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A Continuing Bibliography with Indexes

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NASA SP-7011 (222)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 222)

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in July 1981 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 115 reports, articles and other documents announced during July 1981 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.

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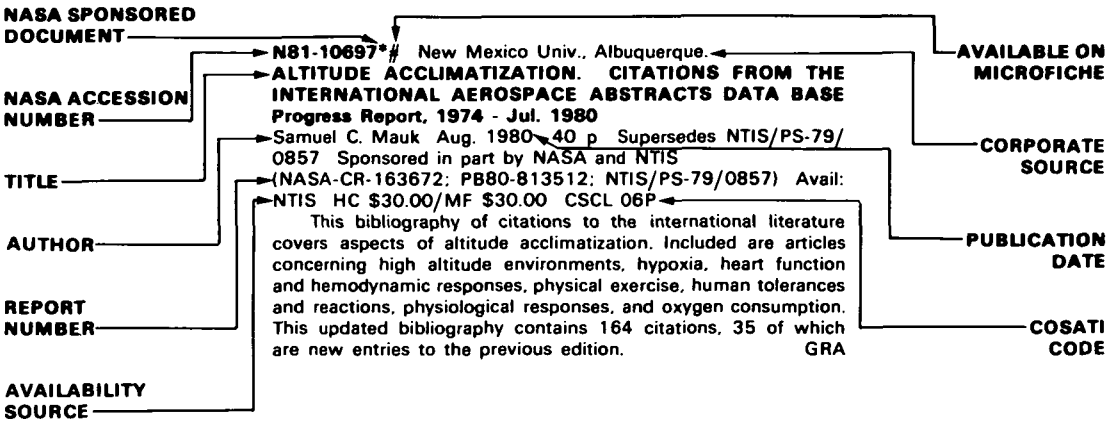

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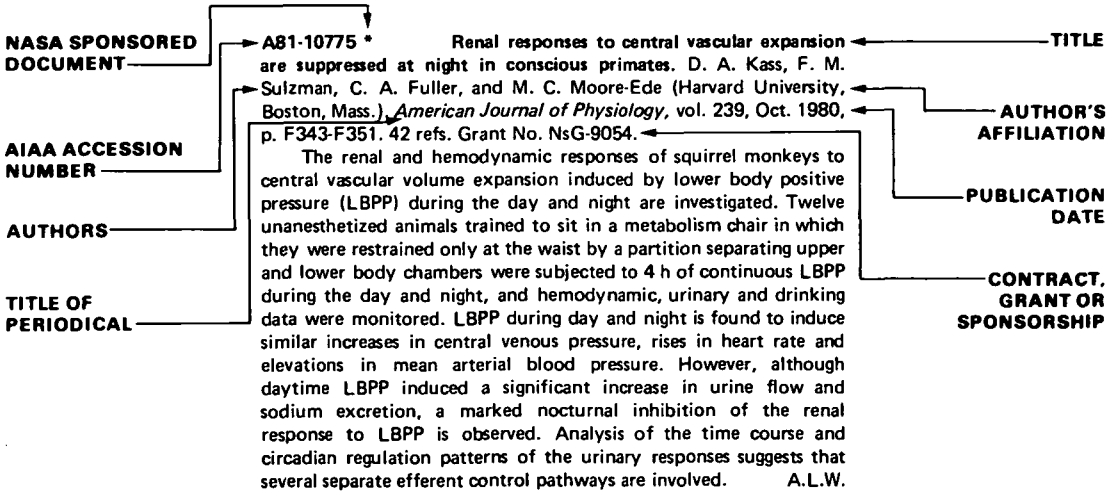

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 222)

AUGUST 1981

IAA ENTRIES

A81-30738 # **Systems analysis of thermoregulation mechanisms in the human organism (Sistemnyi analiz mekhanizmov termoreguliatsii organizma).** G. V. Ryzhikov and G. K. Rakov (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR). *Fiziologiia Cheloveka,* vol. 7, Mar.-Apr. 1981, p. 251-258. 16 refs. In Russian.

A systems analysis is presented of human thermoregulatory mechanisms during actual work under winter conditions in the Arctic. The analysis was conducted by applying methods of variational statistics to indicators of thermoregulation, cardiovascular function, and central nervous system function measured before work, in the middle of the shift and following work under weather conditions of the first (down to -25 C), third (down to -45 C) and fourth (less than -45 C) degrees of severity. The measurements demonstrate the characteristics of the dependence of thermoregulatory reactions on the degree of external cooling. Systems analysis of the factors involved in cold adaptation reveals hemodynamics to play a major role in thermoregulation, allowing the warming of peripheral tissues and protection against freezing. Large heat losses are found to be facilitated by the decoupling of oxidation and phosphorylation. A.L.W.

A81-30739 # **Changes in pressure within thigh and foot vessels during postural activity (Izmeneniia davleniia v sosudakh bedra i stopy pri postural'nykh vozdeistviiakh).** V. E. Katkov, V. V. Chestukhin, A. A. Petrov, and V. M. Mikhailov. *Fiziologiia Cheloveka,* vol. 7, Mar.-Apr. 1981, p. 259-263. 14 refs. In Russian.

The effects of postural changes on vascular pressures in the thigh and foot as well as the oxygenation and acid-base balance of the blood leaving these areas are investigated. Femoral arteries and veins were catheterized and arteries and veins in the top surface of the opposite foot were punctured to obtain blood pressure and composition measurements in subjects lying on a rotating table in the horizontal position and at head-up and head-down tilts of 10, 30 and 75 deg. In the orthostatic position, increases in the absolute values of arterial pressure are found to exceed those of the corresponding veins, and to be close to calculated values. In the antiorthostatic position, the absolute value of arterial pressure is observed to decrease more than venous pressure, with both arterial and venous pressures in the top of the foot approaching zero at inclinations of 75 deg. The arterio-venous difference in oxygen concentration in the lower extremities is observed to increase with inclination angle in the orthostatic position, while acid-base balance indicators remain constant, indicating the satisfaction of tissue oxygen demands. A.L.W.

A81-30740 # **The effects of different levels of motor activity on sweat electrolyte composition (Vliianie razlichnykh urovnei dvigatel'noi aktivnosti na elektrolitnyi sostav pota).** G. I. Kozyrevskaia and N. N. Moskovkina. *Fiziologiia Cheloveka,* vol. 7, Mar.-Apr. 1981, p. 264-268. 6 refs. In Russian.

The quantities and electrolyte compositions of sweat produced by healthy humans during normal daily activities (caloric expenditure 2800-3000 kcal/day), physical training of various intensities, and antiorthostatic hypokinesia during bed rest at a head-down tilt of 4 deg for 182 days are investigated. Although a large scatter is found, mean values of electrolytes excreted through a standard area of the skin during normal activity amounting to 4 meq sodium, 3 meq potassium, 2 meq calcium and 0.4 meq magnesium are obtained. Physical training at levels of 560 and 160 kcal/day is observed to lead to increased sweat production and changes in the electrolyte composition of the sweat, with losses of up to 48 meq Na in certain individuals exercising at 560 kcal. Following the first three days of hypokinesia, sweat production is found to be similar to that observed during normal activities, however, after 99-101 days a slight decline in skin electrolyte excretion is noted which is restored upon the resumption of normal activities. A.L.W.

A81-30741 # **Types of cardiorespiratory responses produced during acute hypoxia (O tipakh formirovaniia kardiorespiratornykh reaktsii pri ostroi gipoksii).** V. P. Krotov, E. A. Kovalenko, G. Timann, Iu. N. Kasatkin, T. M. Mikerova, and V. F. Smirnov. *Fiziologiia Cheloveka,* vol. 7, Mar.-Apr. 1981, p. 269-276. 14 refs. In Russian.

Changes in human hemodynamics, left ventricular contractility and oxygen regime during exposure to acute hypoxia are investigated. Indicators of central hemodynamics and myocardial contractility were monitored by radioisotope methods while subjects breathed a gas mixture containing 11% oxygen before and after a 10-day period of daily exposures to simulated altitudes of 5000 and 6500 m. Two types of immediate response to acute hypoxia corresponding to altitudes of approximately 5000 m are observed: a predominantly cardiac response characterized by increases in cardiac and systolic indexes, finite diastolic volume and a decrease in general vascular tonus, and a predominantly vascular response characterized by decreased cardiac and systolic indexes, finite diastolic volume and muscular and cutaneous blood flow and increased peripheral resistance. The extent of the response is observed to be less marked following hypoxia training, however the two types are maintained. It is noted that individuals exhibiting the vascular response appear to be more tolerant to sharply rarefied gas mixtures. A.L.W.

A81-30742 # **Hypoventilatory training as a means of increasing reserve time in pure-nitrogen breathing (Gipoventiliatornaia trenirovka kak sredstvo uvelicheniia 'rezervnogo vremeni' pri dykhanii chistym azotom).** A. Iu. Katkov and E. A. Kovalenko. *Fiziologiia Cheloveka,* vol. 7, Mar.-Apr. 1981, p. 283-288. 9 refs. In Russian.

The use of voluntary hypoventilation as a means of prolonging the reserve time or time of useful consciousness following the initiation of pure-nitrogen breathing, which is used to simulate breathing conditions encountered following the decompression of high-altitude aircraft or spacecraft cabins, is investigated. Nitrogen breathing tolerance times as well as respiratory and circulatory

parameters were determined in control subjects normally and slowly breathing pure nitrogen, and in experimental subjects breathing nitrogen normally and slowly both before and after a 10-day period of hypoventilatory training on pure nitrogen. Training is found to increase reserve times from about 70 sec to 140-160 sec, an effect primarily due to the elevation of the sensitivity threshold of the breathing center to hypoxic and hypercapnic stimuli which allows oxygen losses to be slowed. Hypoventilation during nitrogen breathing is also found to be accompanied by a marked decrease in skin oxygen tension relative to normal breathing under these conditions, which is attributed to increased blood flow to the brain and heart at the expense of peripheral regions. A.L.W.

A81-30743 # **Training of pattern recognition by central and peripheral vision (Treninovka opoznaniia izobrazhenii tsentral'nym i perifericheskim zreniem).** V. M. Kamenkovich (Akademiia Nauk SSSR, Institut Vysshei Nervnoi Deiatel'nosti i Neirofiziologii, Moscow, USSR). *Fiziologiia Cheloveka,* vol. 7, Mar.-Apr. 1981, p. 324-328. 13 refs. In Russian.

Tests were conducted on nine adult subjects with normal vision to determine the effect of training on the threshold time of recognition of eight line-orientations. It is shown that there is no marked monotonic spatial gradient of training with respect to the field of vision in the radial direction in the case of local recognition training in the peripheral part of the field of vision. Furthermore, this local training produces a reciprocal deterioration in the center of the field of vision and in the symmetric point of the other half of the field of vision. It is suggested that the localness of training effects is associated with the restructuring of the properties of cortical elements of relatively low functional level. A.L.W.

A81-30744 # **Regulation of the tracking movements of the eyes under various conditions of visual perception (Reguliatsiia proslezhivaiushchikh dvizhenii glaz pri razlichnykh usloviiakh zritel'nogo vospriiatiia).** E. V. Shtil'man (Moskovskii Gosudarstvennyi Pedagogicheskii Institut, Moscow, USSR). *Fiziologiia Cheloveka,* vol. 7, Mar.-Apr. 1981, p. 329-336. 17 refs. In Russian.

Automatic control theory is used to study the dependence of eye tracking movements on the localization of moving stimuli in the field of vision, and on the contrast and adaptation level of these stimuli. It is suggested that the speed of the movements depends on the speed of the stimuli on the retina and on the time lag of the system. The magnitude of the time lag depends on the afferent character of the visual perception and increases with decreasing stimulus contrast and with decreasing sensitivity of receptor fields to the speed and brightness of the stimulus. The speed of the tracking movements decreases as the time lag increases. A.L.W.

A81-30745 # **Sequential color images in the case of physical work in a hot environment (Posledovatel'nye tsvetovye obrazy pri fizicheskoi rabote v zharkoi srede).** A. T. Mar'ianovich (Voenno-Meditsinskaia Akademiia, Leningrad, USSR). *Fiziologiia Cheloveka,* vol. 7, Mar.-Apr. 1981, p. 337-340. In Russian.

Seven healthy subjects were tested by a method of sequential image recognition in order to study the dynamics of the central nervous system under conditions of heat adaptation and physical work. It is shown that light physical work in a hot environment leads to a certain reduction in the number and duration of sequential images. The discrete effect (3 times of 20 min each) of an environment of 60 C has a more marked effect than the continuous two-hour effect of an environment of 49 C. These effects are explained by the heightened tonus of the central nervous system. B.J.

A81-30746 # **Optimization of decompression on the basis of chest impedance (Optimizatsiia rezhima dekompressii po impedansu grudnoi kletki).** A. A. Shurubura, V. A. Grinevich, and V. I. Timofeev (Leningradskii Elektrotekhnicheskii Institut, Leningrad, USSR). *Fiziologiia Cheloveka,* vol. 7, Mar.-Apr. 1981, p. 363-367. 12 refs. In Russian.

Measurements of the electrical impedance of the human chest were made during simulations of underwater descent and ascent in a chamber at pressures of 0.12-2.3 MPa. These data clarified the formation and dynamics of gas bubbles under decompression and were used in experiments on the optimization of decompression conditions on the basis of chest impedance. Neural-reflex and neurohumoral mechanisms for the elimination of gas bubbles from the blood circulation under decompression are examined. B.J.

A81-30788 # **Elevation of the tolerance of the organism to high environmental temperatures /Review of the literature/ (Povyshenie ustoichivosti organizma k vozdeistviiu vysokoi temperatury okruzhaiushchei sredy /Obzor literatury/).** G. N. Novozhilov. *Voenno-Meditsinskii Zhurnal,* Feb. 1981, p. 39-42. 25 refs. In Russian.

A81-30789 # **The effects of controlled levels of physical loads on exchange processes under conditions of elevated atmospheric carbon dioxide content (Vliianie dozirovannoi fizicheskoi nagruzki na obmennye protsessy pri povyshennom soderzhanii uglekislogo gaza v vozdukhe).** V. G. Altukhov, L. A. Morozov, V. L. Makarov, and V. N. Nosov. *Voenno-Meditsinskii Zhurnal,* Feb. 1981, p. 43-46. 12 refs. In Russian.

The effects of controlled levels of prolonged submaximal physical loads on intracellular bioenergetic processes under conditions of elevated CO2 content are investigated. Six subjects without previous athletic training performed bicycle ergometer and treadmill exercise at levels and durations determined in accordance with subject physical preparation for periods of 30 min five days a week over the course of three months while breathing air mixtures containing 0.3-0.5% CO2 during the first two months, and 0.8% CO2 during the third month. Evaluations of subject physical work capacity and maximal oxygen intake, as well as erythrocyte numbers, hemoglobin contents, and glycolytic enzyme activities reveals that submaximal exercise under hypercapnic conditions does not affect the regulatory mechanisms of intracellular energy metabolism, although an intensification of glycolysis and a decreased correlation between erythrocyte morphological and glycolytic indicators are observed by the 90th day of the experiment. Exposure at levels of 0.5% CO2 is found to increase the adaptive capacity of bioenergetic processes, while levels of 0.8% lead to increased work capacities during the first three weeks of exposure, which then decline. A.L.W.

A81-30790 # **The use of an information model of the aircraft instrument panel for the determination of pilot preparedness levels (Ispol'zovanie informatsionnoi modeli pribornoi doski samoleta dlia opredeleniia urovnia podgotovlennosti letchika).** V. V. Kniga. *Voenno-Meditsinskii Zhurnal,* Feb. 1981, p. 47, 48. 10 refs. In Russian.

The possibility of using a second-signal information model of the aircraft instrument panel in the evaluation of pilot preparedness for flight is evaluated. A total of 60 pilots of varying levels of ability was asked to calculate aircraft position in space and relative to flight stage on the basis of information perceived in slide representations of aircraft instrument displays. A direct dependence is found between the quality of the analysis and synthesis of instrumental information and levels of pilot preparedness as indicated by pilot class. Changes observed in cardiovascular and respiratory parameters during the tests demonstrate that the second-signal information model provides an adequate simulation of actual flight conditions. Results are concluded to demonstrate the usefulness of the present method as a supplementary indicator of pilot preparedness. A.L.W.

A81-30925 **Effects of geometrical uncertainties on electrocardiography.** J. Choi (Florida Institute of Technology, Melbourne, Fla.) and T. C. Pilkington (Duke University, Durham, N.C.). *IEEE Transactions on Biomedical Engineering,* vol. BME-28, Apr. 1981, p. 325-334. 26 refs. Grants No. NIH-HL-11307; No. NIH-HL-07063.

The effects of uncertainties in geometrical coordinates on calculated torso and epicardial potentials obtained in electrocardiography are evaluated, and the feasibility of using estimation techniques in the minimization of geometrical uncertainty effects is

considered. The epicardial potential and multipole models of electrocardiography are developed, and formulation procedures are presented for geometrical uncertainty processors based on the epicardium and spherical epicardium epicardial potential models, and the multipole models based on torso position and origin uncertainties. Monte Carlo simulations indicate that an uncertainty in geometrical position of + or - 0.13 causes a 19% rms residual in calculated torso potentials in the spherical epicardium representation and a 40% rms residual in the multipole representation, corresponding to an uncertainty of 0.5 to 1 cm in a human. The position uncertainty processors are observed to lead to improved torso potentials, although only on the order of 5-10%. A.L.W.

A81-30962 The role of human visual models in image processing. D. J. Granrath (Science Applications, Inc., Tucson, Ariz.). *IEEE, Proceedings,* vol. 69, May 1981, p. 552-561. 60 refs.

The mechanisms are discussed by which the human eye forms a neural image of the outside world for transmission along the optic nerve. Mathematical models of these mechanisms which can be exploited for engineering purposes are presented and their usefulness and limitations are discussed. Three areas in which human vision models have been successfully applied are image bandwidth compression, image quality assessment, and image enhancement; results from these areas are summarized and some example results are given. Some future directions are suggested. (Author)

A81-30964 * Computational vision. H. G. Barrow and J. M. Tenenbaum (SRI International, Menlo Park, Calif.). *IEEE, Proceedings,* vol. 69, May 1981, p. 572-595. 57 refs. NSF-DARPA-NASA-supported research.

The range of fundamental computational principles underlying human vision that equally apply to artificial and natural systems is surveyed. There emerges from research a view of the structuring of vision systems as a sequence of levels of representation, with the initial levels being primarily iconic (edges, regions, gradients) and the highest symbolic (surfaces, objects, scenes). Intermediate levels are constrained by information made available by preceding levels and information required by subsequent levels. In particular, it appears that physical and three-dimensional surface characteristics provide a critical transition from iconic to symbolic representations. A plausible vision system design incorporating these principles is outlined, and its key computational processes are elaborated. O.C.

A81-31165 Measurements of the RF power absorption in spheroidal human and animal phantoms exposed to the near field of a dipole source. M. F. Iskander, H. Massoudi, C. H. Durney (Utah, University, Salt Lake City, Utah), and S. J. Allen (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *IEEE Transactions on Biomedical Engineering,* vol. BME-28, Mar. 1981, p. 258-264. 14 refs.

A81-31166 A method to estimate volume and surface area of organ by two-dimensional echocardiography. Y. Watanabe, Y. Nose, S. Sanefuji, M. Yokota, and M. Nakamura (Kyushu University Hospital, Fukuoka, Japan). *IEEE Transactions on Biomedical Engineering,* vol. BME-28, Mar. 1981, p. 294-297. 9 refs.

Two-dimensional echocardiography has recently facilitated production of cardiac sectional images. This paper describes a method to estimate volumes and surface areas of various cardiac regions from their oblique sectional images. Cardiac oblique sectional images are recorded with a sector scanner probe which is tilted gradually on an intercostal point. The contour of a particular region on the recorded image is traced manually to put into a computer. The computer calculates the volume and the surface area using a triangular pyramid as the fundamental segment. The accuracy on this calculation method was evaluated by two types of phantoms constructed in the computer. The method is applicable to determine the volume and the surface area not only of the heart, but also of other organs even though they have indents or protrusions on the surface. (Author)

A81-31167 Dielectric behavior of selected animal tissues in vitro at frequencies from 2 to 4 GHz. M. M. Brady, S. A. Symons, and S. S. Stuchly (Ottawa, University, Ottawa, Canada). *IEEE Transactions on Biomedical Engineering,* vol. BME-28, Mar. 1981, p. 305-307. 7 refs.

The permittivities of bovine muscle (artery, kidney, and liver) are measured at 37 deg C in vitro at 2.0, 3.0, and 4.0 GHz, using a coaxial-line reflection technique and an automatic network analyzer. Uncertainties, evaluated by measurements on organic alcohols whose permittivities are well known, are consistently less than + or - 10 percent. The data compare well with those published for similar animal tissues. (Author)

A81-31289 Time on task effect on tracking performance under heat stress. M. Y. Beshir, A. S. El-Sabagh (Ain Shams University, Cairo, Egypt), and M. A. El-Nawawi (Al-Azar University, Cairo, Egypt). *Ergonomics,* vol. 24, Feb. 1981, p. 95-102. 14 refs.

The relationship of time on task to ambient temperature and work/rest ratios was investigated for a compensatory one-dimensional vertical tracking task. It was found that as the time on task increased, tracking performance decreased. The detrimental effect on tracking performance appeared to be greater in hot environments with the tracking error score doubled when ambient temperature was raised from 20 to 26 C. No significant effect on tracking performance was produced by changing the work/rest ratio. L.S.

A81-31290 Stereotypes for direction-of-movements of rotary controls associated with linear displays - The effects of scale presence and position, of pointer direction, and distances between the control and the display. H. Petropoulos and J. Brebner (Adelaide, University, Adelaide, Australia). *Ergonomics,* vol. 24, Feb. 1981, p. 143-151. 12 refs.

A81-31300 Robots leap into the space age. P. Marsh. *New Scientist,* vol. 90, Apr. 23, 1981, p. 234-236.

One of the major goals of NASA's computer science research is the development of an intelligent robot, which could be placed onboard a spacecraft by 1986. Research will include the application of computer intelligence to sequencing problems, automation of the command-and-control procedures on the ground, pure research on artificial intelligence, spacecraft design using artificial intelligence techniques, the design of observation satellites that screen out unwanted data, and new transportation systems that use remote-controlled arms. Soviet and ESA activities in this area are also discussed. The future tasks of space robots could include the servicing of orbiting space stations and the fabrication of materials in space. K.S.

A81-31522 Microprocessor-based real time system for eye motion analysis. O. M. Abdel Gadir and D. J. Quarmby (Loughborough University of Technology, Loughborough, Leics., England). *Electronics Letters,* vol. 17, Mar. 5, 1981, p. 196, 197. 5 refs.

A microprocessor-based real time video analysis system has been built and used in conjunction with an oculometer to perform some aspects of eye motion analysis. An outstanding feature of this system is its ability to process data in real time so that information concerning instantaneous eye point of regard is readily available for direct observation. (Author)

A81-31541 The selection of air traffic control specialists - History and review of contributions by the Civil Aeromedical Institute, 1960-80. W. E. Collins, J. O. Boone, and A. D. VanDeventer (FAA, Aviation Psychology Laboratory, Oklahoma City, Okla.). *Aviation, Space, and Environmental Medicine,* vol. 52, Apr. 1981, p. 217-240. 52 refs.

Research conducted by the FAA Civil Aeromedical Institute from 1960-1980 concerning proper standards for the selection of personnel for air traffic controller training is reviewed. Results are presented for a series of evaluations of the effectiveness of various aptitude tests in predicting subsequent trainee performance which have lead to the establishment of revised air traffic controller selection standards by the Civil Service Commission. Research on

various factors related to the screening and selection of controller trainees is then examined, with attention given to follow-up attrition studies of aptitude test predictions, and the influences of age, previous aviation experience, post-high school education, sex, and past military training on training and job performance. Efforts in the development of alternative screening measures which test applicant visual-spatial abilities and simultaneous multiple task performance are summarized, and implications of the adoption of the Uniform Guidelines on Employee selection for the validation of FAA air traffic controller selection procedures are discussed. A.L.W.

A81-31542 Human error in the seventies - Reviewed and projected through the eighties. A. F. Zeller (USAF, Life Sciences Div., Norton AFB, Calif.). *Aviation, Space, and Environmental Medicine*, vol. 52, Apr. 1981, p. 241-246. 11 refs.

The record of the USAF with regard to aircraft accidents in the 1970s is examined, and areas where improvements or increasing problems may be expected in the 1980s are indicated. The trends in accident rates observed during the 1970s are shown to indicate a decrease in safety improvement, suggesting that a minimum has been reached so that, unless additional effort is exerted, an actual increase in accident rates may occur. Increases in in-flight accidents over landing accidents are also noted, which are attributed for the most part to the operational crew. Although the downward trend in accidents was reflected in both aircraft destroyed and fatalities, it is pointed out that the proportion of major mishaps resulting in a fatality has increased and is expected to increase further. Data also indicate that, unless crewmen in ejection-seat-equipped aircraft improve their perceptive and decision-making abilities, the proportion of success in airborne escape may decrease even further from its peak in the mid-1980s. Factors remaining sources of concern for the 1980s include collisions of Air Force aircraft with other aircraft, particularly civilian, and the increasing involvement of women in aircraft accidents. A.L.W.

A81-31543 Antihistamine provides sex-specific radiation protection. G. A. Mickley (U.S. Armed Forces Radiobiology Research Institute, Bethesda, Md.; U.S. Air Force Academy, Colorado Springs, Colo.). *Aviation, Space, and Environmental Medicine*, vol. 52, Apr. 1981, p. 247-250. 14 refs.

Rats suffer an early transient performance decrement immediately after a sufficiently large dose of ionizing radiation. However, it has been shown that males experience a more severe incapacitation than females. This sex difference has been attributed to the low estrogen levels in the male. In support of this notion, supplemental estrogens in castrated male rats have produced less-severe performance decrements post-irradiation. Antihistamines have also previously been shown to alleviate radiation's effect on behavior. The present study revealed that antihistamines are only effective in altering the behavioral incapacitation of sexually intact male subjects. This contrasts with previous work which indicates that estrogens can only benefit gonadectomized rats. These findings suggest that different mechanisms may underlie antihistamine and estrogen radiation protection. (Author)

A81-31544 * Effects of antiorthostatic bedrest on the cardiorespiratory responses to exercise. V. A. Convertino, R. Bisson, R. Bates, D. Goldwater, and H. Sandler (NASA, Ames Research Center, Biomedical Research Div., Moffett Field, Calif.). *Aviation, Space, and Environmental Medicine*, vol. 52, Apr. 1981, p. 251-255. 31 refs.

The cardiorespiratory changes in exercise performance induced by horizontal and antiorthostatic bed rest are compared in order to determine the physiological changes occurring in the antiorthostatic position and their degree of similarity to those observed in weightlessness. Systolic and diastolic pressures, heart rates, maximum oxygen uptake, ventilation volume during and following 5 min of submaximal exercise in the supine position and body weight and composition were determined in subjects before and following 7 days of bed rest in the horizontal or 6-deg head-down positions. Bed rest is found to result in a general decrease in exercise tolerance as indicated by cardiorespiratory parameters in both groups, with the 6-deg head-down treatment causing greater cardiovascular deconditioning. When compared with space flight data, the antiorthostatic position is shown to simulate the effects of weightlessness more effectively than horizontal bed rest. A.L.W.

A81-31545 Eight-year follow-up of exercise electrocardiograms in healthy, middle-aged aviators. N. R. MacIntyre, J. R. Kunkler, R. E. Mitchell, A. Oberman, and A. Graybiel (U.S. Naval Aerospace Medical Center, Aerospace Medical Research Laboratory, Pensacola, Fla.). *Aviation, Space, and Environmental Medicine*, vol. 52, Apr. 1981, p. 256-259. 24 refs.

To study the prognostic capabilities of the exercise electrocardiogram (ECG) in a fit, healthy, middle-aged population, 548 members of the U.S. Navy's '1000 Aviator' cohort were exercised to 85% predicted maximum heart rate in 1969 and then followed-up in 1977 for the development of clinically evident coronary artery disease (CAD). Of these subjects, 23 (4.2%) had significant ST depression during their exercise test in 1969. At the end of the 8-year follow-up period, 38 of the 548 subjects (6.9%) had developed clinically evident CAD. The sensitivity (percent of disease predicted by an abnormal test) and predictive value (percent of abnormal tests predictive of disease) of an abnormal exercise test were 15.7% and 26%, respectively. We conclude that even in a carefully screened aviator population with a low risk for CAD, a single normal exercise ECG does not exclude the presence of latent CAD. Furthermore, in this population, a single abnormal exercise ECG should not be a disqualifying defect without further work-up. (Author)

A81-31546 Psychiatric disability of Air Force fliers. J. F. T. Corcoran (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aviation, Space, and Environmental Medicine*, vol. 52, Apr. 1981, p. 260-263. 28 refs.

Case reports of psychiatric disorders in flying personnel tend to be reported in diagnostic clusters. When viewed separately, these reports suggest specific patterns. When looked at collectively, psychiatric disorders in military aviators follow no specific pattern. A 5-year review of psychiatric evaluations done at the USAF School of Aerospace Medicine reveals a wide range of psychiatric diagnoses. Although aviators with psychiatric disabilities are seldom seen, a greater proportion of this group will be grounded compared to other medical referrals. In selected cases, psychiatric treatment is highly successful. In future work, greater emphasis should be given to the identification of life stress events for the purpose of deterrence, in addition to rehabilitation through treatment. (Author)

A81-31652 Solar rotation and activity in the past and their possible influence upon the evolution of life. E. H. Geyer (Bonn, Universität, Sternwarte, Bonn, West Germany). *Moon and the Planets*, vol. 24, June 1981, p. 399-405. 23 refs.

It is proposed that the rotational angular momentum of the lower main sequence stars determines the intensity of their magnetic spot activity. As a consequence of this feedback coupling, stellar rotation and the activity decay exponentially by magnetic braking of the induced stellar flare and wind activity. Therefore, the sun should have rotated much faster and must have shown a very enhanced activity in its early history. This strong solar activity in the past could have had influenced the evolution of terrestrial life, and may explain the stagnation of maritime life for about 2 billion years, the diversification of species during the Cambrian formation, and the land conquest by life in the upper Silurian system. (Author)

A81-31849 # Operator psychophysiology in man-machine systems (Psikhofiziologiia operatora v sistemakh chelovek-mashina). K. A. Ivanov-Muromskii, O. N. Luk'ianova, V. A. Chernomorets, K. V. Liudvichek, V. E. Alekseev, and D. I. Chus'. Kiev, Izdatel'stvo Naukova Dumka, 1980. 344 p. 512 refs. In Russian.

Results of experiments on operator psychophysiology under experimental, simulated and actual production conditions in man-machine systems are presented. Following a discussion of the

psychological nature and various classes of work activity, consideration is given to investigations of individual psychophysiological characteristics and social directedness, evaluation methods for operator activity, and the state of the organism and operator activity in stressful situations. Mathematical and physical models of operator activity and their application are discussed, and means of processing physiological data concerning operator condition obtained by experimental apparatus are considered. A.L.W.

A81-31875 # **The design of two-sided-action servo systems (Proektirovanie slediashchikh sistem dvustorennego deistviia).** I. N. Egorov, B. A. Zhigalov, V. S. Kuleshov, E. I. Kubarev, N. A. Lakota, B. A. Nikanchikov, and B. A. Petrov. Moscow, Izdatel'stvo Mashinostroenie, 1980. 304 p. 85 refs. In Russian.

The work examines the basic design principles of two-sided-action servo systems, viewed as two-dimensional systems of automatic control. Particular attention is given to problems of operational reliability, stability, and correction for such systems. The development of remote manipulator and teleoperator systems on the basis of the concepts described here is discussed. B.J.

A81-32000 **Aviation medicine (Aviatsionnaia meditsina).** Edited by A. N. Babiichuk. Moscow, Izdatel'stvo DOSAAF SSSR, 1980. 248 p. In Russian.

The book treats current problems in aviation medicine relating to the medical security of civil and military auxiliary flight. Following a review of the development of aviation medicine in the USSR, attention is given to the medical aspects of work-rest cycles of flight personnel, the physiological and hygienic characteristics of aircraft cabins, and the role of vision in flight activities. The effects of various factors in the flight environment on human physiology are discussed, including altitude, rarefied atmospheres, acceleration, aircraft noise, and vibration. The basic principles of medical examination in civil aviation are considered, together with medical means of safety assurance in flight schools, parachute jumping, and auxiliary military aviation. Consideration is also given to the search and rescue of flight crews and passengers, aviation toxicology, the medical aspects of aviation chemistry, and the physiological and hygienic principles of oxygen supply systems. A.L.W.

A81-32022 **Energetics of the biosphere.** V. G. Gorshkov and V. R. Dol'nik (Academy of Sciences, Zoological Institute, Leningrad, USSR). *(Uspekhi Fizicheskikh Nauk,* vol. 131, July 1980, p. 441-478.) *Soviet Physics - Uspekhi,* vol. 23, July 1980, p. 386-408. 64 refs. Translation.

It is noted that since photons cannot be stored, plants cannot increase their utilization of photons by moving about. Plants are therefore stationary and the area they utilize coincides with the earth surface area that they cover. It is pointed out that as organisms become larger, their rates of consumption increase and the fraction of the production of vegetation that they consume decreases. This results in a rapid expansion in the area utilized as the size of the animal increases and increases the energy expended on grazing, which limits this increase in size. With regard to humans, it is shown that the high anthropogenic share of the total consumption in the biosphere can be achieved only through the use of nonrenewable energy resources. C.R.

A81-32052 **Generation and amplification of chirality in chemical systems; Proceedings of the Second International Symposium, Universität Bremen, Bremen, West Germany, July 16-18, 1980.** Symposium supported by the Deutsche Forschungsgemeinschaft and Universität Bremen. Edited by W. Thiemann (Bremen, Universität, Bremen, West Germany). *Origins of Life,* vol. 11, Mar.-June 1981. 194 p.

Papers are presented concerning the origin and amplification of the structural asymmetry which gives rise to the optical activity found in biological molecules. Specific topics include mechanisms for the formation of asymmetrical radicals in D- and L-amino acids irradiated with the products of parity nonconserving beta decay, the generation of asymmetric molecules through interactions with physical fields, the amplification of optical activity by crystallization in the presence of additives, and the differential adsorption of amino acid enantiomers by Na-montmorillonite. A.L.W.

A81-32053 **Review of the origin of asymmetry of biomolecules through weak interaction - The latest developments.** L. Keszthelyi (Magyar Tudomanyos Akademia, Biofizikai Intezet, Szeged; Magyar Tudomanyos Akademia, Kozponti Fizikai Kutato Intezet, Budapest, Hungary). *(Deutsche Forschungsgemeinschaft and Universität Bremen, International Symposium on Generation and Amplification of Chirality in Chemical Systems, 2nd, Bremen, West Germany, July 16-18, 1980.) Origins of Life,* vol. 11, Mar.-June 1981, p. 9-21. 44 refs.

Results of recent experimental and theoretical studies concerning the role of parity-nonconserving weak interactions in the origin of the asymmetry of biological molecules are reviewed. Attention is given to investigations of the Vester-Ulbricht process, which involves the electromagnetic interaction of beta particles longitudinally polarized by the weak interaction with biological molecules undergoing synthesis, decomposition or crystallization, and to Yamagata processes, in which the parity-violating weak interaction plays a role in intramolecular interactions, including polymerization and crystallization. The amplification of the small asymmetries produced in such processes is also considered, and it is concluded that it seems improbable that the weak interaction played any role in establishing the nearly complete asymmetry of biological molecules. S.C.S.

A81-32054 **An approach to the mechanism of the asymmetrical radical formation in yttrium-90-beta-irradiated D- and L-alanines.** M. Akaboshi, M. Noda, K. Kawai, H. Maki, Y. Ito, and K. Kawamoto (Kyoto University, Osaka, Japan). *(Deutsche Forschungsgemeinschaft and Universität Bremen, International Symposium on Generation and Amplification of Chirality in Chemical Systems, 2nd, Bremen, West Germany, July 16-18, 1980.) Origins of Life,* vol. 11, Mar.-June 1981, p. 23-29. 9 refs.

An investigation of the mechanisms of asymmetrical radical formation induced by the beta irradiation of D- and L-alanines is presented. Purified samples of polycrystalline D- and L-alanine powders and 1.5-M alanine solutions in H2O and D2O were irradiated at 77 K by Y-90 beta radiation and Co-60 gamma rays, and the resulting radical concentrations were determined by ESR. No difference was found in the relative amounts of radicals formed in the solutions. In the D and L powders, the differential D-alanine radical formation with respect to L-alanine radicals was observed to depend on radiation dosage received, with greater doses leading to a decrease in asymmetry. Comparison of the present results with those of previous investigations reveals that asymmetrical radical formation only occurs under polarized beta ray irradiation of powders at 77 K, indicating that the phenomenon may be brought about by an interaction between the crystal structures of the enantiomers and the polarized radiation. S.C.S.

A81-32055 * **Investigations of electron helicity in optically active molecules using polarized beams of electrons and positrons.** D. W. Gidley, A. Rich, J. C. Van House (Michigan, University, Ann Arbor, Mich.), and P. W. Zitzewitz (Michigan, University, Dearborn, Mich.). *(Deutsche Forschungsgemeinschaft and Universität Bremen, International Symposium on Generation and Amplification of Chirality in Chemical Systems, 2nd, Bremen, West Germany, July 16-18, 1980.) Origins of Life,* vol. 11, Mar.-June 1981, p. 31-36. 14 refs. NASA-NSF-supported research.

A positronium-formation experiment with a high sensitivity to a possible relation between the helicity of beta particles emitted in nuclear beta decay and the optical asymmetry of biological molecules is presented. The experiment is based on a mechanism in which the electrons in optically active molecules possess a helicity of less than 0.001, too weak to detect in radiolysis experiments, the sign of which depends on the chirality of the isomer. A helicity-dependent asymmetry is sought in the formation of the triplet ground state of positronium when a low-energy beam of polarized positrons of reversible helicity interacts with an optically active substance coating

a channel electron multiplier. Asymmetries between positronium decays observed at positive and negative helicities for the same substance can thus be determined with a sensitivity of 0.0001, which represents a factor of 100 improvement over previous positronium experiments. S.C.S.

A81-32056 Beta irradiation may induce stereoselectivity in the crystallization of optical isomers. K. L. Kovacs (Magyar Tudomanyos Akademia, Biofizikai Intezet, Szeged, Hungary). *(Deutsche Forschungsgemeinschaft and Universität Bremen, International Symposium on Generation and Amplification of Chirality in Chemical Systems, 2nd, Bremen, West Germany, July 16-18, 1980.) Origins of Life,* vol. 11, Mar.-June 1981, p. 37-52. 7 refs.

The effects of the symmetry-breaking weak interaction involved in beta decay on the crystallization of racemic mixtures of optically active biological molecules are investigated as a possible mechanism leading to the asymmetry of biological molecules. Weights, optical purities and crystallite size distributions were determined for crystals formed from over 1200 samples of saturated D,L-sodium ammonium tartrate solution irradiated by various doses of P-32 beta radiation. Irradiation is found to lead to a significant dose-dependent increase in both the weight of crystals and numbers of crystallites formed. Analysis of the optical activity of the crystals formed in over 1000 crystallizations reveals that crystallization of the L-isomer is promoted by the effects of beta irradiation in proportion to the dose received. Possible mechanisms of the observed stereoselective mechanism are discussed, including the direct radiolysis of tartrate by spin-polarized primary beta particles, which is found to be unlikely, and the selective formation of enantiomeric crystals in short tracks. S.C.S.

A81-32057 Reflections on the origin of optical asymmetry on earth. T. L. V. Ulbricht (Agricultural Research Council, London, England). *(Deutsche Forschungsgemeinschaft and Universität Bremen, International Symposium on Generation and Amplification of Chirality in Chemical Systems, 2nd, Bremen, West Germany, July 16-18, 1980.) Origins of Life,* vol. 11, Mar.-June 1981, p. 55-70. 63 refs.

Consideration is given to the origins of optical asymmetry on earth, noting the optical configuration of amino acids and sugars. Two effects arising from weak interactions which might create optical asymmetry are identified: the effects of polarized electrons on molecules and the effects of the parity-nonconserving interaction within enantiomeric molecules themselves. The results of earlier studies are assessed. S.C.S.

A81-32058 Chemical geometrodynamics - Physical fields can cause asymmetric synthesis. R. C. Dougherty (Florida State University, Tallahassee, Fla.). *(Deutsche Forschungsgemeinschaft and Universität Bremen, International Symposium on Generation and Amplification of Chirality in Chemical Systems, 2nd, Bremen, West Germany, July 16-18, 1980.) Origins of Life,* vol. 11, Mar.-June 1981, p. 71-84. 13 refs.

It is shown that chiral combinations of physical fields can induce the motion of elementary particles or molecules causing asymmetric synthesis. When parity and time-reversal operators are applied to chiral dynamic systems, the motion of these systems induced by a chiral set of physical fields is not invariant on parity and time reflection. With reference to the moments of inertia of a tetrahedrally dissymmetric rotor rotating around each of four bond axes, the relationship between tetrahedral and helical dissymmetry is analyzed. The magnitude of anticipated enantiomeric excess resulting from prochiral chemical reactions in a chiral set of physical fields is estimated. Attention is given to prochiral chemical reactions in a sealed tube spinning perpendicular or parallel to the earth's surface. It is suggested that enantiomeric recognition may have been an important mechanism for amplifying small differences in the rates of prochiral chemical reactions. S.C.S.

A81-32059 A new idea and experiment related to the possible interaction between magnetic field and stereoselectivity. W. Thiemann and U. Jarzak (Bremen, Universität, Bremen, West Germany). *(Deutsche Forschungsgemeinschaft and Universität Bremen, International Symposium on Generation and Amplification of Chirality in Chemical Systems, 2nd, Bremen, West Germany, July 16-18, 1980.) Origins of Life,* vol. 11, Mar.-June 1981, p. 85-92. 9 refs.

The role of electromagnetism in the generation of chirality during chemical evolution is examined. Results are presented for the application of magnetic circular dichroism (MCD) to the conformational changes of enzymes and other macromolecules as a function of pH, buffer and the addition of other chemicals. Values are presented for the MCD of benzene (0.0045 M) in cyclohexane, naphthalene (.00017 M) in cyclohexane and benzene in cyclohexane (.0045 M) at three characteristic magnetic field strengths. It is found that magnetic fields do induce chirality, and that depending on molecular alignment within the field, one will end up with chiral compounds of the one or the other handedness so long as the field stays switched on. It is also concluded that the induction of chirality is not symmetrical upon the reversal of the magnetic field and that even small field strengths could exert large MCD effects. S.C.S.

A81-32060 Unconsidered sources of chirality in nature. K. L. Kovacs, L. Keszthelyi (Magyar Tudomanyos Akademia, Biofizikai Intezet, Szeged, Hungary), and V. J. Goldanskii (Akademiia Nauk SSSR, Institut Khimicheskoi Fiziki, Moscow, USSR). *(Deutsche Forschungsgemeinschaft and Universität Bremen, International Symposium on Generation and Amplification of Chirality in Chemical Systems, 2nd, Bremen, West Germany, July 16-18, 1980.) Origins of Life,* vol. 11, Mar.-June 1981, p. 93-103. 15 refs.

Two global asymmetries are considered with reference to the sources of chirality in nature: the asymmetry of the earth's rotation and the existence of an atmospheric electric field of +100 V/m. It is found that this field accumulates via three processes: (1) charge separation in clouds, (2) discharge in the form of lightning and (3) the distribution of the residual positive charge in the higher conducting layers. Results are presented for two model systems simulating the effects of the unidirectional rotation of the earth. S.C.S.

A81-32062 * Experiments on the abiotic amplification of optical activity. W. A. Bonner, N. E. Blair, and F. M. Dirbas (Stanford University, Stanford, Calif.). *(Deutsche Forschungsgemeinschaft and Universität Bremen, International Symposium on Generation and Amplification of Chirality in Chemical Systems, 2nd, Bremen, West Germany, July 16-18, 1980.) Origins of Life,* vol. 11, Mar.-June 1981, p. 119-134. 61 refs. Grant No. NGL-05-020-582.

Experiments concerning the physical mechanisms for the abiotic generation and chemical mechanisms for the amplification of optical activity in biological compounds are reviewed. Attention is given to experiments involving the determination of the differential adsorption of racemic amino acids on d- and l-quartz, the asymmetric photolysis of racemic amino acids by circularly polarized light, and the asymmetric radiolysis of solid amino acids by longitudinally polarized electrons, and the enantiomeric enrichments thus obtained are noted. Further experiments on the amplification of the chirality in the polymerization of D, L-amino acid mixtures and the hydrolysis of D-, L-, and D, L-polypeptides are discussed. It is suggested that a repetitive cycle of partial polymerization-hydrolyses may account for the abiotic genesis of optically enriched polypeptides on the primitive earth. S.C.S.

A81-32063 Enantiomer enrichment in early peptides. A. Brack and G. Spach (CNRS, Centre de Biophysique Moléculaire, Orléans, France). *(Deutsche Forschungsgemeinschaft and Universität Bremen, International Symposium on Generation and Amplification of Chirality in Chemical Systems, 2nd, Bremen, West Germany, July 16-18, 1980.) Origins of Life,* vol. 11, Mar.-June 1981, p. 135-142. 6 refs. Centre National de la Recherche Scientifique Contract No. ATP-3820.

Results of experiments on the formation of common protein

structures from mixtures of D and L amino acids and the action of these structures in the enhancement of enantiomeric asymmetry are summarized. The alpha helix arrangement of peptide chains has been found to be able to tolerate amino acid residues of both configurations, although alpha helices with an unequal amount of L and D residues have a favored helical sense. Experiments have also demonstrated that the asymmetry of the alpha helix is capable of promoting the polymerization of one enantiomer in a racemic mixture over the other, at least initially. Beta sheets, on the other hand, which, although less common today, are thought to have appeared before alpha helices, must be built up from the association of chain segments containing at least seven residues of the same chirality; in a nonracemic residue composition, the beta sheet nuclei are predominantly of a single chirality. The beta structure is thus concluded to be more plausible as a template for enantiomeric enrichment processes. S.C.S.

A81-32064 Critical evaluation of mathematical models for the amplification of chirality. C. Fajszi and J. Czege (Magyar Tudomanyos Akademia, Biofizikai Intezet, Szeged, Hungary). *(Deutsche Forschungsgemeinschaft and Universität Bremen, International Symposium on Generation and Amplification of Chirality in Chemical Systems, 2nd, Bremen, West Germany, July 16-18, 1980.) Origins of Life,* vol. 11, Mar.-June 1981, p. 143-162. 36 refs.

The principal types of mathematical models of the origin and amplification of the asymmetry of biological molecules are reviewed, and some new models are proposed. The models are classified by the criteria of reaction system complexity, enantiomer interactions, constraints on growth, role of racemization, underlying physical asymmetry and evolutionary times, with attention given to models treating the formation of enantiomers in a single step, amplification of asymmetry in polymerization, autocatalytic enantiomer formation from a symmetric precursor, and heterochiral interactions (mutual antagonism) under asymmetric initial conditions and physical asymmetries. Possible results of selection between the two competing forms are examined, including the coexistence of the two forms, the selection of any form with a slight advantage, and the selection of one form by chance. It is concluded that no model allows a choice to be made between the two latter processes, although a slight preference is expressed for a causal mechanism. S.C.S.

A81-32065 Conservation of optical purity of amino acids - A principal problem in biochemical and protobiochemical systems. K. Dose (Mainz, Universität, Mainz, West Germany). *(Deutsche Forschungsgemeinschaft and Universität Bremen, International Symposium on Generation and Amplification of Chirality in Chemical Systems, 2nd, Bremen, West Germany, July 16-18, 1980.) Origins of Life,* vol. 11, Mar.-June 1981, p. 165-171. 17 refs.

The problem of the conservation and amplification of optical activity in the naturally racemizing amino acids of prebiochemical and early biochemical systems is discussed. The rates and mechanisms of the racemization of peptide-bound amino acids in aqueous solution are considered, and the nonenzymatic racemization of L-aspartic acid in long-lived human proteins such as those of tooth enamel and the lens of the eye, which occurs at a rate of about 0.1 to 0.14%/year, is discussed. The use of aspartic acid enantiomer ratios in determining fossil temperature histories is then examined. Implications of the slow racemization rate at temperatures less than 30 C of amino acids incorporated into water-insoluable polymers for molecular evolution are considered, and it is pointed out that whenever stereoselectivity evolved, biological systems could only take advantage of it once they were able to destroy selectively or convert the unwanted enantiomers. S.C.S.

A81-32066 Adsorption of amino acid enantiomers by Na-montmorillonite. E. Friebele, A. Shimoyama, C. Ponnamperuma (Maryland, University, College Park, Md.), and P. E. Hare (Maryland, University, College Park, Md.; Carnegie Institution of Washington, Washington, D.C.). *(Deutsche Forschungsgemeinschaft and Universität Bremen, International Symposium on Generation and Amplification of Chirality in Chemical Systems, 2nd, Bremen, West Germany, July 16-18, 1980.) Origins of Life,* vol. 11, Mar.-June 1981, p. 173-184. 12 refs.

The differential adsorption of D- and L-amino acids on Na-montmorillonite clays is investigated as a possible means for the origin of optically active biological compounds. Racemic mixtures of D- and L-alanine, D- and L-alpha butyric acid, D- and L-valine and D- and L-norvaline were incubated with Na-montmorillonite in quantities corresponding to 50% of the cation exchange capacity of the clays at pHs of 3, 7 and 10. Quantities of the amino acids not adsorbed, weakly adsorbed and strongly adsorbed on the clay particles were analyzed by ion exchange chromatography, with full recovery of the amino acids, and gas and liquid chromatography were used to separate and determine relative enantiomer abundances in three fractions. Gas chromatographic analyses reveal 0.5-2.0% excesses of the adsorbed L enantiomer at at least one pH for each of the amino acids, which, however, were not consistently confirmed by liquid chromatography. Results indicate that no large selective adsorption of amino acid isomers occurs on Na-montmorillonite, which thus cannot account for the optical activity observed today. S.C.S.

A81-32151 # Characteristics of the response of the peripheral blood of the rat to vertical whole-body vibration (Osobennosti reaktsii periphericheskoi krovi krys na vozdeistvie obshchei vertikal'noi vibratsii). L. Iu. Burennikova, N. V. Bratus', and B. I. Kogan (Vinnitskii Meditsinskii Institut, Vinnitsa, Ukrainian SSR). *Fiziologicheskii Zhurnal* (Kiev), vol. 27, Mar.-Apr. 1981, p. 197-201. 19 refs. In Russian.

The response of the blood composition of two inbred strains of rats to vertical whole-body vibrations is investigated. Preadolescent male rats of the August and Wistar lines were subjected to 30 min of 50-Hz vibration at an amplitude of 1.25 mm in a stationary vibrostand daily over the course of two months, and blood cell compositions and hemoglobin content determined following the experimental period were compared with those of control rats of the same lines and ages. Measurements reveal interstrain differences in blood compositions in the control rats, as well as increases in erythrocyte and reticulocyte numbers, hemoglobin concentration and color index, decreases in leucocyte, lymphocyte and eosinophil contractions, and an elevation in neutrophil concentrations in the experimental animals relative to their respective controls. Results are noted to be consistent with the manifestations of the general adaptation syndrome, and to differ in degree according to genotype. A.L.W.

A81-32152 # The reaction of rat testes to the repeated combined action of hypercapnia, hypoxia and cooling (Reaktsiia semennikov krys na povtornoe sochetannoe vozdeistvie giperkapnii, gipoksii i okhlazhdeniia). V. I. Bertash, K. K. Surikova, and V. I. Baev (Leningradskii Pediatricheskii Meditsinskii Institut, Leningrad, USSR). *Fiziologicheskii Zhurnal* (Kiev), vol. 27, Mar.-Apr. 1981, p. 207-211. 10 refs. In Russian.

A81-32153 # Skin temperature gradients and heat emission at various ambient temperatures (Temperaturnye gradienty v kozhe i teplootdache pri razlichnoi okruzhaiushchei temperature). N. A. Slepchuk and G. V. Rumiantsev (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR,* vol. 67, Mar. 1981, p. 442-447. 15 refs. In Russian.

Magnitudes of temperature gradients within the skin and heat emission from the skin are determined at ambient temperatures from 15 to 30 C in an investigation of thermoreceptor stimuli. Temperatures at depths of 1.0-1.2 and 2.0-2.5 mm from the surface of skin on the nose, back and abdomen of rabbits were measured at temperatures of 15, 20, 25 and 30 C within a calorimeter. The measured differences in temperature between the skin layers and the

ambient are observed to decrease with increasing temperature, accompanied by a decrease in heat transfer rates. The decreases lie within the limits of thermoreceptor sensitivity, which indicates that the thermoreceptors are capable of monitoring temperature gradients, i.e., heat flux. A.L.W.

A81-32173 Monitoring for one kind of signal in the presence of another - The effects of signal mix on detectability. A. Craig (Sussex, University, Brighton, England). *Human Factors,* vol. 23, Apr. 1981, p. 191-197. 18 refs.

The effects of the presence of a second signal which does not have to be detected on the detection of a primary signal in a sequence of single items presented to an observer are investigated. A total of 96 subjects divided into eight groups was asked to detect one of two signal items presented in sequence with a probability of 0.05 or 0.15 among nondetected signal and/or nonsignal items over the course of an hour. Results indicate that signal detectability is impaired by the presence of another kind of signal, the impairment tending to be greater with low detectability of the signal on its own although not necessarily reflected in the number of correct detections, due to a concomitant increase in response bias. The presence of a second signal, however, is not observed to influence the extent of the within-session decline in detections, and the anticipated overall effect of signal probability on correct detections failed to emerge. Implications of the results for inspection practices are pointed out. A.L.W.

A81-32174 Multiple resources, task-hemispheric integrity, and individual differences in time-sharing. C. D. Wickens, W. Schreiner (Illinois, University, Urbana, Ill.), and S. J. Mountford (Honeywell, Inc., Minneapolis, Minn.). *Human Factors,* vol. 23, Apr. 1981, p. 211-229. 47 refs. Contract No. N00203-78-M-3708.

Individual, task-dependent and hemispheric-related differences in the performance of dual tasks requiring time sharing are investigated. Forty right-handed subjects performed simultaneously two tasks chosen from a set of four comprising a manual tracking test, an auditory short-term memory task, a digit classification task and a visually presented line judgement task, with responses communicated by either hand. The extents of individual differences observed provide little evidence for a transsituational general time-sharing ability, although factorial analysis reveals specific dimensions of individual differences related to visual scanning and the automation of short-term memory. Pronounced task-related differences in dual-task efficiency are found which are influenced by the degree of commonality in input modalities (auditory or visual), stages of processing (perceptual encoding and central processing or response selection and execution), and codes of central processing (spatial (right hemispheric) or verbal (left hemispheric)). Results thus support multiple-capacity models of attentional resources implicit in the advocation of such innovations as auditory warning signals or speech recognition systems, and suggest that efficiency may be improved by the placing of controls so that the hemisphere involved in processing corresponds with the hand used for the response. A.L.W.

A81-32845 Errors in derived kinematic variables determined from a fixed accelerometer configuration. L. S. Lustick and H. G. Williamson (U.S. Naval Aerospace Medical Center, Naval Aerospace Medical Research Laboratory Detachment, New Orleans, La.). In: International Instrumentation Symposium, 26th, Seattle, Wash., May 5-8, 1980, Proceedings. Part 1. Research Triangle Park, N.C., Instrument Society of America, 1980, p. 307-327. 9 refs. Navy-supported research.

A study has been carried out with the objective of evaluating the errors in derived linear and angular kinematic variables consistent with a 3-2-1 accelerometer configuration used in acceleration tests. Accelerometer errors of sensitivity, linearity, and orientation are considered. The performance of the six accelerometer configuration is compared with the least squares solution using three triaxial accelerometers. V.L.

A81-32850 Computer velocity control of a sled used in impact studies. P. R. Juhasz and R. P. Parsons (USAF, Wright-Patterson AFB, Ohio). In: International Instrumentation Symposium, 26th, Seattle, Wash., May 5-8, 1980, Proceedings. Part 1. Research Triangle Park, N.C., Instrument Society of America, 1980, p. 393-404.

The design, development, and implementation efforts are described for a velocity control system intended to prevent exposure of human subjects to unsafe impact velocities and corresponding G forces on a low-G sled-launched deceleration facility used in aerospace medical research. The control system incorporates an active velocity control device capable of deceleration but incapable of acceleration. The use of a PDP-11/34 computer and associated sled-mounted hardware is described along with the control loop system and its significant transfer blocks. Statistical data are presented from sled test runs, and implications of theories used in this project are advanced with respect to future velocity control systems. T.M.

A81-32950 A microprocessor-controlled vestibular examination chair. J. R. Tole, J. G. Yorker, R. L. Renshaw (MIT, Cambridge, Mass.), and W. A. Morrison (Computervision Corp., Bedford, Mass.). *IEEE Transactions on Biomedical Engineering,* vol. BME-28, May 1981, p. 390-396. 9 refs. Grants No. NIH-1-PO1-GM-22392-02; No. NIH-NS-15862-01.

This paper discusses the design, implementation, and performance of a microprocessor-controlled moving chair for vestibular function testing. The device is simple enough to use for routine clinical testing yet has sufficient performance to permit research on advanced clinical vestibular tests. Each test procedure is treated as a module in software (and hardware as necessary), and permits easy revision of protocols. (Author)

A81-33124 *Spatial frequency response and perceived* depth in the time-course of object superiority. M. C. Williams and N. Weisstein (New York, State University, Buffalo, N.Y.). *Vision Research,* vol. 21, no. 5, 1981, p. 631-646. 39 refs. NSF Grant No. BNS-76-02059; Grant No. NIH-R01-EY-03047.

The time-course of object superiority is studied by presenting a context pattern at some delay after a diagonal target line. The resulting metacontrast functions reflect, both in shape and in absolute accuracy levels, the perceived depth of the combined patterns. The changes in absolute accuracy levels may indicate that high spatial frequency channels are sensitive to differences in apparent depth. The changes (or lack thereof) in the shape of the functions may indicate that the low spatial frequency channels are sensitive to these differences as well. Both high and low spatial differences appear sensitive to differences in three-dimensionality. The differences found suggest that the high spatial frequency patterns respond with greater sensitivity and the low spatial frequency channels respond with a faster rise time and latency to more three-dimensional patterns. L.S.

A81-33147 Effects of system display format on performance in a fault location task. J. B. Brooke and K. D. Duncan (University of Wales Institute of Science and Technology, Cardiff, Wales). *Ergonomics,* vol. 24, Mar. 1981, p. 175-189. 16 refs. Social Science Research Council Grant No. HR-6045.

It has been suggested that complexity in fault diagnosis tasks is largely a function of problem complexity and little to do with the perceptual complexity of the format in which the system representation is displayed. An experimental study is reported which shows that a left-to-right diagonal display format improves the speed and diagnostic efficiency with which faults are located. The differences in display format which appear to be most beneficial do not affect problem-solving complexity in any obvious way. Differences in display format which could affect problem-solving complexity, such as constraints on direction of signal flow, do not apparently affect fault diagnosis performance. The improvements in performance apparently stem from an increased ability to perceive components of the system relevant to the observed symptoms. (Author)

A81-33324 * Usefulness of stochastic analysis of body weight as a tool in experimental aging research. A. C. Economos (Louvain, Université Catholique, Louvain-la-Neuve, Belgium) and J. Miquel (NASA, Ames Research Center, Moffett Field, Calif.). *Experimental Aging Research,* vol. 6, no. 5, 1980, p. 417-430.

A81-33325 * The effects of cognitive and behavioral control on post-stress performance. H. C. Foushee (NASA, Ames Research Center, Moffett Field, Calif.), M. H. Davis (Texas, University, Austin, Tex.), W. G. Stephan (New Mexico State University, Las Cruces, N. Mex.), and W. M. Bernstein. *Journal of Human Stress,* June 1980. 8 p. 22 refs.

A study was designed to investigate the effects of behavioral and cognitive control on post-stress performance. Half of the subjects exposed to loud unpredictable noise bursts were given 'behavioral' control (a button which would terminate the noise), while the other half had no behavioral control. In addition, subjects were provided with one of three levels of feedback (success, failure, or no feedback) regarding their performance during the noise. It was expected that information about performance would provide subjects with an increased sense of 'cognitive' control which would affect their appraisal of stressful events and their later performance. The results indicated that subjects given feedback performed better on subsequent tasks than those given no feedback. Perceived behavioral control had little effect on performance. The causal attributions made by subjects were used to interpret these effects. These findings were viewed as supportive of Averill's (1973) notion that various types of control are related to stress in a complex fashion. The data may also support the reformulation by Abramson et al. (1978) of learned helplessness theory. (Author)

A81-33721 Industrial design in space. D. Dooling. *Spaceflight,* vol. 23, June 1981, p. 169-171.

Direct and indirect influences of the industrial designer, Raymond Loewy, on NASA and on the interior design of the Skylab, begun in 1967, are reported, with specific references to the personal hygiene area, the kitchen, the need for a window, the food trays, the colors inside the space station, and the sleep stations. Loewy's habitability studies will continue to be felt during the Space Shuttle program. K.S.

A81-33726 Diaphragmatic and genioglossal electromyogram responses to CO2 rebreathing in humans. E. Onal, M. Lopata, and T. D. O'Connor (Illinois, University, Hospital; U.S. Veterans Administration West Side Medical Center, Chicago, Ill.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 50, May 1981, p. 1052-1055. 21 refs. Research supported by the American Lung Association.

The responses of diaphragm and genioglossus muscle neural drives during CO2 rebreathing are investigated in order to assess the relationship between the control of respiratory and upper airway muscles in normal awake humans. Simultaneously recorded diaphragmatic and genioglossal electromyogram responses to CO2 rebreathing were compared in five normal supine volunteers; airflow and end-tidal CO2 pressure were also determined to quantify the onset of inspiratory activity and inspiratory times. In all subjects, both diaphragmatic and genioglossal electromyograms are observed to increase linearly with increasing alveolar CO2 pressure, resulting in a significantly linear electromyograph relationship. The CO2 response slopes of both EMGs were similar and linearly and directly related. Although the onset times and patterns of the EMGs are found to differ, their inspiratory durations are similar. It is concluded that both genioglossus muscle and the diaphragm share similar control mechanics, and that the control of upper airway function may be closely related to the regulation of breathing. A.L.W.

A81-33727 Competitive inhibition of carbon monoxide transport - Evidence against a carrier. D. Z. Rubin, D. Fujino, C. Mittman, and S. M. Lewis (Southern California, University, Los Angeles; City of Hope Medical Center, Duarte, Calif.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 50, May 1981, p. 1061-1064. 18 refs. Grants No. NIH-GM-07139; No. NIH-HL-21990; No. NIH-HL-22976.

The existence of a saturable carrier of CO facilitating transfer across the alveolar membrane could influence interpretations of studies involving kinetics of CO uptake and washout, which are based on the assumption that total pulmonary diffusing capacity is constant. The present paper reports an investigation of the presence of this carrier carried out by means of competitive inhibition studies. Pulmonary diffusion capacities for labeled C(O-18) in concentrations of 60 and 130 ppm were measured in 14 normal adult subjects breathing gas mixtures containing 0, 600 and 2000 ppm unlabeled CO in addition to the C(O-18). No significant differences in C(O-18) pulmonary diffusing capacity are observed at different CO concentrations, indicating the absence of competitive inhibition of facilitated labeled CO transport by unlabeled CO. A.L.W.

A81-33772 # Soviet literature in aviation, space and high-altitude biology and medicine. /Bibliography. Number 3/ (Otechestvennaia literatura po aviatsionnoi kosmicheskoi i vysokogornoi biologii i meditsine. /Bibliografiia. Number 3/). A. A. Sergeev. Leningrad, Izdatel'stvo Nauka, 1980. 160 p. 3,894 refs. In Russian.

The book presents a compilation of 3894 works in the fields of aviation, space and high-altitude biology and medicine published in the Soviet Union from 1972 through 1976, as well as certain works, primarily dissertations, from the 1960s not appearing in the previous two bibliographies. Specific areas considered include hypoxia and altitude adaptation, biological rhythms in pilots and cosmonauts, the helicopter environment, vibration, motion sickness, in-flight emergencies, nutrition, pilot and cosmonaut selection, hygiene, hypokinesis, hypoxia, decompression sickness, the effects of lowered atmospheric pressures, weightlessness, operator activity, pharmacology, psychology and psychophysiology, radiobiology, thermoregulation, acceleration loads, and the vestibular apparatus. A.L.W.

A81-33775 # Supervisory control of manipulators (Supervizornoe upravlenie manipuliatsionnymi robotami). F. M. Kulakov. Moscow, Izdatel'stvo Nauka, 1980. 448 p. 146 refs. In Russian.

The problem of industrial robot control is examined with particular reference to the supervisory control concept whereby man is responsible only for such control functions that he can so far perform better than the computer. Consideration is given to the synthesis of new functional systems such as systems of decision making, man-machine interaction, and information and control. Organization of the computation process is also discussed. V.L.

A81-33797 * Enhancement of peptide bond formation by polyribonucleotides on clay surfaces in fluctuating environments. D. H. White and J. C. Erickson (Santa Clara, University, Santa Clara, Calif.). *Journal of Molecular Evolution,* vol. 17, Mar. 1981, p. 19-26. 33 refs. Research supported by the Research Corp.; Grant No. NCA2-OR-685-806.

The selective effects of polyribonucleotides on the formation of glycine peptide bonds in glycine on clay surfaces are investigated as a model for a template mechanism for the effects of polynucleotides on peptide bond formation. Free oligoglycine yields were determined for the cycling reaction of glycine in the presence and absence of clay and polyribonucleotides or polydeoxyribonucleotides. The polyribonucleotides are observed to lead to increases of up to fourfold increases in oligoglycine formed, with greater enhancements for poly-G nucleotides than for poly-A, poly-U and poly-C, indicating a codonic bias. Polydeoxyribonucleotides are found to provide no enhancement in peptide formation rates, and yields were also greatly reduced in the absence of clay. A mechanism for peptide synthesis is proposed which involves the activation of glycine on the clay surface, followed by the formation of esters between glycine and the 2-prime OH groups of the polyribonucleotide and peptide bonds between adjacent amino acyl esters. It is pointed out that if this mechanism is correct, it may provide a basis for a direct template translation process, which would produce a singlet genetic code. A.L.W.

A81-33798 * Quantification of monocarboxylic acids from a spark discharge synthesis. G. U. Yuen, J. G. Lawless (Arizona State University, Tempe, Ariz.), and E. H. Edelson (NASA, Ames Research Center, Moffett Field, Calif.). *Journal of Molecular Evolution,* vol. 17, Mar. 1981, p. 43-47. 12 refs. Grant No. NsG-7255.

A suite of sixteen monocarboxylic acids having carbon numbers 2 to 7, formed by the Miller-Urey spark discharge process, was identified and quantified by gas chromatography and mass fragmentography using a deuterium spiking technique. The molar concentration and isomeric distribution of these laboratory synthesized monocarboxylic acids are compared to those previously reported for the Murchison meteorite. They show similar trends, namely, decreasing molar concentration with increasing molecular weight, and a ratio of normal/branched isomers tending toward smaller values with increasing carbon numbers. (Author)

A81-33799 Oligoadenylates formation on an oligouridylate template in the presence of a lead catalyst. H. Sawai (Tokyo, University, Tokyo, Japan). *Journal of Molecular Evolution,* vol. 17, Mar. 1981, p. 48-51. 10 refs.

The condensation of adenosine-5-prime-phorphorimidazolide (ImpA) to form oligoadenylates in the presence of various oligouridylate templates and Pb(+2) ion catalysts is investigated. Reaction mixtures containing 0.05 M oligo-U (four to 12 units), 0.025 M (8-(C-14))-ImpA, 0.2 M NaNO3, 0.075 M Mg(NO3)2, 0.0125 M Pb(NO3)2 and 0.2 M imidazole-HNO3 buffer were maintained at 0 C for four and 16 days, and the reaction products were identified by cochromatography with authentic markers. Oligouridylates with chain lengths greater than eight are found to promote the formation of higher oligoadenylates with five or more units, although the yield of diadenylate was low compared to that of a control reaction in the absence of oligourdidylates. Shorter oligouridylates tended to decrease the total yield of oligoadenylates, due to the formation of heterooligonucleotides. In the diadenylates formed in the reaction, the 2-prime-5-prime internucleotide linkage is found to predominate when shorter oligouridylates are used, with higher oligouridylates resulting in a greater proportion of the 3-prime-5-prime linkage. Results suggest that the minimum chain length required for the template in polynucleotide formation could be as short as eight for nonenzymatic replication. A.L.W.

A81-33800 * The nucleotide sequence of Beneckea harveyi 55 rRNA. K. R. Luehrsen and G. E. Fox (Houston, University, Houston, Tex.). *Journal of Molecular Evolution,* vol. 17, Mar. 1981, p. 52-55. 20 refs. Grant No. NsG-7440.

The primary sequence of the 5S ribosomal RNA isolated from the free-living bioluminescent marine bacterium Beneckea harveyi is reported and discussed in regard to indications of phylogenetic relationships with the bacteria Escherichia coli and Photobacterium phosphoreum. Sequences were determined for oligonucleotide products generated by digestion with ribonuclease T1, pancreatic ribonuclease and ribonuclease T2. The presence of heterogeneity is indicated for two sites. The B. harveyi sequence can be arranged into the same four helix secondary structures as E. coli and other prokaryotic 5S rRNAs. Examination of the 5S-RNS sequences of the three bacteria indicates that B. harveyi and P. phosphoreum are specifically related and share a common ancestor which diverged from an ancestor of E. coli at a somewhat earlier time, consistent with previous studies. A.L.W.

A81-33848 Potential effects of zero gravity /space flight/ on oncogenesis. D. R. Mayo (U.S. Veterans Administration, Medical Center, West Haven, Conn.) and M. K. Howett (Pennsylvania State University, Hershey, Pa.). *Speculations in Science and Technology,* vol. 4, Apr. 1981, p. 21-27; Reviewer Comment, p. 27, 28; Authors' Reply, p. 28, 29. 45 refs. Grant No. NIH-CA-25305.

Exposure to weightlessness may affect the establishment and growth of tumours. Factors operating under weightless conditions including (1) disturbances in hormone balance, (2) paralysis of the reticuloendothelial system, (3) decreased activity of thymocytes (T-cells), and (4) effects on cell-cell adhesiveness may lead to an enhanced oncogenic risk in host animals. Supporting evidence and a simple set of experiments for testing this hypothesis, using both metastatic and nonmetastatic tumour cell lines, are presented. (Author)

A81-33899 * Cosmos 1129 - Spaceflight and bone changes. T. J. Wronski, E. Morey-Holton (NASA, Ames Research Center, Mountain View, Calif.), and W. S. S. Jee (Utah, University, Salt Lake City, Utah). *Physiologist,* vol. 23, Dec. 1980, p. S-79 to S-82. 10 refs. Research supported by the National Research Council.

Male Wistar rats were placed in orbit for an 18.5 day period aboard the Soviet Cosmos 1129 biological satellite. The skeletal changes which occurred during spaceflight were determined to be a reduced rate of periosteal bone formation in the tibial and humeral diaphyses, and a decreased trabecular bone volume and an increased fat content of the bone marrow in the proximal tibial metaphysis. (Author)

STAR ENTRIES

N81-22677# Public Service Electric and Gas Co., Newark, N. J.
BIOFOULING CONTROL WITH OZONE AT THE BERGEN GENERATING STATION Interim Report
R. Sugam, C. R. Guerra, J. L. DelMonaco, J. H. Singletary, and W. A. Sandvik Nov. 1980 143 p refs Sponsored by Electric Power Research Inst.
(EPRI Proj. 733-1)
(EPRI-CS-1629) Avail: NTIS HC A07/MF A01

Tests were conducted using a pilot scale condenser system to simulate plant condenser operations. Three model condensers were operated under identical conditions with only the biocide treatment differing. Comparisons of ozone and chlorine were made and the minimum effective levels of each were determined by daily measurements of the heat transfer coefficient across the model condenser tubes and/or the water side pressure drop. Test results indicate that chlorine is capable of effective biofouling control when applied for 2 hours/day at a level as low as 0.1 mg/1. Ozone, applied on the same schedule, requires 0.5 mg/1 for effective control. DOE

N81-22678# Louisiana State Univ. and A&M Coll., Baton Rouge. Dept. of Chemistry.
PHYSICO-CHEMICAL INVESTIGATION OF SOME AREAS OF FUNDAMENTAL SIGNIFICANCE TO BIOPHYSICS Annual Report, 1979 - 1980
S. P. McGlynn 7 Jul. 1980 85 p refs
(Contract DE-AS05-76EV-03018)
(DOE/EV-03018/T2) Avail: NTIS HC A05/MF A01

Results of physico-chemical investigations dealing with primarily molecular Rydberg transitions are presented. Spectroscopic studies of atmospheric pollutants, the colors of post-transition metal salts, and photoelectron spectroscopy of phosphites, phosphates, and substituted phosphates are included. A perturbed linear molecular model for the spectroscopy of linear molecules is presented. DOE

N81-22679*# California Univ., Davis. Dept. of Entomology.
ENVIRONMENTAL ASSESSMENT FOR THE SATELLITE POWER SYSTEM (SPS): STUDIES OF HONEY BEES EXPOSED TO 2.45 GHz CONTINUOUS WAVE ELECTROMAGNETIC ENERGY
N. E. Gary and B. B. Westerdahl Dec. 1980 147 p refs Sponsored in part by NASA Prepared for Argonne National Lab.
(Contract W-31-109-eng-38)
(NASA-CR-164223; DOE/ER-0095) Avail: NTIS HC A07/MF A01 CSCL 06C

Post treatment brood development was normal and teratological effects were not detected at exposures of 3 to 50 mw sq cm for 30 minutes. Post treatment survival, longevity, orientation, navigation, and memory of adult bees were also normal after exposures of 3 to 50 mw sq cm for 30 minutes. Post treatment longevity of confined bees in the laboratory was normal after exposures of 3 to 50 mw sq cm for 24 hours. Thermoregulation of brood nest, foraging activity, brood rearing, and social interaction were not affected by chronic exposure to 1 mw sq cm during 28 days. In dynamic behavioral bioassays the frequency of entry and duration of activity of unrestrained, foraging adult bees was identical in microwave exposed areas versus control areas. DOE

N81-22681 California Univ., Santa Barbara.
TOTAL AND REGIONAL DISTRIBUTION OF CORONARY BLOOD FLOW DURING HYPOXIA Ph.D. Thesis
Richard Anthony Sorich 1980 247 p
Avail: Univ. Microfilms Order No. 8108075

The adjustments made by the coronary and cardiovascular systems were studied during carbon monoxide hypoxia (COH) due to 29-35 percent HbCO and hypoxia hypoxia (HOH) due to inhalation of 95 percent O2, which represent comparable arterial hypoxias when both arterial oxygen content and O2 availability are considered. As a result of COH, coronary blood flow (CBF) increased 40 percent as the arterial oxygen content decreased from 18.7 to 14.7 ml O2 100 ml-1 blood. Coronary sinus Po2 decreased 4.5 torr, which fully compensated for the increased O2 affinity for Hb. Lactate extraction, as well as pH, remained unchanged throughout the COH exposure. No significant change was observed in either cardiac index, heart rate, or mean arterial blood pressure. Dissert. Abstr.

N81-22683*# National Aeronautics and Space Administration, Washington, D. C.
EFFECT OF MEPROBAMATE ON THE VESTIBULOSENSORY AND VESTIBULAR SOMATIC REACTION
N. V. Khinchikashvili Mar. 1980 13 p refs Transl. into ENGLISH from Fiziol. Zh. (USSR), v. 25, no. 5, 1979 p 507-512 Transl. by Scientific Translation Service, Santa Barbara, Calif. Original doc. prep. by Odessa Medical Inst., USSR
(Contract NASw-3198)
(NASA-TM-76104) Avail: NTIS HC A02/MF A01 CSCL 06P

The influence of meprobamate on the vestibular illusion of counter-rotation, movement coordination and vertical writing was investigated by a double blind trial method and placebo. The results confirm the possibility of the meprobamate application for prophylaxis and correction of vestibular disturbances. Author

N81-22684*# National Aeronautics and Space Administration, Washington, D. C.
PHYSIOLOGY OF MAN AND ANIMALS IN THE TENTH FIVE-YEAR PLAN: PROCEEDINGS OF THE THIRTEENTH CONGRESS OF THE I. P. PAVLOV ALL-UNION PHYSIOLOGICAL SOCIETY
K. A. Lange Aug. 1980 26 p Transl. into ENGLISH from Fiziol. Zh. SSSR (USSR), v. 66, no. 5, May 1980 p 757-771 Congr. held in Alma-Ata, USSR, 24-28 Sep. 1979 Transl. by Scientific Translation Service, Santa Barbara, Calif. Original doc. prep. by Academy of Sciences (USSR), Leningrad
(Contract NASw-3198)
(NASA-TM-76296) Avail: NTIS HC A03/MF A01 CSCL 06P

Research in the field of animal and human physiology is reviewed. The following topics on problems of physiological science and related fields of knowledge are discussed: neurophysiology and higher nervous activity, physiology of sensory systems, physiology of visceral systems, evolutionary and ecological physiology, physiological cybernetics, computer application in physiology, information support of physiological research, history and theory of development of physiology. Also discussed were: artificial intelligence, physiological problems of reflex therapy, correlation of structure and function of the brain, adaptation and activity, microcirculation, and physiological studies in nerve and mental diseases. E.A.K.

N81-22685*# National Aeronautics and Space Administration, Washington, D. C.
QUESTIONS OF DIAGNOSING AND TREATING MENIERE'S DISEASE
S. N. Khechinashvili Oct. 1980 12 p refs Transl. into ENGLISH from Zh. Ushnykh Nosovykh Gorlovykh Bolez. (USSR), no. 5, 1979 p 1-5 Transl. by Scientific Translation Service, Santa Barbara, Calif. Original doc. prep. by S. M. Kirov State Inst. for Advancement of Physicians, Tbilisi, USSR
(Contract NASw-3198)
(NASA-TM-76407) Avail: NTIS HC A02/MF A01 CSCL 06E

The possibilities of diagnosis and treatment of Meniere's disease are considered. Attention is given to the use of dehydration tests which are based on glycerol administration or intravenous injection of furosemide. The risks of bilateral sensorineural hearing impairment in prolonged conservative treatment is emphasized. The data of auditory function study before and following endolymphatic sac surgery are presented. Author

N81-22686*# National Aeronautics and Space Administration, Washington, D. C.
VISUAL EVALUATION OF NYSTAGMUS INTENSITY IN POINTS TO DIAGNOSE VESTIBULAR DYSFUNCTION
M. M. Levashov Oct. 1980 11 p refs Transl. into ENGLISH of Zh. Ushnykh Nosovykh Gorlovykh Bolez. (USSR), no. 5, Sep. - Oct. 1979 p 29-33 Transl. by Scientific Translation Service, Santa Barbara, Calif. Original doc. prep. by RSFSR Ministry of Health, Leningrad
(Contract NASw-3198)
(NASA-TM-76409) Avail: NTIS HC A02/MF A01 CSCL 06P

The amplitude of nystagmus multiplied by its frequency gives a value commensurate to the velocity of slow phase. If the amplitude and the frequency during the visual observation are expressed in relative units (e.g., in points ranging from 1 to 3) the results of multiplication are used for a relative evaluation of nystagmus intensity. The relative evaluation of nystagmus intensity is used to compare the responses and, in particular, to calculate the coefficients of labyrinth asymmetry and of directional preponderance. A suggestion is made to analyze the formal results of caloric tests using a simple graphic model reflecting the left-right interactions by which the obtained coefficients are conditioned. S.F.

N81-22687*# National Aeronautics and Space Administration, Washington, D. C.
FUNCTIONAL STABILITY OF CEREBRAL CIRCULATORY SYSTEM
Yu. Ye. Moskalenko Oct. 1980 18 p refs Transl. into ENGLISH from Fiziol. SSSR (USSR), v. 64, no. 5, 1978 p 589-597 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3198)
(NASA-TM-76499) Copyright. Avail: NTIS HC A02/MF A01 CSCL 06P

The functional stability of the cerebral circulation system seems to be based on the active mechanisms and on those stemming from specific of the biophysical structure of the system under study. This latter parameter has some relevant criteria for its quantitative estimation. The data obtained suggest that the essential part of the mechanism for active responses of cerebral vessels which maintains the functional stability of this portion of the vascular system, consists of a neurogenic component involving central nervous structures localized, for instance, in the medulla oblongata. Author

N81-22688*# National Aeronautics and Space Administration, Washington, D. C.
RADIOLOGICAL EXAMINATION OF THE SPINE AND FITNESS FOR WORK AS A HELICOPTER PILOT
R. P. Delahaye, R. Auffret, and P. J. Metges Jun. 1980 8 p refs Transl. into ENGLISH of "Examen Radiologique du Rechis et Aptitude a l'Emploi de Pilot d'Helicoptere" Rept. AGARD-CP-255, Paris, Dec. 1978 p 56-1-56-7 Translation was announced as N79-19634 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Aerospace Research and Development, Paris
(Contract NASw-3199)
(NASA-TM-75791; AGARD-CP-225) Avail: NTIS HC A02/MF A01 CSCL 06P

On the matter of spinal fitness for piloting, standards are proposed that suit the critical spinal segments proper to different jobs. Involved here are primarily pilots of combat airplanes and of helicopters. Fitness for one of these does not necessarily mean fitness for the other. Author

N81-22689*# National Aeronautics and Space Administration, Washington, D. C.
THE EFFECT OF SHORT-TERM ANTIORTHOSTATIC HYPOKINESIA ON CENTRAL AND INTRACARDIAC HEMODYNAMICS AND METABOLISM OF A HEALTHY PERSON
V. Ye. Katkov, V. V. Chesturkhin, O. Kh. Zybin, S. S. Sukhotskiy, S. V. Abrosimov, and V. N. Utkin Feb. 1981 17 p refs Transl. into ENGLISH from Kardiologiya (USSR), no. 12, 1978 p 69-75 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-76525) Avail: NTIS HC A02/MF A01 CSCL 06S

The right parts of the heart and the radial artery were catheterized in healthy male volunteers before and 5 days after strict bedrest in antiorthostatic position of the body (-4.5 deg). After immobilization, most values of central circulation showed no essential changes; the only exceptions were indicates characterizing the inotropic myocardial condition. A shift in the direction of acidosis of a mixed character was noted in mixed venous blood, the beta lipoprotein content increased. A decrease in the arteriovenous difference in oxygen was encountered in blood draining from the heart (from the coronary sinus). Author

N81-22690*# National Aeronautics and Space Administration, Washington, D. C.
EVALUATION OF INTEGRAL EXPOSURE ENERGY LOAD ON AURAL ANALYZER OF MINERS
A. N. Kornilov and Ye. I. Larantseva Feb. 1981 8 p refs Transl. into ENGLISH from Vrach. Delo (USSR), no. 2, 1974 p 44-45 Transl. by Scientific Translation Service, Santa Barbara, Calif. Original doc. prep. by Inst. of Marine Transport Hygiene, Leningrad
(Contract NASw-3198)
(NASA-TM-76550) Avail: NTIS HC A02/MF A01 CSCL 20A

The individual exposure integral noise load on workers before the beginning of hearing impairment was determined for a group of 20 male miners who had worked with drilling equipment and harvesters for 8 to 20 years before the onset of the disability. Results show that the total exposure energy load of about 4 kw x h sq m, obtained by miners in the examined group, resulted in occupational injury to the auditory organ (cochlear neuritis) in 75% of the cases. The equivalent energy level of noise computed according to the date of total energy load is roughly 99 db A, which significantly exceeds the permissible amount of 85 db A. There is a correlation ($r = 0.77$) between the integral exposure energy noise on the aural analyzer in the degree of increase in the total threshold for the mean speech range. A.R.H.

N81-22691# Desmatics, Inc., State College, Pa.
PRELIMINARY ANALYSIS OF MOTION SICKNESS INCIDENCE DATA
Carl A. Mauro and Dennis E. Smith Feb. 1981 25 p refs
(Contract N00014-79-C-0128)
(AD-A096750; TR-112-8) Avail: NTIS HC A02/MF A01 CSCL 06/19

This report analyzes motion sickness data obtained from experiments involving the Office of Naval Research motion generator. Based on the analysis, a mixture of two statistical populations has been postulated as an overall model of time to first emesis. GRA

N81-22692# Los Alamos Scientific Lab., N. Mex.
CANCER RISKS AFTER RADIATION EXPOSURES
George L. Voelz 1980 18 p refs Presented at the Conf. on the Relation of Environmental Pollution to the Cancer Problem, Lakewood, Colo., Sep. 1980
(Contract W-7405-eng-36)
(LA-UR-80-3669; CONF-8009126-1) Avail: NTIS HC A02/MF A01

A general overview of the effects of ionizing radiation on cancer induction is presented. The relationship between the degree of risk and absorbed dose is examined. Mortality from radiation-

induced cancer in the US is estimated and percentages attributable to various sources are given. DOE

N81-22693*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ASSESSMENT OF ZERO GRAVITY EFFECTS ON SPACE WORKER HEALTH AND SAFETY
Nov. 1980 125 p refs
(Contract DE-AI01-79CH-10025)
(NASA-TM-82330; DOE/ER-10025/T1) Avail: NTIS HC A06/MF A01 CSCL 06S

One objective of the study is to assess the effects of all currently known deviations from normal of medical, physiological, and biochemical parameters which appear to be due to zero gravity (zero-g) environment and to acceleration and deceleration to be experienced, as outlined in the references Solar Power Satellites (SPS) design, by space worker. Study results include identification of possible health or safety effects on space workers either immediate or delayed due to the zero gravity environment and acceleration and deceleration; estimation of the probability that an individual will be adversely affected; description of the possible consequence to work efficiency in persons adversely affected; and description of the possible/probable consequences to immediate and future health of individuals exposed to this environment. A research plan, which addresses the uncertainties in current knowledge regarding the health and safety hazards to exposed SPS space workers, is presented. Although most adverse affects experienced during space flight soon disappeared upon return to the Earth's environment, there remains a definite concern for the long-term effects to SPS space workers who might spend as much as half their time in space during a possible five year career period. The proposed 90 day up/90 day down cycle, coupled with the fact that most of the effects of weightlessness may persist throughout the flight along with the realization that recovery may occupy much of the terrestrial stay, may keep the SPS workers in a deviant physical condition or state of flux for 60 to 100% of their five year career. DOE

N81-22694# California Univ., Berkeley. Lawrence Berkeley Lab.
IONIZING RADIATION RISKS TO SATELLITE POWER SYSTEMS (SPS) WORKERS IN SPACE
Dec. 1980 57 p refs
(Contract W-7405-eng-48)
(DOE/ER-0094) Avail: NTIS HC A04/MF A01

The radiation risks to the health of workers who will construct and maintain solar power satellites in the space environment were studied. The major efforts were: to evaluate the radiation environment estimated for the Reference System which could represent a hazard; to assess the possible somatic and genetic radiation hazards; and to estimate the risks to the health of SPS workers due to space radiation exposure, and to make recommendations based on these conclusions. Details are presented. DOE

N81-22695 Texas A&M Univ., College Station.
THE EFFECTS OF INCREASED AMBIENT TEMPERATURE ON DUAL TASK PERFORMANCE Ph.D. Thesis
Robert Parker Bateman 1980 125 p
Avail: Univ. Microfilms Order No. 8107989

Eighteen males, ages 18 - 29, were exposed to wet bulb globe temperatures of 18.5, 28.6 and 32.9 degrees centigrade in three sessions, each of two hours duration. During the second hour, subjects' performance on the tracking task and on six secondary tasks, performed singly and in combination with the primary task were measured. Significant performance decrements due to increased ambient temperature were observed for the vigilance task, the reaction time test and the Stroop test. These constitute the least complex mental tasks. For the sedentary tasks, the subjects were able to thermoregulate quite successfully. The average increase in the body core temperature for the hottest condition was only 0.4 degress C. It appears, from these results, that complex mental tasks remain unaffected by ambient conditions that produce only minor changes in the physiological state. There was, however, a trend towards performance decrements for the most difficult tasks at the highest temperatures. Dissert. Abstr.

N81-22696*# Battelle Columbus Labs., Mountain View, Calif.
FATIGUE AND ASSOCIATED PERFORMANCE DECREMENTS IN AIR TRANSPORT OPERATIONS
E. Gene Lyman and Harry W. Orlady 31 Mar. 1981 36 p refs
(Contract NAS2-10060)
(NASA-CR-166167) Avail: NTIS HC A03/MF A01 CSCL 05E

A study of safety reports was conducted to examine the hypothesis that fatigue and associated performance decrements occur in air transport operations, and that these are associated with some combination of factors: circadian desynchronosis, duty time; pre-duty activity; sleep; work scheduling; workload; and environmental deprivation. The findings are based on a selected sample of reported incidents in which the reporter associated fatigue with the occurrence. In comparing the fatigue reports with a control set, significant performance decrements were found to exist related to time-of-day, awareness and attention to duty, less significantly, final phases of flights. The majority of the fatigue incidents involved such unsafe events as altitude deviations, takeoffs and landing without clearance, and the like. Considerations of duty and sleep are the major factors in the reported fatigue conditions. S.F.

N81-22697*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
HOW A PILOT LOOKS AT ALTITUDE
Amos A. Spady, Jr. and Randall L. Harris, Sr. Apr. 1981 15 p refs Presented at the 1980 Aircraft Safety and Operating Probl. Conf., Hampton, Va., 5-7 Nov. 1980 Submitted for publication
(NASA-TM-81967; NASA-CP-2170; L-14440) Avail: NTIS HC A02/MF A01 CSCL 05I

Commercial pilot eye scanning data previously collected were reanalyzed to evaluate how pilots used the drum pointer altimeter. The results of these tests showed that the pilots seldom used the drum window apparently because it was difficult to read as indicated by average drum window dwell times of 0.6 sec. It is suggested that pilot scanning data be collected for other types of altimeters in order to find those with good scanning characteristics. T.M.

N81-22698# Illinois Univ., Champaign. Cognitive Psychophysiology Lab.
APPLICATIONS OF EVENT-RELATED BRAIN POTENTIALS IN HUMAN ENGINEERING Annual Progress Report
Emanuel Donchin and Christopher D. Wickens Nov. 1980 39 p refs
(Contract F49620-79-C-0233)
(AD-A097007; UILU-CPL80-1/AFO) Avail: NTIS HC A03/MF A01 CSCL 05/10

This report describes research partially or entirely conducted during the first year of the contract period. It describes experiments related to four basic categories of human performance research: attention (including both attention allocation and workload), subjective probability and expectancy, processing latency, and control movement. A series of appendices describes those portions of the research that have been completed. GRA

N81-22699 Tennessee Univ., Knoxville.
THERMAL COMFORT CHARACTERISTICS OF TEXTILE APPAREL FABRICS Ph.D. Thesis
Kay Sanders Grise 1980 167 p
Avail: Univ. Microfilms Order No. 8108143

The fabrics were commerciallv-available textile materials that would normally be worn during the winter months by persons while at home with sedentary to moderate activity levels. Nine fabrics of various fiber content and construction were investigated. Seven of the fabrics represented materials that could be used for an indoor jacket and two fabrics represented materials that could be used for a shirt or blouse. Each test was made at three different combinations of temperature and relative humidity to simulate conditions next to the skin and in the ambient environment. Saturated salt solutions were used to maintain a constant relative humidity. Results of the study indicate that the layering of the fabrics is the most significant factor in thermal insulation for the fabrics under investigation; insulation increases

with an increase in air space. The temperature-relative humidity was also a significant factor in providing insulation.
Dissert. Abstr.

N81-22700*# Acurex Corp., Mountain View, Calif. Aerospace Systems Div.
STUDY FOR FABRICATION, EVALUATION, AND TESTING OF MONOLAYER WOVEN TYPE MATERIALS FOR SPACE SUIT INSULATION Final Report
Ellen B. Merrick May 1979 71 p
(Contract NAS2-9873)
(NASA-CR-166139; ACUREX-TR-79-156) Avail: NTIS HC A04/MF A01 CSCL 06K

An alternative space suit insulation concept using a monolayer woven pile material is discussed. The material reduces cost and improves the durability of the overgarment, while providing protection similar to that provided by multilayer insulation (MLI). Twelve samples of different configurations were fabricated and tested for compressibility and thermal conductivity as a function of compression loading. Two samples which showed good results in the initial tests were further tested for thermal conductivity with respect to ambient pressure and temperature. Results of these tests were similar to results of the MLI tests, indicating the potential of the monolayer fabric to replace the present MLI. A seaming study illustrated that the fabric can be sewn in a structurally sound seam with minimal heat loss. It is recommended that a prototype thermal meteroid garment be fabricated. M.G.

N81-22701*# Analytics, Inc., Willow Grove, Pa.
A HUMAN OPERATOR SIMULATOR MODEL OF THE NASA TERMINAL CONFIGURED VEHICLE (TCV) Final Report
Floyd A. Glenn, III and Stephanie M. Doane Washington NASA May 1981 124 p refs
(Contract NAS1-15983)
(NASA-CR-3421; TR-1463.01-A) Avail: NTIS HC A06/MF A01 CSCL 05H

A generic operator model called HOS was used to simulate the behavior and performance of a pilot flying a transport airplane during instrument approach and landing operations in order to demonstrate the applicability of the model to problems associated with interfacing a crew with a flight system. The model which was installed and operated on NASA Langley's central computing system is described. Preliminary results of its application to an investigation of an innovative display system under development in Langley's terminal configured vehicle program are considered. A.R.H.

N81-22702# Pennsylvania Univ., Philadelphia.
WORKSHOP ON INTERACTIVE MAN-MACHINE DISCOURSE
Aravind K. Joshi 1980 55 p refs Workshop held at Philadelphia, 17-20 Jun. 1980
(Grant N00014-80-G-0054; NR Proj. 049-458)
(AD-A096512) Avail: NTIS HC A04/MF A01 CSCL 05/8

This workshop was organized to discuss some critical issues in the design of interactive natural language system that have not received the careful attention that they deserve. Two of the sessions had as their topics, issues we felt are primary forcing functions in the design of interactive systems capable of responding to, and responding in, natural language. These forcing functions involve the purpose of the interaction, the 'social' conventions assumed by each participant, and the characteristics of the channel through which interaction takes place. The topic of the third session was the future of natural language communication with machines. GRA

N81-22703# Federal Aviation Administration, Washington, D.C. Office of Aviation Medicine.
EVALUATION OF THE PROTECTIVE EFFICIENCY OF A NEW OXYGEN MASK FOR AIRCRAFT PASSENGER USE TO 4000 FEET
D. deSteiguer and J. J. Saldivar Oct. 1980 33 p refs
(AD-A097046; FAA-AM-80-18) Avail: NTIS HC A03/MF A01 CSCL 06/11

This report describes the methods used in the evaluation of a new continuous-flow, phase-dilution passenger oxygen mask for compliance to FAA Technical Standard Order (TSO)-C64 requirements. Data presented include end expiratory partial pressures for oxygen, carbon dioxide, and nitrogen at selected altitudes and oxygen flow rates. Data indicate that the test mask does meet the requirements for TSO-C64 certification. GRA

N81-22704# Mitre Corp., Bedford, Mass.
MAN-MACHINE INTERFACE (MMI) REQUIREMENTS DEFINITION AND DESIGN GUIDELINES Progress Report
Sidney L. Smith Feb. 1981 83 p refs
(Contract F19628-80-C-0001; AF Proj. 572R)
(AD-A096705; MTR-8134; ESD-TR-81-113) Avail: NTIS HC A05/MF A01 CSCL 05/8

A previous report, asserted the need for man-machine interface (MMI) requirements definition and guidelines in the design of computer-based information systems. The present report extends the treatment of that topic. An initial hierarchic list of functional MMI capabilities, previously proposed for use in requirements definition, is here doubled in size to over 400 items, and has been reorganized to improve its structure. Initial design guidelines proposed for data entry functions are here revised and enlarged to include 79 items. Another 131 guidelines are proposed for sequence control functions. A continuation of guidelines development is recommended, in collaboration with other concerned organizations and agencies. GRA

N81-22705# European Space Agency, Paris (France).
COMPATIBILITY TEST OF OXYGEN EXPOSURE IN THE RANGE 2.2 TO 2.8 BAR ABS
Horst Krekeler, Pierre Cabarou, and Hans-Dietrich Fust Mar. 1981 33 p refs Trans. into ENGLISH of 'Untersuchung zur Vertraeglichkeit der Sauerstoffatmung im Bereich von 2.2 bis 2.8 bar abs", Rept. DFVLR-FB-78-10 DFVLR, Bonn, Feb. 1978
(ESA-TT-566; DFVLR-FB-78-10) Avail: NTIS HC A03/MF A01

Decompression tables for the range of diving depths between 100 and 200 m were developed and tested in a pressure chamber. Helium/oxygen mixtures with a maximum oxygen partial pressure of 2.5 bar abs. were breathed during the decompression. The effect of oxygen on the human organism and especially on the respiratory system was studied. Subjects were made to breathe pure oxygen for five days (Monday through Friday) during two conservative weeks, the oxygen pressures corresponding to 18 m for thirty minutes, to 15 m for sixty minutes, and to 12 m for ninety minutes on each occasion, i.e., three hours of oxygen breathing per day. No evidence whatsoever of any harmful affects due to the oxygen breathing was found. Author (ESA)

N81-23787# Naval Research Lab., Washington, D. C. Environmental Biology Branch.
DRAG ENHANCEMENT OF MICROBIAL SLIME FILMS ON ROTATING DISCS Final Report
George I. Loeb 27 Mar. 1981 20 p refs
(AD-A097228; NRL-MR-4412) Avail: NTIS HC A02/MF A01 CSCL 13/1

Recent advances in anti-fouling technology have made control of macroscopic fouling organisms (barnacles, bryozoans and tubeworms) feasible. Among the limiting factors in fast ship performance in the absence of macro-fouling are the hydrodynamic drag of hull coatings themselves, the drag increment caused by microbial fouling of hull coatings, and losses in propulsion efficiency resulting from microbial colonization of propellers. This work assesses the significance of microbial colonization of organic and metal surfaces for hydrodynamic drag over a wide range of flow velocities. Measurements made with a rotating disc apparatus at disc peripheral speeds from 9.5 to 33 Kn (17 to 61 Km/hr) showed that (a) microbial slime films can be grown which withstand testing at these velocities and (b) drag increments in excess of 10% are often observed. Therefore, because they are not eliminated by current anti-foulants, microbial fouling films and their effects on ship performance warrant serious consideration. Author (GRA)

N81-23788# Drexel Univ., Philadelphia, Pa. Dept. of Chemistry.
PHYSICAL AND CHEMICAL STUDIES OF CHLOROPHYLL IN MICROEMULSIONS
1980 14 p refs
(Contract DE-AS02-77ER-04452)
(DOE/ER-04452/3) Avail: NTIS HC A02/MF A01

Studies designed to provide fundamental information on both the nature of photoreactions in microemulsions and the utility of these media as solvents for absorbers of solar energy were conducted. As a test system, the photoreduction of absorbed dye (principally methyl red) sensitized by chlorophyll a in an anionic mineral oil in water microemulsion was investigated. Using ascorbate as the water soluble reducing agent and pigment concentrations of up to eight per drop (10mm), the reaction exhibits a pseudo zero order dependence on methyl red. The effect of sensitizer, ascorbate concentration and light intensity on the quantum yield was examined, as well as the effect of varying the microemulsion charge type, product catalysis, and the use of synthetic porphyrin sensitizers. DOE

N81-23789# Wayne State Univ., Detroit, Mich. Bioengineering Center.
TOLERANCE OF THE HEAD AND NECK TO -G SUB x INERTIAL LOADING OF THE HEAD
Voight R. Hodgson 9 Mar. 1981 16 p refs
(Contract N00014-75-C-1015; NR Proj. 064-624)
(AD-A097632; TR-11) Avail: NTIS HC A02/MF A01 CSCL 06/19

The purpose of this investigation has been threefold: (1) to review the literature for experimental results which either contribute quantitative tolerance data or data supporting mechanisms or criteria of injury; (2) develop new methods of investigating neck response to indirect loading; (3) further refine a mathematical neck model. It has been found that retinal hemorrhage or mild concussion were the threshold injuries produced in forward facing harnessed individuals subjected to 39-45 g sled acceleration impulses lasting on the order of 0.270 ms depending on head-neck orientation. On the other hand, field collision data indicates insignificant head-neck injuries of belted passengers from purely inertial loading of the head due to collisions at highway automotive speeds. However, in abrupt neck stretch experiments with cats it has been found that neck stretch and possible odontoid process cord interaction are related to unconsciousness in this species. Tetanizing the cervical muscles reduced the incidence of 'concussion' symptoms produced in this animal. Collars on monkeys subjected to flexion producing occipital impacts, were reported to provide concussion protection. While no clear picture of tolerable levels or even criteria of injury can be pulled out of this array of evidence, it is clear that until the problem can be better defined, relative motion between head and neck and a position which will minimize stretch in the retinal attachments should be part of protective systems, where feasible, when abrupt -G(x) can be anticipated. GRA

N81-23790# California Univ., Berkeley. Lawrence Berkeley Lab. Engineering and Technical Services Div.
SEMICONDUCTOR DETECTORS FOR MEDICAL TOMOGRAPHY WITH HIGH-ENERGY HEAVY IONS
Jorge Llaner, Eugen E. Haller, William L. Hansen, John T. Walton, and Eleanor K. Batho Nov. 1980 7 p refs Presented at the IEEE Nucl. Sci. Symp., Orlando, Fla., 5-7 Nov. 1980
(Contract W-7405-eng-48)
(LBL-11037; CONF-801103-45) Avail: NTIS HC A02/MF A01

High-energy heavy ion beams are in use for cancer therapy. In order to take full advantage of the very favorable depth-dose characteristics of those beams, it is necessary to determine the stopping characteristics of the ions in the complex media of a human with greater accuracy than obtainable with X-ray CAT scanning. Initial measurements with an array of Si dE/dx position sensitive detectors and a windowless thin planar Ge detector used in a side entry mode show the potential for fabricating an instrument for high accuracy on-line CAT scanning using the same ions to be used for therapy. It is estimated that one tomography can be obtained with a dose of 0.72 Rad-gm. DOE

N81-23791*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECTS OF CURVED APPROACH PATHS AND ADVANCED DISPLAYS ON PILOT SCAN PATTERNS
Randall L. Harris, Sr. and Randolph W. Mixon Washington May 1981 29 p refs
(NASA-TP-1846; L-14229) Avail: NTIS HC A03/MF A01 CSCL 05I

The effect on pilot scan behavior of both advanced cockpit and advanced manuevers was assessed. A series of straight-in and curved landing approaches were performed in the Terminal Configured Vehicle (TCV) simulator. Two comparisons of pilot scan behavior were made: (1) pilot scan behavior for straight-in approaches compared with scan behavior previously obtained in a conventionally equipped simulator, and (2) pilot scan behavior for straight-in approaches compared with scan behavior for curved approaches. The results indicate very similar scanning patterns during the straight-in approaches in the conventional and advanced cockpits. However, for the curved approaches pilot attention shifted to the electronic horizontal situation display (moving map), and a new eye scan path appeared between the map and the airspeed indicator. The very high dwell percentage and dwell times on the electronic displays in the TCV simulator during the final portions of the approaches suggest that the electronic attitude direction indicator was well designed for these landing approaches. E.A.K.

N81-23792# Rice Univ., Houston, Tex. Dept. of Psychology.
UNCERTAINTY MEASUREMENT IN A COMPLEX TASK AS A FUNCTION OF RESPONSE MODE AND EVENT TYPE CHARACTERISTICS Technical Progress Report, 16 Apr. 1980 - 15 Jan. 1981
William C. Howell and Shanta P. Kerkar Feb. 1981 38 p refs
(Contract N00014-78-C-0555; NR Proj. 197-050)
(AD-A097678; TR-81-1) Avail: NTIS HC A03/MF A01 CSCL 05/10

This research was concerned with the hypothesized effect of response mode and event type factors on measured uncertainty for frequentistic events observed within a realistic task setting. Subjects served as dispatchers of emergency services for a hypothetical city on five daily shifts. Events were generated by a stationary stochastic process (emergency calls) or by the subject's responses to these calls (allocations and correct responses). At the conclusion of the 600 dispatching trials, subjects in the two experimental groups estimated either the frequency (FE) or probability (PE) of various kinds of events, and in a subsequent session, made predictive choices among selected event pairs. A control group (C) followed the same procedure except for omission of the estimation task. Results showed that estimation performance is influenced reliably by both variables: the FE group was superior to the PE group on all events, externally generated events produced generally better estimates than 'internal' ones, and spatial events were judged more accurately than non-spatial ones. Experimental groups made better choices than the control group, and there was a tendency for choice performance to reflect the quality of estimation performance. Author (GRA)

N81-23793# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
REFINEMENTS AND VALIDATION TESTING OF HUMAN OPERATOR PERFORMANCE EMULATOR (HOPE) Final Report
Esther Lee Davenport, Joanne Green, William E. Sears, III, and Harold F. Engler Mar. 1981 140 p refs
(Contract F33615-77-C-0042; AF Proj. 2313)
(AD-A097449; AFHRL-TR-81-5) Avail: NTIS HC A07/MF A01 CSCL 05/9

This report is the second of two major technical reports describing the development and testing of a computer simulation of manual control behavior. The simulation is called the Human Operator Performance Emulator (HOPE) and is unique in at least three respects. First, the simulation contains representations of structures and processes believed important in continuous control behavior, and thus has a degree of psychological validity not characteristic of other models of the same behavior. Second,

the simulation models the learning of control behavior, and thus models behavior of both trained and untrained operators. Third, and probably most importantly, the simulation includes representation of a construct called control strategy, and was designed to measure control strategy in humans. GRA

N81-23794# Air Force Academy, Colo. Frank J. Seiler Research Lab.
EFFECTS OF CRITERIA ON FLIGHT SIMULATION. STUDY 2: MULTIPLE CRITERIA Final Report, Jan. - Dec. 1980
Mark Nataupsky, Thomas M. McCloy, John M. Bermudez (East Oklahoma State Univ.), and Valentin W. Tirman Dec. 1980 18 p refs
(AF Proj. 2303)
(AD-A097526; FJSRL-TR-80-0020) Avail: NTIS HC A02/MF A01 CSCL 05/9

Recent studies have shown that criterion levels established in training directly affect later performance of subjects on experimental tasks. Approximately 20% of variance can be explained by these criteria. The purpose of this study was to determine if a similar relationship can be found in transfer of training situations. Twenty male Air Force Academy cadets were trained to one of two multiple criteria levels on a difficult flight maneuver in a GAT-1 simulator. There was an easy criterion set and a more difficult criterion set. These two sets consisted of holding prescribed performance parameters in heading, vertical velocity, and altitude. After achieving their assigned criterion, all cadets in each of the two groups were then tested on the same task in GAT-1 simulator, but this time the maneuver had to be performed under turbulent wind conditions. This wind condition served as the transfer task. Half of the cadets in each group had the same criterion in both the training and the transfer task. The other cadets had different criteria in the training and transfer tasks. Author (GRA)

N81-23795# Illinois Univ., Champaign. Cognitive Psychophysiology Lab.
APPLICATIONS OF EVENT-RELATED BRAIN POTENTIALS IN HUMAN ENGINEERING Annual Progress Report
Emanuel Donchin, Christopher D. Wickens, and Richard L. Horst Nov. 1980 94 p refs
(Contract F49620-79-C-0233; AF Proj. 2313)
(AD-A097542; CPL80-1/AFO-App; SR8-1-App; AFOSR-81-0306TR) Avail: NTIS HC A05/MF A01 CSCL 05/9

Contents: The Event-Related Brain Potential as an Index of Attention Allocation in Complex Displays; Event-Related Brain Potentials and Subjective Probability in a Learning Task; and A Metric for Thought: A Comparison of P300 Latency and Reaction Time. GRA

N81-23796 Ohio State Univ., Columbus.
TERMS AND AXIOMS FOR A THEORY OF HUMAN-MACHINE SYSTEMS Ph.D. Thesis
Kenneth Harding Funk, II 1980 191 p
Avail: Univ. Microfilms Order No. 8107323

A structure incorporating a number of formally defined terms and axioms is developed to aid in organizing knowledge about human-machine systems such as aircraft/aircrew systems, command, control, and communications systems, and process control systems. To provide perspective, the relationships between languages, theories, and models are investigated. A formal, set-theoretical approach is used to define a collection of key terms and state several axioms which allow the description of a buman-machine system as a set of parallel procedures, coordinated by a central executive procedure, governing the operation of other subsystems. A simple illustration is presented and a number of issues and implications raised by the structure are explored. Dissert. Abstr.

N81-23797 Wisconsin Univ. - Madison.
A MOTION CYCLE SIMULATOR FOR ANALYSIS AND OPTIMIZATION OF HUMAN POWER Ph.D. Thesis
Craig Jack Cornelius 1980 190 p
Avail: Univ. Microfilms Order No. 8105267

A novel motion cycle simulator is described which can be effectively used to investigate human dynamics and power generation. The system is capable of producing a multitude of motion patterns at different body postures and monitoring all the significant mechanical and physiological data. The versatility of the apparatus makes it suitable for producing simple as well as complex trajectories for optimizing transient as well as steady state power generation. Although only aerobic pedaling in supine posture was considered, results demonstrated that the optimal efficiency occurred in conditions where the velocity of the pedal and the applied force on it are as uniform as possible and in phase. Besides providing a versatile tool for studies on human power generation, the setup can also be used as a training device for athletes and for physical therapy where the load on a given group of muscles can be exercised by the appropriate selection of the operator's posture and petal trajectory. Dissert. Abstr.

N81-23798*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PRELIMINARY STUDY OF HEAD-UP ASSESSMENT TECHNIQUES. 1: VIEWING DURATION OF INSTRUMENT PANEL AND HUD SYMBOLOGY USING A RECALL METHODOLOGY
Richard F. Haines Aug. 1978 27 p refs
(NASA-TM-78517; A-7589) Avail: NTIS HC A03/MF A01 CSCL 05H

Eight commercial pilots were shown 50 colored, high fidelity slides of a standard instrument panel (IP) with the needle positions of each instrument varying from slide to slide and then 50 slides of a head-up display (HUD) symbology format which contained an equivalent amount of flight-related information as the instrument panel slides. All stimuli were presented under controlled, static viewing conditions that allowed the measurement of the speed and accuracy with which one randomly selected flight parameter on each slide could be read. The subject did not know which parameter would be requested and, therefore, had to remember the total set of information in order to answer the question correctly. The results showed that from 6.6 - 8.7 sec total viewing time was required to correctly extract altitude, airspeed, heading, VSI, or ADI from the IP slides and from 6.1 to 7.4 sec for the HUD slides. T.M.

N81-23799*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A PRELIMINARY STUDY OF HEAD-UP DISPLAY ASSESSMENT TECHNIQUES. 2: HUD SYMBOLOGY AND PANEL INFORMATION SEARCH TIME
Joseph G. Guercio and Richard F. Haines Oct. 1978 25 p refs
(Grant NsG-2269)
(NASA-TM-78536; A-7706) Avail: NTIS HC A02/MF A01 CSCL 05H

Twelve commercial pilots were shown 50 high-fidelity slides of a standard aircraft instrument panel with the airspeed, altitude, ADI, VSI, and RMI needles in various realistic orientations. Fifty slides showing an integrated head-up display (HUD) symbology containing an equivalent number of flight parameters as above (with flight path replacing VSI) were also shown. Each subject was told what flight parameter to search for just before each slide was exposed and was given as long as needed (12 sec maximum) to respond by verbalizing the parameter's displayed value. The results for the 100-percent correct data indicated that: there was no significant difference in mean reaction time (averaged across all five flight parameters) between the instrument panel and HUD slides; and a statistically significant difference in mean reaction time was found in responding to different flight parameters. T.M.

N81-23800*# Massachusetts Inst. of Tech., Cambridge. Dept. of Nutrition and Food Science.
EVALUATION OF ENGINEERED FOODS FOR CLOSED ECOLOGICAL LIFE SUPPORT SYSTEM (CELSS) Interim Report, 1 Dec. 1979 - 31 Jan. 1981
Marcus Karel 1981 19 p refs
(Contract NAS9-16008)

(NASA-CR-160952) Avail: NTIS HC A02/MF A01 CSCL 06H

A system of conversion of locally regenerated raw materials and of resupplied freeze-dried foods and ingredients into acceptable, safe and nutritious engineered foods is proposed. The first phase of the proposed research has the following objectives: (1) evaluation of feasibility of developing acceptable and reliable engineered foods from a limited selection of plants, supplemented by microbially produced nutrients and a minimum of dehydrated nutrient sources (especially those of animal origin); (2) evaluation of research tasks and specifications of research projects to adapt present technology and food science to expected space conditions (in particular, problems arising from unusual gravity conditions, problems of limited size and the isolation of the food production system, and the opportunities of space conditions are considered); (3) development of scenarios of agricultural production of plant and microbial systems, including the specifications of processing wastes to be recycled. S.F.

N81-23801# Applied Psychological Services, Wayne, Pa. Science Center.

COMPUTER SIMULATION OF HUMAN PERFORMANCE IN ELECTRONIC PROCESSED IMAGERY SYSTEMS Final Report

Arthur I. Siegel and Robert F. Bachert (AFAMRL, Wright-Patterson AFB) Jan. 1981 125 p refs

(Contract F33615-77-C-0520; AF Proj. 7184)

(AD-A097622; AFAMRL-TR-79-117) Avail: NTIS HC A06/MF A01 CSCL 09/2

The psychological, analytic, and programmatic aspects for an integrated set of computer simulation subroutines are presented. The algorithms and modules were designed to add the realism of a human element to MAIN network systems simulation model of the AN/UPD-X systems exploitation process. This process involves a multi-operator, multi-stage exploitation of targeting information gathered by an airborne side-looking reconnaissance aircraft. The design of generic modules was a primary goal. The theoretical basis in the behavioral sciences is presented, cast into quantitative terms, and formulation as programming specifications. Author (GRA)

N81-23802# Boeing Aerospace Co., Seattle, Wash. Logistics Support and Services Div.

INSTRUCTOR/OPERATOR DISPLAY EVALUATION METHODS Final Report

Charles Elworth Mar. 1981 191 p refs

(Contracts F33615-77-C-0017; F33615-78-C-0051; AF Proj. 6114)

(AD-A097208; AFHRL-TR-79-41) Avail: NTIS HC A09/MF A01 CSCL 05/9

The purpose of this study was to develop an objective, systematic technique for evaluating alternative formats for the displays to be used at the instructor/operator station (IOS) of a flight simulator. A benchmark performance monitoring task was designed which exercises many of the skills used by an instructor at remote IOS. Measurement techniques were developed for assessing performance of the task. The techniques were demonstrated by using them to compare two popular display formats: digital readouts versus repeater instruments. Three of six variables were monitored with greater accuracy and comprehensiveness using repeater instruments than digital readouts. For the other three variables, there was no difference between display types. Significant effects were caused by both the type of maneuver being flown and the type question being asked in administering the measurement method. We concluded that the benchmark task approach has considerable merit as a method of evaluating display formats. In follow-on studies, additional investigations should be conducted on the specifics of the measurement technique and the possible effects of memory on results. Author (GRA)

N81-23803# Systems Research Labs., Inc., Dayton, Ohio.

A HUMAN OPERATOR GUNNER MODEL FOR A TRACKING TASK WITH INTERRUPTED OBSERVATIONS IN AN ANTIAIRCRAFT ARTILLERY SYSTEM

Chen-Fu Yu Mar. 1981 61 p refs

(Contract F33615-79-C-0500; AF Proj. 6893)

(AD-A097360; AFAMRL-TR-81-37) Avail: NTIS HC A04/MF A01 CSCL 05/1

This report describes the development of a mathematical model (blanking model) for a human operator's tracking performance under visual interruptions via blanking the target in a simulated manned antiaircraft artillery system. The basic ideas of the Luenberger observer theory are extended to develop an observer model with time-varying gains. The model consists of a reduced-order observer, a feedback controller, and two noise components. The blanking model is then obtained from the general model under an exponential-gain assumption. Four blanking time constants associated with the exponential gains are introduced to relate to the human operator's short-term memory. The parameters of the model are identified from a curve-fitting computer program. Model predictions of both azimuth and elevation tracking errors for several flyby and maneuvering trajectories are shown to be in excellent agreement with the empirical data obtained from the blanking experiments. It is concluded that the blanking model developed in this report is a predictive model for a gunner's tracking performance with interrupted observations. GRA

N81-23804# Michigan Univ., Ann Arbor. Highway Safety Research Inst.

SIMULATION ANALYSIS OF HEAD/NECK IMPACT RESPONSE FOR HELMETED AND UNHELMETED MOTORCYCLISTS Final Report, 22 May 1978 - 18 Apr. 1980

Bruce M. Bowman and Lawrence W. Schneider 18 Apr. 1980 410 p refs Sponsored in part by Insurance Inst. for Highway Safety, Washington, D.C.

(PB81-145377; UMICH-HSRI-80-26) Avail: NTIS HC A18/MF A01 CSCL 06Q

Computer simulations were used to determine both quantitative and qualitative measures of the effectiveness of motorcycle helmets in reducing head and neck injuries in motorcyclist impacts. A wide variety of impact conditions were investigated in order to establish a broad overall view of the effectiveness of helmet use. It was found that helmet use invariably lessens the exposure levels of dynamic responses which have a role in producing head injury. In addition, helmet use was found to almost always reduce the severity of neck response as well and for no simulation configuration or condition to greatly increase the likelihood of neck injury. L.F.M.

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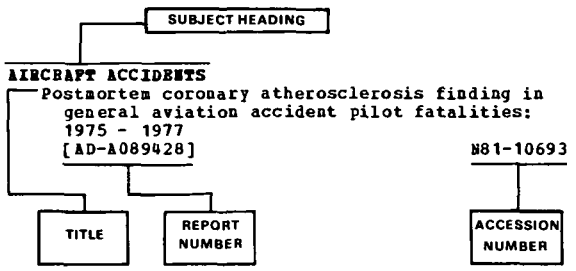

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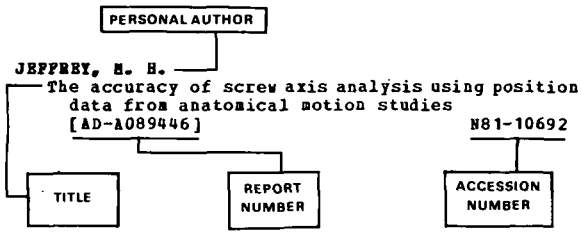

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