Habitability is defined and documents containing statements on habitability are identified within the context of the Corps of Engineers facility delivery process. This process is described as a cycle of events that includes master planning, construction programming, project development, design, and construction. *Three generic and ten specific habitability expressions are* conceptualized which relate properties of occupant activities (physical, physiological, and mental) to properties of facilities (dimensions of length, width, light and sound levels, temperature, etc.). Three expressions of cost-effectiveness are conceptualized as ratios of the dollar cost of a facility, facility property, or property categories divided by units of occupant needs for health, safety, performance and satisfactions. Structural, content, and technical assumptions are given, and data categories are defined by example. Further steps toward the development of prototype expressions are outlined. Author (GRA)

N77-19729*# Alcorn State Univ., Lorman, Miss. Dept. of Biological Sciences.
BIO-GAS PRODUCTION FROM ALLIGATOR WEEDS Semiannual Report
Abdul Latif 1 Jun. 1976 11 p
(Grant NsG-8036)
(NASA-CR-149809) Avail: NTIS HC A02/MF A01 CSCL 06C

Laboratory experiments were conducted to study the effect of temperature, sample preparation, reducing agents, light intensity and pH of the media, on bio-gas and methane production from the microbial anaerobic decomposition of alligator weeds (Alternanthera philoxeroides. Efforts were also made for the isolation and characterization of the methanogenic bacteria. Author

N77-19730# Florida Univ., Gainesville. Water Resources Research Center.
INTERRELATIONSHIPS BETWEEN CERTAIN MICROORGANISMS AND SOME ASPECTS OF SEDIMENT-WATER NUTRIENT EXCHANGE IN TWO BAYOU ESTUARIES, PHASE 1 AND 2
Gerald A. Moshiri (West Florida Univ.) 12 Jul. 1976 50 p refs
(Contracts DI-14-31-0001-5065)
(PB-259538/7; WRRC-Pub-37; W77-00674) Avail: NTIS HC A03/MF A01 CSCL 13B

Over a two-year period, certain aspects of nutrient exchange and regeneration were studied as related to major physical, chemical, and microbial parameters in two bayou estuaries. Sediment to water phosphate PO4(-3) exchange was affected by dissolved oxygen concentrations in both systems, but Eh effects of oxygen depletion on PO4(-3) exchange kinetics differed in the two bayous. Sediment Eh profiles followed a temporal pattern perhaps related to the bacterial activity. Glucose concentrations and uptake were monitored as related to possible sources and utilizers respectively. GRA

N77-19731# Advisory Group for Aerospace Research and Development, Paris (France).
RECENT ADVANCES IN SPACE MEDICINE
J. Colin, ed. Jan. 1977 113 p refs In ENGLISH; partly in FRENCH Conf. Proc of the Aerospace Medical Panel Specialists' Meeting, Athens, 20-24 Sep. 1976
(AGARD-CP-203; ISBN-92-835-0186-1) Avail: NTIS HC A06/MF A01

Some of the topics discussed are: the effect of free fall on the vestibular organ and of its post flight readaptation as part of the shuttle program; successful transfer of adaptation aquired in a slow rotation room to motion environments in Navy flight training; environmental investigations on motion sickness susceptibility; and space mission simulation. The significance of physical fitness in selection and training of spacelab crews; and the psychometric characteristics of astronauts are also reviewed.

N77-19732# Milan Univ. (Italy).
INVESTIGATION OF THE EFFECT OF FREE FALL ON THE VESTIBULAR ORGAN AND OF ITS POST-FLIGHT READAPTATION AS PART OF THE SHUTTLE PROGRAM: A CONTRIBUTION TO BASIC VESTIBULAR PHYSIOLOGY AND TO THE PROBLEM OF SPACE SICKNESS
Torquato Gualtierotti *In* AGARD Recent Advances in Space Medicine Jan. 1977 7 p refs

Avail: NTIS HC A06/MF A01

Basic vestibular physiology and the problem of space sickness was reviewed. A space experiment monitoring the single vestibular statoreceptors output indicated important reversible and unreversible changes. The significance of such changes is discussed. Author

N77-19733*# Naval Aerospace Medical Research Lab., Pensacola, Fla.
SUCCESSFUL TRANSFER OF ADAPTATION ENVIRONMENTS IN NAVY FLIGHT TRAINING
D. B. Cramer, A. Graybiel, and W. J. Oosterveld *In* AGARD Recent Advances in Space Medicine Jan. 1977 5 p refs Sponsored by NASA

Avail: NTIS HC A06/MF A01

Two flight students, grounded for the reason they were highly susceptible to motion sickness, completed their training after gradually adapting 10 rpm, achieved by executing head movements during small stepwise increases in angular velocity. Subject 1 executed a total of about 77,000 head movements within a period of five months and Subject 2 executed about 108,000 head movements within a period of 42 days. The transfer of the adaptation acquired in the laboratory to most motion environments aloft was good; the notable exception involved weightless maneuvers in the case of Subject 1. Both were on flight status when contacted recently. The current motion sickness susceptibility in Subject 1 in the fall of 1975 was assessed. He reached a (mild) motion sickness endpoint, in the rotating room, at 17 rpm; the average endpoint is 7 to 8 rpm. Some practical and theoretical implications are discussed. Author

N77-19734# Air Force Inst. of Aviation Medicine, Fuerstenfeldbruck (West Germany).
EXPERIMENTAL INVESTIGATIONS ON MOTION SICKNESS SUSCEPTIBILITY
W. Hoffelt *In* AGARD Recent Advances in Space Medicine Jan. 1977 5 p refs

Avail: NTIS HC A06/MF A01

The sensory conflict theory formulated by REASON was experimentally examined with psychological and sensory-physiological methods in two groups differing in their resistence towards coriolis accelerations. In all tests applied both groups showed consistent behavioral differences which may be interpreted in the sense of the conflict theory. Author

N77-19735# Air Force Inst. of Aviation Medicine, Fuerstenfeldbruck (West Germany).
SPACE MISSION TRAINING: A NECESSARY ELEMENT IN PLANNING AND TRAINING FOR SHUTTLE SPACELAB MISSIONS
Eduard C. Burchard *In* AGARD Recent Advances in Space Medicine Jan. 1977 13 p

Avail: NTIS HC A06/MF A01

In an attempt during the last 2 years to evaluate space mission simulations, two shuttle spacelab simulations were performed at the NASA Lyndon B. Johnson Space Center. The first spacelab mission simulation provided valuable insights into the many Shuttle Spacelab Operations which were not necessarily payload dependent. Two crewmen, free of Orbiter duties, acted as mission specialist and payload specialists to operate 12 typical life sciences experiments on one shift schedule. The second spacelab mission simultion involved one mission specialist and two payload specialists in a 7-day multidiscipline simulation which included 20 life sciences experiments and one cosmic ray laboratory experiment. The use of space mission simulations in preparation for Shuttle Spacelab Missions is discussed. Author

N77-19736# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Bad Godesberg (West Germany). Inst. fuer Flugmedizin.
NEUTRAL BUOYANCY: ONE POSSIBLE TOOL FOR MAN'S TRAINING IN A SIMULATED ZERO-G ENVIRONMENT
Heinz Oser *In* AGARD Recent Advances in Space Medicine Jan. 1977 5 p refs

Avail: NTIS HC A06/MF A01

In order to get the payload specialists well prepared for performing their tasks under space conditions in a resonable time, the water immersion technique for simulating certain aspects of zero and partial gravity condition is amongst others one possible tool. The water immersion technique was used mainly for three purposes: (1) studying physiological responses to weightlessness, (2) evaluating human performance under quasi weightless conditions, and (3) testing equipment, facilities and simulation techniques. Author

N77-19737# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
HUMAN ENGINEERING: CREW SYSTEMS TOOL FOR SPACELAB DESIGN
Udo G. Munkelt (McDonnell-Douglas Corp., St. Louis) and Harold S. Jencks (McDonnell-Douglas Corp., St. Louis) *In* AGARD Recent Advances in Space Medicine Jan. 1977 9 p refs

Avail: NTIS HC A06

The space shuttle spacelab system is described with emphasis on crew accommodation/utilization. The artificially supplied internal environment is discussed which provides for the well being of the crew in the hostile surroundings of space including atmosphere, temperature, lighting and noise. The interior arrangement of spacelab showing architectural considerations which essentially provide a one - G oriented concept in respect to work stations, display control consoles, floor, ceiling, etc., minimizing disorientation and faciliting ground operations is explained. The restraint systems are cited which enable the crewman not only to overcome the negative aspects of working in zero - G, but also to take advantage of the positive aspects. Several photos and sketches are provided showing full scale Mockups and neutral buoyancy test fixtures which support the human engineering considerations in Spacelab design/development. Author

N77-19738*# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
THE EFFECTS OF PROLONGED SPACEFLIGHT ON THE

REGIONAL DISTRIBUTION OF FLUID, MUSCLE AND FAT: BIOSTEREOMETRIC RESULTS FROM SKYLAB

M. W. Whittle, R. E. Herron (Texas Inst. for Rehabilitation and Res., Houston), J. R. Cuzzi (Texas Inst. for Rehabilitation and Res., Houston), and C. W. Keys (Technology Inc., Houston) *In* AGARD Recent Advances in Space Medicine Jan. 1977 5 p refs

(Contract NAS9-11604)

Avail: NTIS HC A06/MF A01

Biostereometric analysis of body form was performed several times preflight and postflight on the astronauts of all three skylab flights. The analysis was made by deriving the three-dimensional coordinates of numerous points on the body surface from stereoscopic pairs of photographs of the subject, using a stereoplotter. The volume of segments of the body, and of the body as a whole, was calculated by integration of cross sectional areas derived from the coordinate data. All nine astronauts demonstrated regional changes in volume distribution which could be related to changes in total body water, muscle mass, and fat deposits. The change in water resulted from a redistribution of fluid in response to zero gravity. Changes in muscle mass resulted from an alternation in patterns of musclar activity in the absence of gravity, and changes in fat resulted from discrepancies between the individual's caloric needs and his food consumption. Author

N77-19739# Air Force Inst. of Aviation Medicine, Fuerstenfeldbruck (West Germany).

OPHTHALMOLOGICAL REQUIREMENTS FOR SPACELAB ASTRONAUT-SCIENTISTS

F. J. Dauman *In* AGARD Recent Advances in Space Medicine Jan. 1977 6 p refs

10-51)

Avail: NTIS HC A06/MF A01

Ophthalmological requirements for visual acuity, field of vision, binocular vision, accommodation, color vision, and equilibrium of eye muscles are presented from an occupational medical point of view. Correction of visual deficiencies by means of glasses and contact lenses is discussed. The necessity of full visual field, binocular vision, dark adaptation and color vision is stressed. Next, anomalies and diseases compatible with the stresses of a payload-specialist and those causing rejection are covered. Author

N77-19740# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Bad Godesberg (West Germany). Inst. fuer Flugmedizin.

ATHLETIC ENDURANCE TRAINING: ADVANTAGE FOR SPACE FLIGHTS? THE SIGNIFICANCE OF PHYSICAL FITNESS FOR SELECTION AND TRAINING OF SPACELAB CREWS

K. E. Klein, H. M. Wegmann, and P. Kuklinski *In* AGARD Recent Advances in Space Medicine Jan. 1977 13 p refs

Avail: NTIS HC A06/MF A01

The morphological and functional changes obtained with an athletic endurance training are rather specific, and not at all, of general advanatage for the tolerance to space stresses. In particular during gravitational loads they allow a higher shift of fluid into the lower extremities with the possible consequence of a reduced tolerance. This response obviously, is accentuated through immersion and weightlessness; also, the aerobic work capacity is more impaired. Author

N77-19741# School of Aerospace Medicine, Brooks AFB, Tex.

PSYCHOMETRIC CHARACTERISTICS OF ASTRONAUTS

Bryce O. Hartman and Richard C. McNee *In* AGARD Recent Advances in Space Medicine Jan. 1977 9 p refs

Avail: NTIS HC A06/MF A01

Detailed information on the role of psychological testing in the selection process for NASA astronauts is reported. Because of the current activity in the European space agency, where there is a requirement for astronaut selection, psychometric procedures and data are of renewed scientific interest. An overview of the psychometric process and extensive statistical analyses are reported. Author

N77-19742# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Hamburg (West Germany). Inst. fuer Flugmedizin.

PSYCHOLOGICAL SELECTION OF ASTRONAUT-SCIENTISTS (PAYLOAD SPECIALISTS)

Klaus-Martin Goeters *In* AGARD Recent Advances in Space Medicine Jan. 1977 5 p refs

Avail: NTIS HC A06/MF A01

Psychological testing of spacelab-payload specialists is mandatory. Astronaut-scientists characteristics were discussed: (1) High basic technical comprehension and practical skills, (2) high motivation, (3) adequate group behavior, and (4) emotional maturity and stress resistence. The significance of these psychological factors for working in confinement are demonstrated by experimental results. Author

N77-19743# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).

EXPERIMENTAL BASIS FOR THE USE OF HYPNOTICS BY AEROSPACE CREWS

A. N. Nicholson, R. G. Borland, Coral H. Clarke, and Barbara M. Stone *In* AGARD Recent Advances in Space Medicine Jan. 1977 11 p refs

Avail: NTIS HC A06/MF A01

The work which was carried out at the Royal Air Force Institute of Aviation Medicine on the immediate and residual effects of hypnotics on performance, the effectiveness of hypnotics, and the problems associated with the use of hypnotics at unusual times of the day is reviewed. Author

N77-19744*# National Aeronautics and Space Administration, Washington, D.C.

SPACE AGE HEATLH CARE DELIVERY

Walter L. Jones *In* AGARD Recent Advances in Space Medicine Jan. 1977 9 p refs

Avail: NTIS HC A06/MF A01 CSCL 06E

Space age health care delivery is being delivered to both NASA astronauts and employees with primary emphasis on preventive medicine. The program relies heavily on comprehensive health physical exams, health education, screening programs and physical fitness programs. Medical data from the program is stored in a computer bank so epidemiological significance can be established and better procedures can be obtained. Besides health care delivery to the NASA population, NASA is working with HEW on a telemedicine project STARPAHC, applying space technology to provide health care delivery to remotely located populations. Author

N77-19746*# Methodist Hospital, Houston, Tex.

AUTOMATED ELECTROENCEPHALOGRAPHY SYSTEM AND ELECTROENCEPHALOGRAPHIC CORRELATES OF SPACE MOTION SICKNESS, PART 3 Final Report

James D. Frost, Jr. 15 Feb. 1977 179 p refs

(Contract NAS9-13870)

(NASA-CR-151210) Avail: NTIS HC A09/MF A01 CSCL 06P

Computer quantification methods were used to analyze the Skylab electroencephalographic data obtained during the course of the M133 series of experiments. This undertaking was prompted by initial observations made during visual analysis of the tape-recorded sleep records where there appeared to be an increase of the alpha-rhythm frequency during some inflight recording sessions, as compared to preflight baseline observations. A number of potential etiological factors are identified and their various possible influences discussed. The presence of the zero-g state is thought to be an important factor, possibly influencing EEG through alteration of vestibular function and/or

by producing fluid shifts secondary to loss of hydrostatic pressure. Author

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N77-19747*# Technology, Inc., Houston, Tex. Life Sciences Div.
SYSTOLIC TIME INTERVAL DATA ACQUISITION SYSTEM. SPECIALIZED CARDIOVASCULAR STUDIES
Joseph T. Baker 3 May 1976 61 p refs
(Contract NAS9-14880)
(NASA-CR-151213) Avail: NTIS HC A04/MF A01 CSCL 06B

The development of a data acquisition system for noninvasive measurement of systolic time intervals is described. R-R interval from the ECG determines instantaneous heart rate prior to the beat to be measured. Total electromechanical systole (Q-S2) is measured from the onset of the ECG Q-wave to the onset of the second heart sound (S2). Ejection time (ET or LVET) is measured from the onset of carotid upstroke to the incisure. Pre-ejection period (PEP) is computed by subtracting ET from Q-S2. PEP/ET ratio is computed directly. Author

N77-19748*# Adrian Industries, Inc., Titusville, Fla.
PERCUTANEOUS MULTIPLE ELECTRODE CONNECTOR, DESIGN PARAMETERS AND FABRICATION (BIOMEDICAL)
Laurence A. Myers Feb. 1977 20 p refs
(NASA Order CC-56498-A)
(NASA-CR-144859) Avail: NTIS HC A02/MF A01 CSCL 06B

A percutaneous multielectrode connector was designed which utilizes an ultrapure carbon collar to provide an infection free biocompatible passage through the skin. The device provides reliable electrical continuity, mates and demates readily with the implant, and is fabricated with processes and materials oriented to commercial production. Author

N77-19749*# Virginia Univ., Charlottesville. Dept. of Physiology.
EFFECTS ON BODY SIZE AND COMPOSITION OF CHRONIC EXPOSURE TO ALTERED GRAVITY Final Report, 1 Aug. 1973 - 31 Mar. 1977
Grover C. Pitts Mar. 1977 103 p refs
(Grant NGR-47-005-213)
(NASA-CR-149804) Avail: NTIS HC A06/MF A01 CSCL 06P

The effects of chronic centrifugation on body composition and growth of rats, mice, monkeys, and man are studied. The benefits of exercise and restraint during acceleration are investigated. Physiological regulation and energy balance are also discussed. Author

N77-19750*# National Aeronautics and Space Administration. Pasadena Office, Calif.
AUTOMATED CLINICAL SYSTEM FOR CHROMOSOME ANALYSIS Patent Application
Kenneth Castleman (JPL), Howard J. Frieden (JPL), Elbert T Johnson (JPL), Paul A. Rennie (JPL), and Raymond J. Wall, Inventors (to NASA) (JPL) Filed 16 May 1976 215 p
(Contract NAS7-100)
(NASA-Case-NPO-13913-1; US-Patent-Appl-SN-687251) Avail: NTIS HC A10/MF A01 CSCL 06B

An automatic chromosome analysis system is provided wherein a suitably prepared slide with chromosome spreads thereon is placed on the stage of an automated microscope. The automated microscope stage is computer operated to move the slide to enable detection of chromosome spreads on the slide. The X and Y location of each chromosome spread that is detected is stored. At the conclusion of this searching operation, the computer directs the microscope to again sequence through the chromosome spread locations in response to the stored X and Y locations. NASA

N77-19751# Wyoming Univ., Laramie. Dept. of Chemistry.
PHOTO-INITIATED PROCESSES IN VISION Technical Progress Report, 1 Jul. 1975 - 30 Jun. 1976
A. V. Guzzo 1976 8 p refs Sponsored by ERDA
(COO-1627-31) Avail: NTIS HC A02/MF A01

The photoreaction between vitamin A (and other carbonyl containing compounds) and various nitroxide spin labels was analyzed. The decrease in the label signal upon illumination is due to the photosensitization of the nitroxide resulting in the reduction of the N-O group to the N-OH group. No evidence of any carbonyl radical participation was obtained therefore a triplet-doublet energy transfer process is proposed. A similar behavior was noted for the Schiff bases of these carbonyl compounds and nitroxides. The findings do not support the idea of radical participation in the retinal isomerization process even when a good electron acceptor is present. ERA

N77-19752*# Old Dominion Univ., Norfolk, Va.
A REVIEW OF METHODOLOGICAL FACTORS IN PERFORMANCE ASSESSMENTS OF TIME-VARYING AIRCRAFT NOISE EFFECTS
Glynn D. Coates, Earl A. Alluisi, and C. J. Adkins, Jr. Mar. 1977 38 p refs
(Grant NsG-1092)
(NASA-CR-2789) Avail: NTIS HC A03/MF A01 CSCL 05E

Literature on the effects of general noise on human performance is reviewed in an attempt to identify (1) those characteristics of noise that have been found to affect human performance; (2) those characteristics of performance most likely to be affected by the presence of noise, and (3) those characteristics of the performance situation typically associated with noise effects. Based on the characteristics identified, a theoretical framework is proposed that will permit predictions of possible effects of time-varying aircraft-type noise on complex human performance. An annotated bibliography of 50 articles is included. Author

N77-19753*# Life Systems, Inc., Cleveland, Ohio.
ADVANCED COMBINED IODINE DISPENSER AND DETECTOR Final Report
J. B. Lantz, F. H. Schubert, F. C. Jensen, and J. D. Powell Jan. 1977 132 p refs
(Contract NAS9-14624)
(NASA-CR-151214; ER-277-4) Avail: NTIS HC A07/MF A01 CSCL 06K

A total weight of 1.23 kg (2.7 lb), a total volume of 1213 cu m (74 cu in), and an average power consumption of 5.5W was achieved in the advanced combined iodine dispenser/detector by integrating the detector with the iodine source, arranging all iodinator components within a compact package and lowering the parasitic power to the detector and electronics circuits. These achievements surpassed the design goals of 1.36 kg (3.0 lb), 1671 cu m (102 cu in) and 8W. The reliability and maintainability were improved by reducing the detector lamp power, using an interchangeable lamp concept, making the electronic circuit boards easily accessible, providing redundant water seals and improving the accessibility to the iodine accumulator for refilling. The system was designed to iodinate (to 5 ppm iodine) the fuel cell water generated during 27 seven-day orbiter missions (equivalent to 18,500 kg (40,700 lb) of water) before the unit must be recharged with iodine crystals. Author

N77-19754*# Massachusetts Inst. of Tech., Cambridge. Man-Vehicle Lab.
HUMAN DYNAMIC ORIENTATION MODEL APPLIED TO MOTION SIMULATION M.S. Thesis

Joshua D. Borah May 1976 219 p refs
(Contract NSR-22-009-701)
(NASA-CR-149862) Avail: NTIS HC A10/MF A01 CSCL 05E

The Ormsby model of dynamic orientation, in the form of a discrete time computer program was used to predict non-visually induced sensations during an idealized coordinated aircraft turn. To predict simulation fidelity, the Ormsby model was used to assign penalties for incorrect attitude and angular rate perceptions. It was determined that a three rotational degree of freedom simulation should remain faithful to attitude perception even at the expense of incorrect angular rate sensations. Implementing this strategy, a simulation profile for the idealized turn was designed for a Link GAT-1 trainer. A simple optokinetic display was added to improve the fidelity of roll rate sensations. Author

N77-19755*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.
FEASIBILITY STUDY OF AUTOMATIC CONTROL OF CREW COMFORT IN THE SHUTTLE EXTRAVEHICULAR MOBILITY UNIT
D. W. Cook 22 Feb. 1977 27 p
(Contract NAS9-15200)
(NASA-CR-151230; LEC-9980; TM-7001) Avail: NTIS HC A03/MF A01 CSCL 05E

Computer simulation is used to demonstrate that crewman comfort can be assured by using automatic control of the inlet temperature of the coolant into the liquid cooled garment when input to the controller consists of measurements of the garment inlet temperature and the garment outlet temperature difference. Subsequent tests using a facsimile of the control logic developed in the computer program confirmed the feasibility of such a design scheme. Author

N77-19756*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
CONTROL OF THERMAL BALANCE BY A LIQUID CIRCULATING GARMENT BASED ON A MATHEMATICAL REPRESENTATION OF THE HUMAN THERMOREGULATORY SYSTEM Ph.D. Thesis - California Univ., Berkeley
Lawrence H. Kuznetz Oct. 1976 561 p refs
(NASA-TM-X-58190; JSC-11579) Avail: NTIS HC A24/MF A01

Test data and a mathematical model of the human thermoregulatory system were used to investigate control of thermal balance by means of a liquid circulating garment (LCG). The test data were derived from five series of experiments in which environmental and metabolic conditions were varied parametrically as a function of several independent variables, including LCG flowrate, LCG inlet temperature, net environmental heat exchange, surrounding gas ventilation rate, ambient pressure, metabolic rate, and subjective/obligatory cooling control. The resultant data were used to relate skin temperature to LCG water temperature and flowrate, to assess a thermal comfort band, to demonstrate the relationship between metabolic rate and LCG heat dissipation, and so forth. The usefulness of the mathematical model as a tool for data interpretation and for generation of trends and relationships among the various physiological parameters was also investigated and verified. Author

N77-19757# Calspan Corp., Buffalo, N.Y.
DEVELOPMENT OF A FRONT PASSENGER ASPIRATOR AIR BAG SYSTEM FOR SMALL CARS
David J. Romer Sep. 1976 136 p refs
(Contract DOT-HS-5-01254)
(PB-259008/1; CALSPAN-ZP-5777-V-1; DOT-HS-802-039) Avail: NTIS HC A07/MF A01 CSCL 13F

During the first year's effort an aspirator air bag system was designed and developed. Tests with the aspirator air bag system produced data which satisfied the injury criteria for the full range of adult dummy sizes through the 45 MPH crash speed range. Test results indicate that the system did not present a hazard to the forward, out-of-position child and that the results also satisfied the injury criteria for the normally seated 6 yr. old child size dummy through the 45 MPH crash range. GRA

N77-19758# Probe Consultants, Inc., Phoenix, Ariz.
SAINT SIMULATION OF A REMOTELY PILOTED VEHICLE/DRONE CONTROL FACILITY: MODEL DEVELOPMENT AND ANALYSIS Final Report, Oct. 1974 - Jun. 1975
David B. Wortman, Deborah J. Seifert, and Steven D. Duket Jun. 1976 214 p refs
(Contract F33615-75-C-5012; AF Proj. 7184)
(AD-A031085; AMRL-TR-75-118) Avail: NTIS HC A10/MF A01 CSCL 01/3

A model of a real-time simulation of a Remotely piloted Vehicle/Drone Control Facility (RPV/DCF) has been constructed using SAINT, a totally digital man-machine modeling and simulation technique. The real-time simulation consists of a mock-up of a DCF, where actual operators control the flight of simulated RPVs through the use of cathode ray tube (CRT) displays of RPB flight paths and parameters. The SAINT model consists of two interacting components. The state variable component of the model duplicated the simulation of RPV flight of the real-time simulation. The task-oriented component represents the control and decision tasks performed by the DCF operators. The interactions between the components include models of the presentation of mission status information to the operators and the processing of commands sent to the RPVs by the operators. Through input values, the generalized SAINT model is made specific to one group of operators performing one mission of the real-time simulation. This mission is simulated using SAINT. The simulation results are evaluated by comparing them with the mission performance output obtained from the real-time simulation. GRA

N77-19759# Bunker-Ramo Corp., Westlake Village, Calif. Electronic Systems Div.
PILOT FACTORS CONSIDERATIONS IN SEE-TO-LAND Final Technical Report, Apr. 1974 - Jan, 1975
William F. Swartz, Donald M. Condra, and Ralph P. Madero May 1976 52 p refs
(Contract F33615-73-C-0391; AF Proj. 6190)
(AD-A030789) Avail: NTIS HC A04/MF A01 CSCL 01/2

The aviation industry is employing a building block approach with respect to aircraft avionics in general and automatic flight control systems in particular, to move systematically from Category 1 through Category 2 to Category 3 operations. The building block approach has been quite effective in structuring what must be done in terms of equipment for delivering the aircraft reliably to the Category 1, 2 and 3 equipment minima. From an operational viewpoint, however, the recovery of the aircraft still remains a see-to-land operation for these categories. The purpose of this paper is to address the issue of how far the see-to-land concept can be extended considering the pilot factors constraints in the environment in which the problem exists. The basic question is can the pilot effectively use the equipment in what remains a see-to-land operation. The low visibility landing experiences of the USAF Flight Dynamics Laboratory and the USAF Instrument Flight Center are heavily drawn upon in the preparation of this report. The results of their flying a Head-Up Display in visibilities down to 400 feet Runway Visual Range (RVR) in a T-39 Sabreliner are reviewed and reported. In addition, a number of other relevant papers and reports are used in helping to describe the nature of the low visibility landing. An assessment is made of some solutions that are being proposed for dealing with the see-to-land problem while considering the pilot factors constraints. GRA

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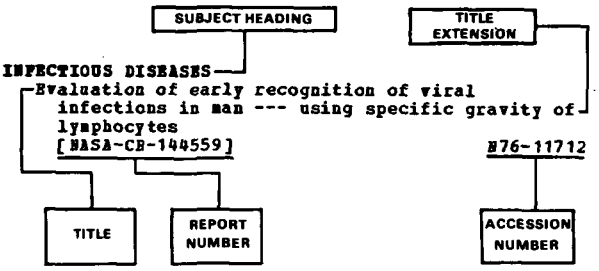

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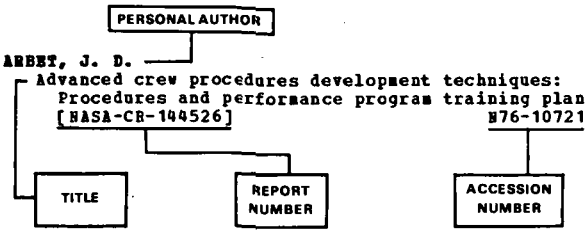

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