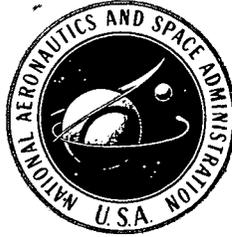


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AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY

WITH INDEXES

(Supplement 99)

FEBRUARY 1972

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ACCESSION NUMBER RANGES

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

STAR (N-10000 Series) N72-10001—N72-11851

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AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY
WITH INDEXES

(Supplement 99)

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 January 1972 in

- *Scientific and technical Aerospace Reports (STAR)*
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INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* (NASA SP-7011) lists 344 reports, articles, and other documents announced during January 1972 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, irregular 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 on 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.

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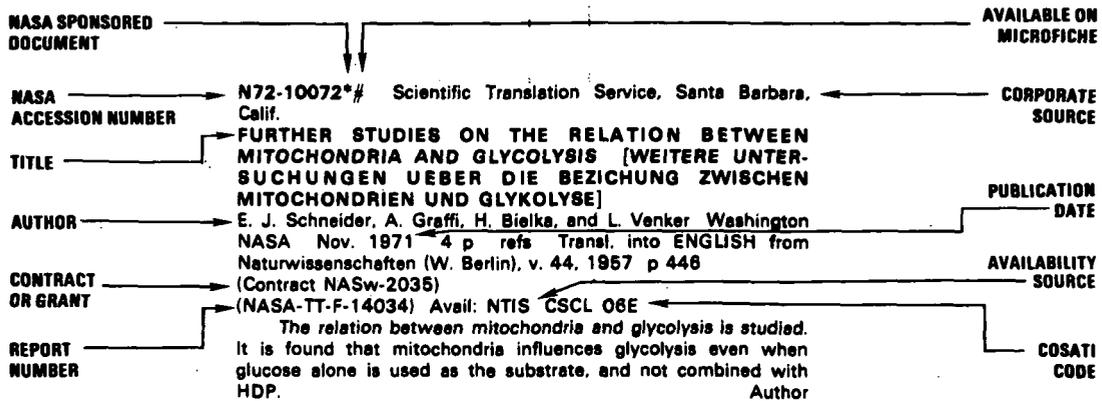
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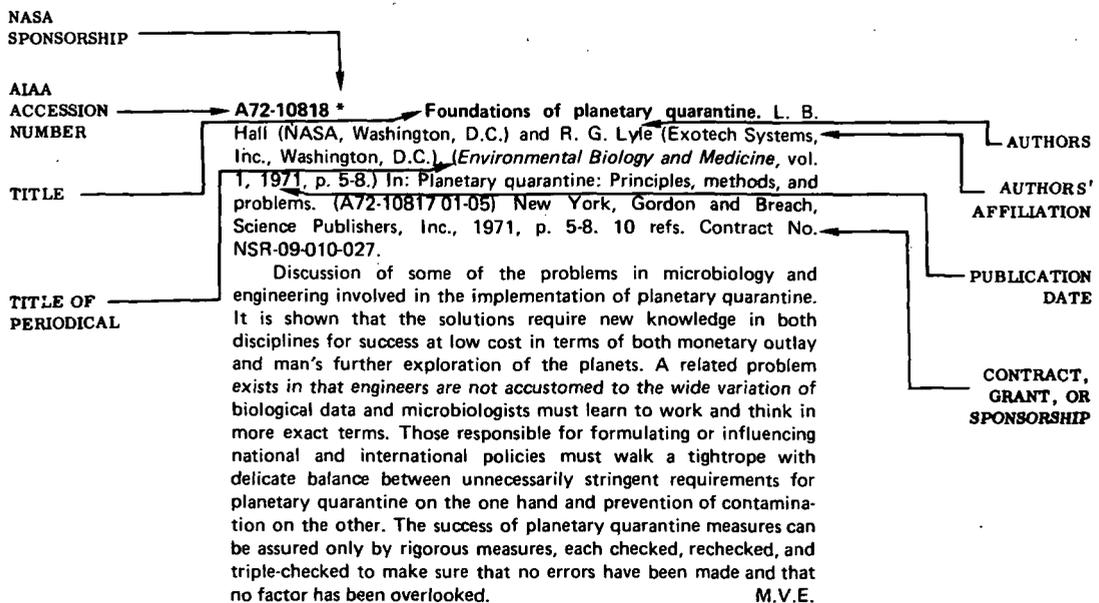
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TYPICAL CITATION AND ABSTRACT FROM IAA





AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 99) FEBRUARY 1972

IAA ENTRIES

A72-10017 Proposed mechanism of force generation in striated muscle. A. F. Huxley and R. M. Simmons (University College, London, England). *Nature*, vol. 233, Oct. 22, 1971, p. 533-538. 20 refs.

The length of a striated muscle fiber of the frog *Rana temporaria* was suddenly altered (by plus or minus 0.1 to 1.5%), and the time course of the resulting change in muscle tension was recorded. The results are used to substantiate some fairly definite suggestions about the way in which the cross-bridges may actually produce the force between the thick and thin filaments. T.M.

A72-10050 # Acoustic fatigue of humans exposed to noise. G. C. Tolhurst (Massachusetts, University, Amherst, Mass.). *Naval Research Reviews*, vol. 24, Aug. 1971, p. 20-30. 28 refs.

Discussion of auditory fatigue resulting from exposure to environmental acoustic stimuli. Both physiological factor changes and psychological modifications are considered, realizing that the two functions are really inseparable. The physiological parameters of acoustic fatigue are discussed, together with the deafening effects of noise, the damage caused by exposure to noise, and autonomic system responses. It is pointed out that one environmental parameter that seems to have an almost universal psychological reaction is the total absence of stimuli, whether acoustic, visual, or other sensory inputs. This condition is poorly tolerated by man and subhuman species. M.M.

A72-10072 Multichannel topography of human alpha EEG fields. D. Lehmann (University of the Pacific, San Francisco, Calif.). *Electroencephalography and Clinical Neurophysiology*, vol. 31, Nov. 1971, p. 439-449. 31 refs. PHS Grants No. NB-06038; No. FR-00241.

A phenomenology is given of typical EEG alpha field distributions on the human scalp, using a 48-channel recording system for off-line mapping of the scalp EEG fields on five subjects. Field distributions showed one to two positive and negative maximal values in each map. These maximal values were located with significant preference in three scalp areas: prevertex to parietal, left occipital, and right occipital. Preferential areas were similar in the five subjects. The maximal values stepped clockwise or counterclockwise from preference area to preference area. It appears that the assumption of three stationary, semi-independent generators can account for the main features of alpha fields. M.V.E.

A72-10073 Application of a computer-based model for EEG analysis. A. Wennberg (Karolinska Sjukhuset, Stockholm, Sweden) and L. H. Zetterberg (Kungl. Tekniska Högskolan, Stockholm, Sweden). *Electroencephalography and Clinical Neurophysiology*, vol. 31, Nov. 1971, p. 457-468. 13 refs. Research supported by the Statens Medicinska Forskningsråd and the Kardinska Institutet. Project B 70-14X-3077-01.

The application is discussed of a parameter analysis of EEG based upon a model that describes the spectral EEG properties in parametric form. A computer program is used for estimating the EEG parameters and for calculating the statistical uncertainty in these parameters. The analysis permits an exact determination of the parameters and their relationships. M.V.E.

A72-10074 * Chimpanzee sleep stages. F. R. Freeman, J. J. McNew, and W. R. Adey (Marquette University, Milwaukee, Wis.; California, University, Los Angeles, Calif.). *Electroencephalography and Clinical Neurophysiology*, vol. 31, Nov. 1971, p. 485-489. 6 refs. PHS Grant No. NB-02501; Contract No. NSR-05-007-158.

The electroencephalogram and electro-oculogram of two unrestrained juvenile chimpanzees was monitored for 7 consecutive nights using telemetry methods. Of the sleeping time, 23% was spent in the rapid eye movement of REM type of sleep, whereas 8, 4, 15, and 10% were spent in non-REM stages 1 through 4, respectively. Seven to nine periods of REM sleep occurred per night. The average time from the beginning of one REM period to the beginning of the next was approximately 85 min. M.V.E.

A72-10075 * Prolongation of RBC survival in the hypophysectomized rat. S. A. Landaw and S. K. Bristol (California, University, Berkeley, Calif.). *Society for Experimental Biology and Medicine, Proceedings*, vol. 138, Oct. 1971, p. 152-156. 15 refs. NASA-supported research; AEC Contract No. W-7405-eng-48.

Red blood cell (RBC) survival was prolonged in hypophysectomized rats. While the rate of random hemolysis was decreased in some hypophysectomized hosts, in all directly injected and cross-transfused hypophysectomized rat hosts, there was a significant prolongation of the phase of senescent death. In contrast, RBCs from hypophysectomized donors survived normally in normal hosts. These experiments are further evidence of a relationship between RBC aging and metabolic rate, and suggest an intimate involvement with the calorogenic hormones. M.M.

A72-10110 * On the dynamics of a human body model. R. L. Huston and C. E. Passarello (Cincinnati, University, Cincinnati, Ohio). *Journal of Biomechanics*, vol. 4, Oct. 1971, p. 369-378. 11 refs. Grant No. NGL-36-004-014.

Equations of motion for a model of the human body are developed. Basically, the model consists of an elliptical cylinder representing the torso, together with a system of frustrums of elliptical cones representing the limbs. They are connected to the main body and each other by hinges and ball and socket joints. Vector, tensor, and matrix methods provide a systematic organization of the geometry. The equations of motion are developed from the principles of classical mechanics. The solution of these equations then provide the displacement and rotation of the main body when the external forces and relative limb motions are specified. Three simple example motions are studied to illustrate the method. The first is an analysis and comparison of simple lifting on the earth and the moon. The second is an elementary approach to underwater swimming, including both viscous and inertia effects. The third is an analysis of kicking motion and its effect upon a vertically suspended man such as a parachutist. (Author)

A72-10111 **Elastic deformation characteristics of the spine.** A. J. King (Wayne State University, Detroit, Mich.) and A. P. Vulcan (Department of Shipping and Transport, Melbourne, Australia). *Journal of Biomechanics*, vol. 4, Oct. 1971, p. 413-429. 22 refs.

A survey of some of the significant contributions in the area of experimental studies on the strength of the vertebral column is made. A short history on the experimental work with intact human cadavers is then given, leading to a discussion on the significance of bending stresses in the vertebral column during caudocephalad acceleration. Statistical data are presented to demonstrate this bending phenomenon. Justification of the use of embalmed cadaver material is provided in the form of a comparative investigation of fresh and embalmed vertebral segments under dynamic loading. (Author)

A72-10116 **Assessment of the exercise capacity of young men.** M. F. Haisman (Army Personnel Research Establishment, West Byfleet, Surrey, England). *Ergonomics*, vol. 14, July 1971, p. 449-456. 28 refs.

Assessment of the exercise capacity of groups of military personnel from estimates of maximal oxygen intake (VO₂ max) and the Harvard Step Test. VO₂ max was derived by extrapolation from heart rates and oxygen intakes during a submaximal step test. Tests repeated within one week showed slightly improved VO₂ max values, but reproducibility was good. Five groups of contrasting fitness were found to have different VO₂ max values. The results of the Harvard Step Test were of a similar pattern to the VO₂ max results, but reproducibility was poorer. F.R.L.

A72-10117 **Performance and thermal comfort.** I. D. Griffiths and P. R. Boyce (Electricity Council, Research Centre, Chester, England). *Ergonomics*, vol. 14, July 1971, p. 457-568. 26 refs.

This experiment attempts to establish an objective measure of thermal comfort. A theoretical explanation of the relationship between performance and comfort is given and is represented in terms of a hypothesis. A total of 50 subjects was divided among five groups, each group experiencing one temperature in the range from 60 to 80 F for both air and surfaces. Each subject was placed in an environmental chamber for a two-hour period. During this period subjects performed an auditory inspection task and a visual tracking test, separately and in combination. At the beginning and end of the period each subject completed three rating scales: (1) the Bedford warmth scale, (2) a thermal sensation scale, and (3) a comfort scale. Examination of the results from the dual task performance revealed an optimum of performance at a temperature similar to the optimum comfort temperature as given by the subjective rating scales, and an overall significant temperature effect on performance. (Author)

A72-10118 **A comparison of the legibility of three types of electronic digital displays.** G. C. Simpson (British Iron and Steel Research Association, London, England). *Ergonomics*, vol. 14, July 1971, p. 497-507. 13 refs.

A series of experiments was carried out to compare the legibility of three different types of electronic digital display. The three displays, namely the cold cathode, the side illumination and the straight projection types, were examined under varying ambient light levels and viewing positions. The two performance criteria used in the investigations were recognition time for a single digit and accuracy of report of a four digit number. Results indicated that there was little difference between the cold cathode and the straight projection types under the conditions used in the experiment. However, the side illumination display gave a significantly poorer performance score than either of the two other displays. It was also shown that performance decrements would result if any of the displays were used in ambient light levels of greater than 22 foot candles. (Author)

A72-10119 **The determination of an optimum size cylindrical handle by use of electromyography.** M. M. Ayoub (Texas Tech University, Lubbock, Tex.) and P. L. Presti (USAF, Washington, D.C.). *Ergonomics*, vol. 14, July 1971, p. 509-518. 14 refs.

An experiment was designed using muscle electromyography to determine if an optimum cylindrical handle size exists. The experiment had two phases. One phase was concerned with an experimental task of gripping a cylindrical handle and performing a simple task routine to evaluate the optimum handle size. The other phase was concerned with a fatigue test utilizing the same cylindrical handles. The experimental variables were: hand size, weight resistance, and cylindrical handle diameter. Findings indicate that generally the 2.0 in. diameter handle showed lowest EMG activity. The 1.5 in. diameter handle was found to be the optimum handle size based on the ratio between force applied and the EMG activity measured. The 1.5 in. diameter handle was found to provide the maximum number of completed task cycles before the onset of fatigue. (Author)

A72-10120 # **A new approach to the recording of low frequency precordial vibrations.** J. L. Willems, H. De Geest, and H. Kesteloot (Leuven, Katholieke Universiteit, Louvain, Belgium). *Acta Cardiologica*, vol. 26, no. 3, 1971, p. 263-276. 25 refs. NFWO-supported research.

A method for the quantitative recording of 1f precordial vibrations, such as pressure variations, is presented and compared with the conventional method of recording the tracings of precordial displacement. The external precordial tracings were compared with tracings obtained at the epicardial surface and with tracings of intraventricular pressure in 42 dogs. The object was to analyze in what way the thoracic wall modifies the original signal. The external pulsation represented approximately half of that recorded directly on the wall of the left ventricle during open-thorax experiments. The precordial impulse was equal to 34 plus or minus 16 mm Hg in 40 normal sedentary subjects aged 18 to 60 yrs, and equaled 56 plus or minus 16 mm Hg in 20 athletes. Patients suffering from hypertrophy of the left ventricle showed a precordial pressure impulse outside the limits of what is considered to be normal. M.M.

A72-10121 # **The pulmonary protodiastolic click studied by intracardiac phonocardiography.** E. Macieira-Coelho (Instituto de Alta Cultura, Lisbon, Portugal) and L. Lima-Faleiro (Hospital de Santa Maria, Lisbon, Portugal). *Acta Cardiologica*, vol. 26, no. 3, 1971, p. 277-284. 9 refs.

Right heart intracardiac phonocardiograms were recorded in thirty-three subjects. Twenty-four had normal or low pressures in the pulmonary circulation. Nine had pulmonary hypertension, secondary

to acquired heart disease in six, and to congenital heart disease in three. Normal or low pressures in the pulmonary circulation were recorded in ten normal subjects, in five with atrial septal defects, in three with ventricular septal defects, in one with persistent ductus arteriosus and in five with pulmonary stenosis. A pulmonary early diastolic click simultaneous with the diastolic wave of the pulmonary artery pressure curve was recorded in 27 subjects. Five without pulmonary click showed low pressures in the pulmonary artery due to pulmonary stenosis. The pulmonary diastolic click was higher in patients with pulmonary hypertension or with increased pulmonary blood flow due to left-to-right shunt. The pulmonary diastolic click increased with expiration. M.M.

A72-10146 **Exercise test, history, and serum lipid levels in patients with chest pain and normal electrocardiogram at rest - Comparison to findings at coronary arteriography.** C. A. Ascoop, M. L. Simoons, W. G. Egmond, and A. V. B. Brusckhe (St. Antonius Ziekenhuis, Utrecht, Netherlands). *American Heart Journal*, vol. 82, Nov. 1971, p. 609-617. 23 refs.

In a series of 96 patients with chest pain, and a normal ECG at rest, the results of a graded exercise test (GXT), the history, and the serum lipid levels were compared to the findings at coronary arteriography. In addition, in 91 subjects a modified two-step test was performed. To characterize quantitatively and in one number the relation to the coronary arteriogram, use was made of the index of merit (T) which ranges from 0 to 1. The following indices were found: history, 0.59; GXT, 0.53; serum beta-lipoprotein, 0.37; serum cholesterol, 0.28; and two-step test, 0.26. In 30 subjects the statements of the history, the GXT, and serum beta-lipoprotein were concordant. In this category the agreement with the coronary arteriogram was excellent (T = 0.93). In 64 subjects the statements by the history and the GXT were concordant, but the serum beta-lipoprotein level was at variance. M.M.

A72-10147 * **Cardiocirculatory responses to exercise - Physiologic study by noninvasive techniques.** V. M. Pigott (Lemuel Shattuck Hospital, Boston, Mass.), D. H. Spodick (Lemuel Shattuck Hospital; Tufts University; Boston University, Boston, Mass.), E. H. Rectra, and A. H. Khan (Tufts University, Boston, Mass.). *American Heart Journal*, vol. 82, Nov. 1971, p. 632-641. 28 refs. Grant No. NGR-22-012-006.

The changes from rest to exercise were determined for certain phases of the cardiac cycle in ten healthy male subjects who underwent submaximal, physiologically paced bicycle ergometry. ECGs, phonocardiograms, and carotid pulse tracings were recorded. The preejection period and isovolumic contraction time decreased with exercise. Changes in left ventricular ejection time appeared to depend on the severity or the duration of stress. Pulse transmission time did not change significantly. The data obtained in the study and comparison of these results to those obtained by invasive methods indicate that noninvasive techniques, when used in the manner suggested, are appropriate means for detecting a variety of cardio-circulatory changes during exercise. M.M.

A72-10148 **A new approach to clinical electrocardiography - The phase plane cardiogram.** A. R. Freeman, J. P. Berkoben, L. A. Stein, J. Tolbert, and W. S. Wilson (Rutgers University, New Brunswick, N.J.). *American Heart Journal*, vol. 82, Nov. 1971, p. 654-659.

Description of a method for increasing the diagnostic capability of clinical electrocardiography. The coordinated display of voltage against the time derivative of voltage - namely, phase plane cardiogram, was found to be remarkably sensitive to subtle aberrations in QRS contours not easily visualized in the standard ECG portrayal - voltage against time. In preliminary studies, the method revealed statistically significant differences in selected phase plane parameters of patients with left ventricular hypertrophy as compared to normal subjects. The method allows information gained by means of standard clinical procedures to be viewed in a fashion which reveals details otherwise lost. M.M.

A72-10169 **Hibernation and the hypothalamus.** N. Mrosovsky (Toronto, University, Toronto, Canada). New York, Appleton-Century-Crofts (Neuroscience Series, No. 3), 1971. 275 p. 739 refs. \$16.

Essential characteristics of the phenomena of mammalian hibernation are discussed and interpreted, and attempts are made to make some coherence out of the facts considered. Hibernation is shown as a natural occurrence dependent upon the special use of ordinary mechanisms, rather than as a unique and unorthodox state. Emphasizing the nature and role of the central nervous system regulating mechanisms, such topics are covered as: hibernation cycles and problems of long-term biologic rhythmicity; the relationship of hibernation to migration; and the role of the hypothalamus in controlling annual changes in hibernators. The data on hibernation are also related to mammalian regulation in general, stressing its significance in the study of human beings. O.H.

A72-10184 # **A rheological approach to the architecture of arterial walls.** T. Azuma and M. Hasegawa (Shinshu University, Matsumoto, Japan). *Japanese Journal of Physiology*, vol. 21, Feb. 1971, p. 27-47. 22 refs. Research supported by the Ministry of Education.

Stress relaxation tests and stress-strain hysteresis tests were made on strips excised from portions of the aorta of dogs and from the external iliac and femoral arteries. In order to investigate the results from the architectural point of view, both tests were also carried out on the nuchal ligament, tendon and intestinal smooth muscle bundle which are composed mainly of elastin, collagen and smooth muscle fiber. Some of the findings are: (1) a very good positive correlation was found between the relaxation strength at 1 sec and that at 300 sec after stretch, regardless of the cutout region and direction of the strips; (2) an exponential relationship was obtained between the plastic deformation rate and the relaxation strength at 300 sec after stretch; and (3) the nuchal ligament was regarded as almost entirely elastic, whereas the intestinal smooth muscle showed remarkable viscoelasticity. M.M.

A72-10195 **Effects of respiration on heart rate in an aversive classical conditioning situation.** G. S. Laird and W. D. Fenz (Waterloo, University, Waterloo, Ontario, Canada). *Canadian Journal of Psychology*, vol. 25, Oct. 1971, p. 395-411. 16 refs. Research supported by the Alcohol and Drug Addiction Research Foundation of Ontario; Medical Research Council of Canada Grant No. MA 2330.

In the study subjects inhaled at the start of each trial, held their breath, exhaled during a 4-second tone, and then refrained from breathing in again until they received an electric shock. Thus, each trial corresponded to one breath cycle. It was found that a reliable, large magnitude deceleration followed the inhalation at the start of each trial. The biphasic form of the cardiac response occurred over an 8- to 10-second period. Thirty male university students were used as subjects; all were between the ages of 18 and 25, and had no record of heart ailments or rheumatic fever. G.R.

A72-10211 # **Studies of carbon monoxide hemoglobin in blood.** K. Yano, I. Kuroda, and H. Ikegami (Japan Air Self-Defense Force, Aeromedical Laboratory, Tachikawa, Japan). *Japan Air Self Defence Force, Aeromedical Laboratory, Reports*, vol. 11, Mar. 1971, p. 225-229. 7 refs. In Japanese, with abstract in English.

Carbon monoxide levels were measured in the blood of smokers, nonsmokers, and deceased crewmembers of a crashed aircraft. The CO-hemoglobin concentration of nonsmokers ranged from 0.1 to 0.8% (0.4% average), while that of smokers (5 to 30 cigarettes daily) was from 2.3 to 5.5% (4.3% average). Daily changes of the CO-hemoglobin concentration in blood stored at 7 and 28 C for four days were studied, and no change was observed within this period of time. The CO-hemoglobin concentration in blood samples of crewmembers from an aircraft which burned after crashing indicated that death was caused by crashing. T.M.

A72-10212 # Comparative study of several endurance indices as a screening test. C. Sakakibara, H. Ikegami, N. Yuza, and R. Yurugi (Japan Air Self-Defense Force, Aeromedical Laboratory, Tachikawa, Japan). *Japan Air Self Defence Force, Aeromedical Laboratory, Reports*, vol. 11, Mar. 1971, p. 236-245. 7 refs. In Japanese, with abstract in English.

Eight trained and eight untrained healthy male subjects were subjected to submaximal and maximal work regimes on a bicycle ergometer in a study designed to select a reliable screening test for evaluating physical fitness. The heart rate, oxygen consumption, oxygen debt, and work rate were measured, and sixteen items derived from the measurements were compared with the maximal oxygen intake. The highest correlation was observed between the maximal working capacity and the maximal oxygen intake; the former index is proposed as the best screening test for evaluating physical fitness on a bicycle ergometer. T.M.

A72-10213 # Change of voice characteristics in urgent situation. II - Vibration space analysis on voice under some psychological stresses. K. Niwa (Japan Air Self-Defense Force, Aeromedical Laboratory, Tachikawa, Japan). *Japan Air Self Defence Force, Aeromedical Laboratory, Reports*, vol. 11, Mar. 1971, p. 246-251. 5 refs. In Japanese, with abstract in English.

Study of changes in voice characteristics during unintended speech under experimental stress conditions and in actual emergency situations. The speaker's psychological state was revealed through voice examination by a technique called vibration space analysis. The influence of the stress condition on the fundamental vibration space could be observed in each test. T.M.

A72-10214 # Seasonal variation of hypothermia induced by hypoxia in rats. H. Fujiwara (Japan Air Self-Defense Force, Aeromedical Laboratory, Tachikawa, Japan). *Japan Air Self Defence Force, Aeromedical Laboratory, Reports*, vol. 11, Mar. 1971, p. 259-265. 16 refs. In Japanese, with abstract in English.

The colonic temperature was measured in rats exposed to a simulated altitude of 10,000 m for 40-min periods during each of the four seasons. The temperature remained constant near about 38 C at sea level during each season, but decreased after 40-min exposures to high altitude by 31.5, 33.3, 31.9, and 17.0 C in spring, summer, autumn, and winter, respectively. The air temperature in the chamber was maintained at 21.0, 29.7, 21.0, and 12.3 C in spring, summer, autumn, and winter, respectively. The fatality rate during high-altitude exposure remained constant throughout the four seasons. T.M.

A72-10215 # A method of analyzing flight record data by FORTRAN programs. II. K. Takeda, N. Ishidoh, S. Ohhara, and I. Kuroda (Japan Air Self-Defense Force, Aeromedical Laboratory, Tachikawa, Japan). *Japan Air Self Defence Force, Aeromedical Laboratory, Reports*, vol. 11, Mar. 1971, p. 266-270. In Japanese, with abstract in English.

Description of a computerized flight record filing system based on FORTRAN programs. The flight records were filed on magnetic tapes using 268 letters summarized from official reports. An individual's name or serial number was employed as the key word for distinguishing among different records. T.M.

A72-10295 # Essays on the physiology of conditioned reflexes (Ocherki po fiziologii uslovnykh reflektsov). E. A. Asratian. Moscow, Izdatel'stvo Nauka, 1970. 361 p. 497 refs. In Russian.

Outline of the principal results obtained from the last ten years of research on the conditioned-reflex activity of the brain. Problems examined include the relationship of conditioned reflexes with related effects in the activity of the nervous system, structural and functional foundations of conditioned reflexes, aspects of

conditioned-reflex formation and specialization, functional architecture of classical and instrumental conditioned reflexes, electrophysiological features of conditioned reflexes, mechanisms and localization of conditioned inhibitions, and physiological characteristics of tonic conditioned reflexes. Research procedures, experimental results, and theoretical models are covered. T.M.

A72-10322 * Effects of hydrostatic pressure and temperature on the uptake and respiration of amino acids by a facultatively psychrophilic marine bacterium. K. L. Paul and R. Y. Morita (Oregon State University, Corvallis, Ore.). *Journal of Bacteriology*, vol. 108, Nov. 1971, p. 835-843. 19 refs. NSF Grant No. GA-28521; Grant No. NGR-38-112-017.

Studies of pressure and temperature effects on glutamic acid transport and utilization indicated that hydrostatic pressure and low temperature inhibit glutamate transport more than glutamate respiration. The effects of pressure on transport were reduced at temperatures near the optimum. Similar results were obtained for glycine, phenylalanine, and proline. Pressure effects on the transport systems of all four amino acids were reversible to some degree. Both proline and glutamic acid were able to protect their transport proteins against pressure damage. The data presented indicate that the uptake of amino acids by cells under pressure is inhibited, which is the cause of their inability to grow under pressure. (Author)

A72-10365 Biological effects of space flight on the lysogenic bacteria E. coli K-12 /lambda/ and on human cells in culture. N. N. Zhukov-Verezhnikov, M. N. Volkov, N. I. Rybakov, I. N. Maikii, P. P. Saksonov, M. A. Guberniev, I. I. Podoplelov, V. V. Antipov, V. A. Kozlov, and A. N. Kulagin. (*Kosmicheskie Issledovaniia*, vol. 9, Mar.-Apr. 1971, p. 292-299.) *Cosmic Research*, vol. 9, Oct. 1971, p. 267-273. 25 refs. Translation.

Study of the effect of space flight factors on lysogenic bacteria E. coli K-12(lambda), the colicinogenic strain E. coli CA-23 (D), and E. coli 200 PS with F-Lac(+) episome, as well as on cultures of HeLa, A-1, fibroblast, and Cave K-10 cells. It is shown that under space flight conditions of a certain duration bacteriophage induction and a decrease in the proportion of cells carrying the F-Lac(+) factor in the integrated state are observed. Space flight factors were found to have no effect on the frequency of auxotrophic mutations and the enzyme synthesis of beta-galactosidase induced by isopropyl-beta-D-galactoside in the bacteria. After being exposed four times in space the cultures of HeLa cells were found to show changes in the morphology of the cells and in the nature of their growth, and also an intensification of the proliferative activity and antigenic properties. The possible mechanisms of the biological action of space flight factors are discussed. A.B.K.

A72-10399 * System distortion errors in radiorespirometry curves. E. D. Neville, D. D. Feller, and C. B. Dolkas (NASA, Ames Research Center, Environmental Biology Div., Moffett Field, Calif.). *International Journal of Applied Radiation and Isotopes*, vol. 22, 1971, p. 434-439. 9 refs.

Description of a method for evaluating the maximum error producible in the system distortion of a carrier gas type radiorespirometer. The maximum producible error is evaluated on the basis of a second order. The maximum producible decrease in peak height output is calculated as a function of the system's time constant or flow rate by using the system's transfer function and the Laplace transformation equation (Gardner and Barnes, 1961). M.M.

A72-10400 A device for counting Chlorella algae (Gerät zur Zählung von Chlorella-Algen). E. Reichel (Wien, Universität, Vienna, Austria). *Messtechnik*, vol. 79, Oct. 1971, p. 232-234. 9 refs. In German. Research supported by the Forschungsförderungsfonds der gewerblichen Wirtschaft.

Description of a method of determining the cell concentration of suspensions of asynchronously grown *Chlorella* algae by counting electrical conductivity pulses (the Coulter principle). It is shown that by combining a Coulter device with a discriminator designed for gamma scintillation spectrometry a size distribution curve for the algae can be obtained. The plotting of the curve requires only about 10 min. A.B.K.

A72-10463 Pattern recognition in biological and technical systems; Deutsche Gesellschaft für Kybernetik, Congress, 4th, Technische Universität Berlin, Berlin, West Germany, April 6-9, 1970, Proceedings (Zeichenerkennung durch biologische und technische Systeme; Deutsche Gesellschaft für Kybernetik, Kongress, 4th, Technische Universität Berlin, Berlin, West Germany, April 6-9, 1970, Tagungsberichte). Edited by O.-J. Grüsser and R. Klinken (Berlin, Freie Universität, Berlin, West Germany). Berlin, Springer-Verlag, 1971. 419 p. In German and English. \$25.70.

The topics considered include a quantitative approach to the analysis of the functional organization of the visual cortex, the neural substrates of sensory substitution, electronic analog models of the retina and the visual system, the simulation of a system of homogeneous layers with coherent light, aspects of recognition of human faces, and a program for automatic speech recognition. G.R.

A72-10464 The human touch. D. M. MacKay (Keele, University, Keele, Staffs., England). In: Pattern recognition in biological and technical systems; Deutsche Gesellschaft für Kybernetik, Congress, 4th, Technische Universität Berlin, Berlin, West Germany, April 6-9, 1970, Proceedings. Berlin, Springer-Verlag, 1971, p. 20-30. 19 refs.

A common complaint against most artificial 'pattern recognizers' is that they lack the 'human touch.' Either in the ease with which they are deceived or in the inelegance of their principles of operation they appear to be inferior by comparison with human beings. It is suggested that a reason for this inferiority is the neglect of certain key principles exemplified in human pattern recognition rather than the limited size of the machines. Among the test cases considered are the recognition of products of human action such as handwriting or speech, and of patterns involving 'nonevents.' G.R.

A72-10466 Neurophysiological basis of pattern recognition in the cat's visual system. U. Th. Eysel and O.-J. Grüsser (Berlin, Freie Universität, Berlin, West Germany). In: Pattern recognition in biological and technical systems; Deutsche Gesellschaft für Kybernetik, Congress, 4th, Technische Universität Berlin, Berlin, West Germany, April 6-9, 1970, Proceedings. Berlin, Springer-Verlag, 1971, p. 60-80. 51 refs.

Deutsche Forschungsgemeinschaft Grant No. Gr-161; National Council to Combat Blindness Grant No. G 371; PHS Grant No. NB-07575.

The responses of neurons in the visual system of the cat to a simple visual stimulus pattern are described. The image of an object in the visual world at the receptor surface of the retina causes an 'electrical image' which is represented by the spatial distribution of the generator potentials of the photoreceptors. This electrical image undergoes a multiple nonlinear mapping process when transmitted from the eye to the brain. The properties of each of these mapping processes are determined by the geometrical arrangement of the inhibitory and excitatory synaptic contacts, converging at each nerve cell of a neuronal layer, the temporal transfer characteristics, the synaptic processes, and the threshold changes for the generation of impulses at the nerve cells' output. G.R.

A72-10467 Quantitative approach for the analysis of the functional organization of the visual cortex /Investigations with primates/ (Quantitativer Ansatz zur Analyse der funktionellen

Organisation des visuellen Cortex /Untersuchungen an Primaten/). O. Creutzfeldt, E. Pöppel, and W. Singer (Max-Planck-Institut für Psychiatrie, Munich, West Germany). In: Pattern recognition in biological and technical systems; Deutsche Gesellschaft für Kybernetik, Congress, 4th, Technische Universität Berlin, Berlin, West Germany, April 6-9, 1970, Proceedings. Berlin, Springer-Verlag, 1971, p. 81-96. 9 refs. In German.

Squirrel monkeys and rhesus monkeys were used in the studies. Binocularly driven cells were found to be less common than in the cat. Considerable differences could be found between monocular and binocular responses. One type of cell received a strong inhibitory input from one eye and an excitatory input from the other. It was concluded that a deterministic classification of cortical neurons according to their trigger characteristics or to the degree of stimulus abstraction is not appropriate for understanding the function of the visual cortex. G.R.

A72-10468 Sensory psychological investigations regarding invariance formation in the visual system of man (Sinnespsychologische Untersuchungen zur Invarianzbildung im visuellen System des Menschen). A. Hajos (Giessen, Universität, Giessen, West Germany). In: Pattern recognition in biological and technical systems; Deutsche Gesellschaft für Kybernetik, Congress, 4th, Technische Universität Berlin, Berlin, West Germany, April 6-9, 1970, Proceedings. Berlin, Springer-Verlag, 1971, p. 97-113. 12 refs. In German.

The formation of sensory invariances is important for the various perceptual functions. Invariances from corresponding stimulus transformation were created in sensory information processing. Particular attention in the discussion of the results of the investigations is given to the adaptation of prismatically induced color fringes. The adaptation involves a selection process in which the contour direction, the contrast, and the direction of the illumination gradient create invariances corresponding to the transformation of the edge stimuli. No invariances were found corresponding to other variables such as illumination level and edge color. Further illustrations of invariance in the sensory process are discussed in relation to the abstraction process through which meaningful perceptual categories are formed. G.R.

A72-10469 The present status of the psychology of form perception (Zum derzeitigen Stand der Psychologie der Figuralwahrnehmung). H. Erke (Braunschweig, Technische Universität, Braunschweig, West Germany). In: Pattern recognition in biological and technical systems; Deutsche Gesellschaft für Kybernetik, Congress, 4th, Technische Universität Berlin, Berlin, West Germany, April 6-9, 1970, Proceedings. Berlin, Springer-Verlag, 1971, p. 114-129. 78 refs. In German.

The psychology of form perception is concerned with the formal principles of organization and interaction in the construction of the phenomenal world. Some experimental procedures are described which make possible the operational definition and measurement of phenomena which can be related to neurophysiological principles of lateral interaction and organization. The aspects considered include aftereffects, reversible figures, stabilized retinal images, afterimages, prolonged fixation, illusions, acuity, temporal discrimination, attention, voluntary control of frame of reference, figural aftereffects, peripheral vision, microgenesis, apparent form transformation, masking, and binocular rivalry. Evidence for a correspondence between psychological and physiological principles is discussed. G.R.

A72-10470 Neural substrates of sensory substitution. P. Bach-y-Rita (Visual Sciences Pacific Medical Center, San Francisco, Calif.). In: Pattern recognition in biological and technical systems; Deutsche Gesellschaft für Kybernetik, Congress, 4th, Technische Universität Berlin, Berlin, West Germany, April 6-9, 1970, Proceedings.

ings. Berlin, Springer-Verlag, 1971, p. 130-142. 67 refs. Research supported by the Max C. Fleischmann Foundation and PHS.

A Tactile Vision Substitution System (TVSS) has been developed to deliver 'visual' information from a subject-controlled TV camera to the brain, by means of a 400 point tactile stimulus array on the skin of the back. The blind subjects learn to identify objects, words, and faces, and to locate them spatially using cues such as linear perspective, parallax, size constancy, and monocular cues of depth. With training they subjectively locate the stimuli as originating in the three-dimensional space in front of the camera instead of on the back. The evidence relating to the possible neural substrates of TVSS is evaluated. Aspects evaluated include cutaneous receptors and afferent fibers, spinal cord relays, thalamic and cortical areas, mechanisms modifying afferent transmission, learning and plasticity, and the higher levels of integration and perception. G.R.

A72-10471 Electronic analog models of the retina and the visual system. R. Eckmiller (Berlin, Freie Universität, Berlin, West Germany). In: Pattern recognition in biological and technical systems; Deutsche Gesellschaft für Kybernetik, Congress, 4th, Technische Universität Berlin, Berlin, West Germany, April 6-9, 1970, Proceedings. Berlin, Springer-Verlag, 1971, p. 143-151. 21 refs. Research supported by the Stiftung Volkswagenwerk.

Each of the 115 photoreceptors in the models discussed consists of phototransistor, band-pass, and impedance converter. The signal processing in the analog model has temporal and spatial aspects. The stimulation of a photoreceptor with a rectangular shaped time function of luminance produces an excitation which progresses from one layer to the next in the direction of the visual cortex. The excitation spreads out within certain layers. The further development of analog models of the visual system can be expected to be in two directions including an extension of the model and an improvement of its structure. G.R.

A72-10476 Pattern recognition using local operations (Bildmustererkennung mit lokalen Operationen). E. Triendl (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Satelliten-Elektronik, Oberpfaffenhofen, West Germany). In: Pattern recognition in biological and technical systems; Deutsche Gesellschaft für Kybernetik, Congress, 4th, Technische Universität Berlin, Berlin, West Germany, April 6-9, 1970, Proceedings. Berlin, Springer-Verlag, 1971, p. 241-247. In German.

By the example of distorted letters, black and white images of hand-written symbols are locally processed in the form of binary 32 x 32 matrices by a computer until the characteristic representation is obtained. For the subsequent recognition, a numerical class representation together with a distance criterion is still employed, as a local class representation has not yet been possible. O.H.

A72-10477 Psychophysical principles of binocular vision (Psychophysische Grundlagen des Binocularsehens). E. Aulhorn (Universitätsaugenklinik, Tübingen, West Germany). In: Pattern recognition in biological and technical systems; Deutsche Gesellschaft für Kybernetik, Congress, 4th, Technische Universität Berlin, Berlin, West Germany, April 6-9, 1970, Proceedings. Berlin, Springer-Verlag, 1971, p. 262-275. In German.

The double image of the surrounding world in both eyes of a man is shown to produce a single-image impression only if several sensoric and motoric preconditions are satisfied. These preconditions are discussed in detail. A description is given of how the image impressions change in case one or more of these preconditions are not satisfied. Particular attention is given to binocularly produced, monocularly effective inhibition processes. O.H.

A72-10478 Size-distance transformation. W. Richards (MIT, Cambridge, Mass.). In: Pattern recognition in biological and technical systems; Deutsche Gesellschaft für Kybernetik, Congress, 4th, Technische Universität Berlin, Berlin, West Germany, April 6-9, 1970, Proceedings. Berlin, Springer-Verlag, 1971, p. 276-287. 11 refs. Contract No. AF 44(620)-69-C-0108.

Problems of perception of size and distance are investigated. It is shown that an object of fixed angular extent may be made to appear grossly different in size by merely altering its apparent distance, either by converging the eyes or by changing its disparity relative to other parts of the field. An adequate prediction of apparent size thus depends on a better understanding of the localization of objects in depth. A possible solution to the problem of depth perception lies in the nature of individual differences in depth perception and in abilities to process disparity. The differences suggest that depth perception may be based upon the activities of three classes of disparity detectors, each class representing a different subset of detectors that sample the disparity spectrum. Depth might then depend upon a comparison of the activities of the classes available. Such a mechanism would explain why depth is generally a nonmonotonic function of disparity. Furthermore, the mechanism would permit relatively minor changes in binocular activity to yield major transformations in apparent size. O.H.

A72-10479 The neuronal basis of binocular vision. E. R. Wist and H. J. Freund (Neurologische Universitätsklinik, Freiburg am Breisgau, West Germany). In: Pattern recognition in biological and technical systems; Deutsche Gesellschaft für Kybernetik, Congress, 4th, Technische Universität Berlin, Berlin, West Germany, April 6-9, 1970, Proceedings. Berlin, Springer-Verlag, 1971, p. 288-300. 23 refs.

Recent microelectrode investigations of Bishop, Barlow and their associates on binocular vision in cats are described, and their relevance as a basis for a neurophysiological theory of binocular vision is discussed. An account of Panum's areas, stereopsis and the horopter is given in terms of the model of Joshua and Bishop (1971). Recent psychophysical experiments on the effect of interocular delays in stimulation on binocular vision in man are described and compared with recent neurophysiological findings on the cat. Finally, the relationship of these results to several neurophysiological models of stereopsis is discussed. O.H.

A72-10480 Binocular depth perception in man - A cooperative model of stereopsis. B. Julesz (Bell Telephone Laboratories, Inc., Murray Hill, N.J.). In: Pattern recognition in biological and technical systems; Deutsche Gesellschaft für Kybernetik, Congress, 4th, Technische Universität Berlin, Berlin, West Germany, April 6-9, 1970, Proceedings. Berlin, Springer-Verlag, 1971, p. 301-315. 21 refs.

Recent studies on stereoscopic depth perception are reviewed and their results are critically analyzed. A spring-coupled magnetic dipole model is proposed which exhibits most of the known psychophysical results. The model explains many of the local and global phenomena of stereopsis and has several implications for some recent neurophysiological findings. It can be further generalized to cope with some other perceptual processes, perhaps even with cognitive processes. O.H.

A72-10481 Neurophysiological basis of hearing - Mechanisms of the inner ear. R. Klinke (Berlin, Freie Universität, Berlin, West Germany). In: Pattern recognition in biological and technical systems; Deutsche Gesellschaft für Kybernetik, Congress, 4th, Technische Universität Berlin, Berlin, West Germany, April 6-9, 1970, Proceedings. Berlin, Springer-Verlag, 1971, p. 316-327. 38 refs.

An introduction is given to pattern recognition in the mammalian peripheral auditory system. A sound stimulus is shown to cause traveling waves to form on Reissner's and, in particular, basilar membrane. Depending on the frequency of the sound stimulus, these waves form a maximum amplitude on different parts of the membrane. The receptor cells on the basilar membrane are most strongly stimulated where the maximum amplitude occurs. The region stimulated with a particular frequency increases with increasing sound intensity. The excitation of the receptors in turn causes a chemical transmitter substance to be released. By means of this substance, the excitation is transmitted to the ends of neighboring afferent nerve fibers. The nerve fibers can transmit the information concerning the intensity of the stimulus with the help of pulse frequency modulation. As the frequency increases, the pulse frequency also increases. Moreover, in the low and middle ranges of sound frequencies there is a correlation between certain phases of the acoustical stimulus and the probability that a discharge will occur.

O.H.

A72-10482 Central mechanisms relevant to the neural analysis of simple and complex sounds. E. F. Evans (Keele, University, Keele, Staffs., England). In: Pattern recognition in biological and technical systems; Deutsche Gesellschaft für Kybernetik, Congress, 4th, Technische Universität Berlin, Berlin, West Germany, April 6-9, 1970, Proceedings. Berlin, Springer-Verlag, 1971, p. 328-343. 87 refs.

Published studies dealing with the neurophysiological aspects of pattern recognition in the auditory system of mammals are reviewed. Steady tonal stimuli, complex stimuli and spatial localization of sources of sound are analyzed. Clicks, noise, stimuli with multiple frequency components, temporal patterning of tones, amplitude-modulated tones, and frequency-modulated tones are covered. Sensory information delivered by the cochlea to the central nervous system is found to be relatively simple. It is also concluded that the temporal vibration patterns of the basilar membrane are retained in the discharge pattern of the cochlear nerve, that the frequency selectivity of the basilar membrane is relatively sharp, and that the so-called acoustic 'relay' nuclei of the brainstem are not passive in nature.

V.Z.

A72-10483 Contributions of the higher auditory pathway portions to pattern recognition in cats (Beiträge höherer Hörbahnanteile der Katze zur Mustererkennung). E. David, P. Finkenzerler, S. Kallert, and W. D. Keidel (Erlangen-Nürnberg, Universität, Erlangen, West Germany). In: Pattern recognition in biological and technical systems; Deutsche Gesellschaft für Kybernetik, Congress, 4th, Technische Universität Berlin, Berlin, West Germany, April 6-9, 1970, Proceedings. Berlin, Springer-Verlag, 1971, p. 344-349. 18 refs. In German.

Only a few neurons in the medial geniculate body show sustained discharge after stimulation with pure tones of noise, whereas with complex stimuli a strong sustained discharge is caused. Likewise, in opposition to the deeper parts of the auditory pathway, many neurons of the medial geniculate body show multiplex frequency response curves. It is suggested that the discrimination of complex sound stimuli (in the sense of phonemes and transients) takes place in the medial geniculate body, whereas frequency discrimination occurs in the deeper parts of the auditory pathway.

M.V.E.

A72-10564 The forgetting of instrument flying skills. R. F. Mengelkoch (Bunker-Ramo Corp., Dayton, Ohio), J. A. Adams (Illinois, University, Champaign, Ill.), and C. A. Gainer (Bunker-Ramo Corp., Canoga Park, Calif.). *Human Factors*, vol. 13, Oct. 1971, p. 397-405. Contract No. N-61339-126.

A laboratory study of forgetting was conducted, using an aircraft simulator as the research device. Two groups of subjects were

used, with one group receiving twice the amount of original training as the other. The retention interval was four months for both groups. The principal result was that discrete procedural response sequences had statistically and practically significant loss over the retention interval, but proficiency in controlling flight parameters (tracking) and statistically significant losses in only some instances and never in operationally significant amounts.

(Author)

A72-10565 * Optimal flash rate and duty cycle for flashing visual indicators. J. Markowitz (MIT, Cambridge, Mass.). *Human Factors*, vol. 13, Oct. 1971, p. 427-433. Research supported by the U.S. Department of Transportation and NASA.

This experiment examined the ability of observers to determine, as quickly as possible, whether a visual indicator was steadily on or flashing. Six flash rates (periods) were combined factorially with three duty cycles (on-off ratios) to define 18 'types' of intermittent signals. Experimental sessions were divided into six runs of 100 trials, each run utilizing one of the six flash rates. On any given trial in a run, the probability of a steady signal occurring was 0.5 and the probability of a flashing signal occurring was 0.5. A different duty cycle was employed daily for each experimental session. In all, 400 trials were devoted to each of the flash rates at each duty cycle. Accuracy and latency of response were the dependent variables of interest. The results show that the observers view the light for an interval of time appropriate to the expected flash rate and duty cycle; whether they judge the light to be steady or intermittent depends upon whether the light is extinguished during the predetermined waiting period. Adoption of this temporal criterion delays responding in comparison to those tasks involving responses to light onset. The decision or response criteria held by the observers are also sensitive to the parameters of the flashing light: observers become increasingly willing to call a flashing light 'steady' as flash duration increases.

(Author)

A72-10567 Foot forces exerted at various aircraft brake-pedal angles. H. T. E. Hertzberg and F. E. Burke (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio). *Human Factors*, vol. 13, Oct. 1971, p. 445-456. 8 refs.

Study of the forces (means and standard deviations) exerted by the foot at various angles of extension about its ankle. A sample of 100 rated pilots was selected by height and weight. The forces were measured in a cockpit mock-up constructed around a specially instrumented F-80 rudder-pedal assembly. The right rudder pedal (hinged on the rudder bar) could be rigidly set to any desired angle between vertical and 75 deg forward of vertical. Foot forces were measured at 11 positions of the instrumented brake pedal in both neutral and extended positions of the right leg, and in three cockpit sizes (37, 39-1/4, and 41 in.) - 66 measures on each man. In all three conditions, maximal forces were exerted within a 20-deg zone between 15 and 35 deg forward of vertical. Subjective comfort preferences, expressed by 86 pilots, closely paralleled the force findings. It is concluded that aircraft brake-pedal systems should be designed to maximize the effectiveness of the foot in that optimal zone, and that the same zone should be considered for other foot-operated controls, like automobile accelerator pedals. (Author)

A72-10568 The effects of age and physique on continuous-work capacity. S. H. Snook (Liberty Mutual Insurance Co., Hopkinton, Mass.). *Human Factors*, vol. 13, Oct. 1971, p. 467-479. 37 refs.

Two hypotheses concerning continuous work capacity were investigated - i.e., the capacity does not decrease with increasing age, and physique has a greater effect on the capacity during slower, heavier tasks than during faster, lighter tasks. Healthy male subjects of two age groups were employed to perform different manual handling tasks, and also a walking task. The continuous-work

capacity of each subject was measured for each task by a psychophysical technique. Heart rates were monitored continuously during task performance. The results supported the age hypothesis. The physique hypothesis, however, was supported only by the results of the younger group of subjects. O.H.

A72-10623 # The intracellular pH prime in the brain in acute and sustained hypercapnia. K. Messeter (Lund, University Hospital, Lund, Sweden) and B. K. Siesjö (Lund, Universitet, Lund, Sweden). *Acta Physiologica Scandinavica*, vol. 83, Oct. 1971, p. 210-219. 33 refs. Research supported by the Swedish Medical Council and the C.-B. Nathorst's Vetenskapliga Stiftelse; PHS Grant No. 5 RO1 NS-07838-02. Project B71-14X-263-07A; Project B71-14X-2179-03.

The regulation of intracellular pH prime in the brain was studied in rats exposed to about 11% CO₂ for periods of 15 min to 72 hr. The intracellular HCO₃(-) concentration was calculated assuming extracellular volumes of 12, 15, and 20%, respectively, and the intracellular pH prime was derived from the HCO₃(-) concentration and the mean tissue CO₂ tension. An analysis of the regulating mechanisms suggests that physicochemical buffering, metabolic consumption of acids, and transmembrane fluxes of H(+) or HCO₃(-) each contributed about a third of the total accumulation of bicarbonate in the cell during hypercapnia. M.M.

A72-10624 # Discharge patterns in motor nerve fibres during voluntary effort in man. U. Freyschuss and E. Knutsson (Kungl. Karolinska Institutet, Stockholm, Sweden). *Acta Physiologica Scandinavica*, vol. 83, Oct. 1971, p. 278, 279. 5 refs.

Nerve impulses were recorded in 13 healthy volunteers with commercial microelectrodes inserted percutaneously into the median or ulnar nerves just above the wrist (Knutsson and Widén, 1967). The nerve impulses which were repeatedly elicited at intentions to perform a handgrip were regarded as motor nerve discharges. It is pointed out that transient random discharges in motor units during the first seconds after succinylcholine administration would indicate an excitatory drive, but that these discharges ceased as the block became complete and sustained resting discharges of the motor fibers were never seen. Hence, a drug-induced inhibition of the motoneurons cannot be excluded, but other mechanisms might also explain the relatively low degree of activity in the motor fibers even during maximal effort to contract. Thus a maintenance of voluntary contraction might require a concomitant excitation of the fusimotor system, which was inoperative by the neuromuscular blockade of intrafusal fibers. M.M.

A72-10625 * On the anisotropic elastic properties of hydroxyapatite. J. L. Katz and K. Ukraincik (Rensselaer Polytechnic Institute, Troy, N.Y.). *Journal of Biomechanics*, vol. 4, May 1971, p. 221-227. 22 refs. PHS Grants No. 5 PO1 DE-0117-08; No. 5 TI DE-0117-08; Grant No. NGL-33-018-003.

Experimental measurements of the isotropic elastic moduli on polycrystalline specimens of hydroxyapatite and fluorapatite are compared with elastic constants measured directly from single crystals of fluorapatite in order to derive a set of pseudo single crystal elastic constants for hydroxyapatite. The stiffness coefficients thus derived are given. The anisotropic and isotropic elastic properties are then computed and compared with similar properties derived from experimental observations of the anisotropic behavior of bone. M.M.

A72-10713 The threshold for successiveness. J. Baron (McMaster University, Hamilton, Ontario, Canada). *Perception and Psychophysics*, vol. 10, no. 4(A), Oct. 1971, p. 201-207. 21 refs. NSF Grant No. GB-8181.

In Experiment 1, three stimuli were presented on each trial; the second and third were simultaneous. Ss said which of the three they saw first and then made a different second guess. Second guesses were correct more often than chance when first guesses were wrong, contradicting the predictions of a psychological moment theory. Psychometric functions are inconsistent with a theory which holds that Ss can order their perceptions and that errors result from lack of correspondence between this order and that of the stimuli. In Experiment 2, two pairs of stimuli, each simultaneous or successive, were presented on each trial, the interval between their onsets varying, and Ss guessed whether each was successive. A moment-like cyclic process affecting the perception of successive stimuli should raise the correlation between responses when both pairs were successive and beginning at the same time; this was not found.

(Author)

A72-10714 A depth processing theory of the Poggendorff illusion. B. Gillam (Columbia University, New York, N.Y.). *Perception and Psychophysics*, vol. 10, no. 4(A), Oct. 1971, p. 211-216. 29 refs. PHS Grant No. 5 RO1 EY-00391; Contract No. N00014-67-A-0108-0009.

The Poggendorff illusion is attributed to the processing of the oblique lines of the Poggendorff figure as receding horizontal lines with their inner ends equidistant because of attachment to a horizontal plane (defined by the parallel lines of the figure). Collinearity in three-dimensional space is inconsistent with such equidistance; one line must lie on a higher horizontal plane than the other. This necessarily noncollinear resolution of the lines in depth processing (which is inferred irrespective of the subject's consciousness of depth) is assumed to influence apparent projective relationships within the figure, thus accounting for the illusion. T.M.

A72-10715 Objective and subjective complexity measures for a new population of patterns. J. G. Snodgrass (New York University, Bronx, N.Y.). *Perception and Psychophysics*, vol. 10, no. 4(A), Oct. 1971, p. 217-224. 25 refs. Research supported by New York University; NIH Grant No. MH-17612-01.

A method of generating two-element matrix patterns having varying degrees of internal constraint is described. The method was used to generate a set of 9 x 9 matrix patterns of black and white squares in approximately equal proportion, ranging from very simple to very complex. Three sets of objective complexity measures were developed, the first two within the framework of information theory and the third based on symmetry and grouping of identical elements. Multiple regression between the objective measures and subjective complexity scale values obtained in three separate experiments indicated that one of the information measures was uniformly superior in predicting subjective complexity. (Author)

A72-10716 Contrast reversal or distance paradox in the temperature perception aftereffect. M. M. Taylor (Defence Research Establishment, Toronto, Downsview, Ontario, Canada). *Perception and Psychophysics*, vol. 10, no. 4(A), Oct. 1971, p. 247, 248. 9 refs.

Data claiming to show a reversal of the classical contrast effect in temperature perception seem instead to bring the temperature aftereffect into the class of aftereffects which show a 'distance paradox.' The amount of direct contrast first increases and then decreases as the temperature differential between the adapting and test objects increases. Reversed contrast does not seem to occur. The form of the distance paradox function is like that of the distance paradox function in many other perceptual dimensions and probably demands a similar explanation. The effect of prolonged adaptation, however, is the opposite of the effect found in most figural aftereffects. (Author)

A72-10717 The Poggendorff illusion - Amputations, rotations, and other perturbations. D. J. Weintraub and D. H. Krantz

(Michigan, University, Ann Arbor, Mich.). *Perception and Psychophysics*, vol. 10, no. 4(B), Oct. 1971, p. 257-264. 15 refs. NSF Grants No. GB-3110; No. GB-4947; No. GB-8181; PHS Grant No. FR-07050-03.

Studies of the Poggendorff illusion (a transversal interrupted by parallel lines) showed that illusory effects increased linearly with increasing separation between the parallels, increased in inverse proportion to the tangent of the angle of intersection between transversal and parallels, decreased whenever line segments (other than a transversal segment) were omitted, decreasing to zero when the segment of a parallel forming the obtuse angle with the transversal was omitted, and varied systematically with the tilt of the whole display, approaching zero when the transversal was oriented in a horizontal or vertical position. Hypothesis: The Poggendorff illusion involves at least three kinds of effects on the perceived orientation of a segment: distortion by other segments (especially a segment intersecting at an obtuse angle), stability of vertical and horizontal orientations, and assimilation toward vertical or horizontal. (Author)

A72-10718 Practice and some methodological problems in unidimensional information transmission. A. Fulgosi and B. Bartolović (Zagreb, Sveučilište, Zagreb, Yugoslavia). *Perception and Psychophysics*, vol. 10, no. 4(B), Oct. 1971, p. 283-285. 9 refs.

Fifty circular lights differing in diam from 4 to 53 cm and increasing by 1 cm were presented 135 times each to five subjects who were asked to identify each circle. Presentations were in random order. Indices of information transmission (T), response equivocation HS(R), and response uncertainty H(R) were calculated for different phases of the experiment for individual and pooled responses. The following conclusions were reached: (1) channel capacity indices should not be calculated from all individual responses given during the experiment or from pooled responses of different subjects; and (2) indices of channel capacity should be calculated only after the performance of subjects has reached a final and stable level, which means after enough repetitions of each stimulus. M.M.

A72-10719 Does head-movement feedback calibrate the perceived direction of optical motions. J. C. Hay (Wisconsin, University, Milwaukee, Wis.). *Perception and Psychophysics*, vol. 10, no. 4(B), Oct. 1971, p. 286-288. 12 refs. NIH Grant No. 5R-HD-03082.

Vertical motions of the head were made to cause diagonal optical motions by using an electronic rearrangement technique. Constancy of visual position during the head movement showed a rapid adaptive change; however, no change was found in perceived movement direction when the head was then held stationary and a vertical object movement presented. These results confirm that a memory exists for the correlation between head motion and optical motion, but indicate that this memory does not control the perception of externally generated optical motions. Together with earlier evidence, the results suggest that the memory lies in the eye-movement control system and in a part of that system which is operative during head movement but not during passively viewed object movement. (Author)

A72-10720 Factors affecting the filled-duration illusion in the auditory, tactual, and visual modalities. L. Buffardi (Kansas State University of Agriculture and Applied Science, Manhattan, Kan.). *Perception and Psychophysics*, vol. 10, no. 4(B), Oct. 1971, p. 292-294. 10 refs. NIH Grant No. MH-15969.

The filled-duration illusion was investigated for auditory, tactual, and visual presentation. The number of intervening discrete elements was the most important factor, as durations with more elements were judged longer than durations with fewer elements. In addition, the configuration of the intervening elements affected

judgments. However, the illusion was identical in all three modalities. A cognitive explanation based on counting the number of intervening elements seemed most satisfactory. (Author)

A72-10721 Stabilized images - The search for pattern elements. M. J. Schmidt, D. D. Fulgham, and D. R. Brown (Purdue University, West Lafayette, Ind.). *Perception and Psychophysics*, vol. 10, no. 4(B), Oct. 1971, p. 295-299. 30 refs. NIH Grant No. HD-00909.

In a series of four experiments, the fragmentation of stabilized lines and angles viewed in different orientations was studied. With high inter-O agreement, it was possible to demonstrate reliable differences among patterns, with resistance to fading being a function of both pattern and orientation. The results were discussed in terms of possible suparetinal stages of pattern analysis. (Author)

A72-10722 The relationships among time, distance, and intensity as determinants of motion discrimination. D. C. Henderson (Columbia University, New York, N.Y.). *Perception and Psychophysics*, vol. 10, no. 4(B), Oct. 1971, p. 313-320. 25 refs. PHS Grant No. R01 NB-07698; Contract No. Nonr-266(46).

The threshold stimulus for visual motion discrimination was analyzed into the constituent parameters of velocity - i.e., time and distance, with both of these primary variables subject-determined. It was found that, given a constant stimulus luminance, motion threshold was characterized generally by a 'trade-off' or inverse power relationship between time and distance of movement. Earlier reports of energy constancy at threshold (Brown, 1955, 1957, 1958), implying threshold relationships incompatible with these, were confirmed only for the atypical conditions of high-velocity/low-luminance stimuli and were attributed to absolute visibility requirements. Under more general and representative conditions, threshold was relatively insensitive to luminance. The present results were also contrasted with earlier findings (Graham, 1968) of distance or 'displacement' constancy at threshold, pertaining to movement between stationary start and stop positions. (Author)

A72-10768 Compatibility of the CO₂ concentrator's materials to the space shuttle life support environment. R. A. Wynveen (Life Systems, Inc., Cleveland, Ohio). In: Space shuttle materials; Proceedings of the National Technical Conference, Huntsville, Ala., October 5-7, 1971. Azusa, Calif., Society of Aerospace Material and Process Engineers, 1971, p. 499-505.

Comparison of an electrochemical CO₂ concentrating system under development with alternate CO₂ removal systems for meeting the CO₂ removal requirements of the Space Shuttle orbiter. The only system comparable to the proposed system is a nonregenerative system based on the use of LiOH. The electrochemical system surpasses the LiOH method in having a lower life cycle cost, because it avoids the LiOH logistics and in-flight service requirements. After missions of 20 to 30 man-days the electrochemical system becomes more attractive than the LiOH method. A.B.K.

A72-10771 Toxicological control and chemical analysis of outgassing products from nonmetallics evaluated for use within the LM crew compartment. R. L. Santoro and R. J. Holden (Grumman Aerospace Corp., Bethpage, N.Y.). In: Space shuttle materials; Proceedings of the National Technical Conference, Huntsville, Ala., October 5-7, 1971. Azusa, Calif., Society of Aerospace Material and Process Engineers, 1971, p. 549-556.

Methods of gaseous analysis are outlined for the determination of outgassing products resulting from the exposure of nonmetallics to a 100% oxygen atmosphere and elevated temperature. Various techniques involving gas and liquid chromatography and infrared spectroscopy are discussed. Approximately 300 to 400 materials

have been evaluated, including adhesives, plastics, potting compounds, and coatings. The use of wet chemical methods for the determination of ammonia, hydrogen cyanide, and trapping techniques to concentrate gases which outgas at low levels is presented. The analytical outgassing data are integrated into a computer program which tabulates the gaseous trace contaminants and shows their additive effect upon different body organs and physiological systems. In addition, the integrated system permits the suspected outgassing trace contaminants to be traced back to their material sources. (Author)

A72-10817 **Planetary quarantine: Principles, methods, and problems.** Edited by L. B. Hall (NASA, Washington, D.C.). New York, Gordon and Breach, Science Publishers, Inc., 1971. 173 p. \$14.50.

Microbial survival in deep space environment, contamination of planets by nonsterile flight hardware, and hazards of back contamination are among the topics covered in papers concerned with the analytical basis for planetary quarantine. The development of the technology and policies of planetary quarantine is covered in contributions on microbiologic assay and sterilization of space flight hardware and control of microbial contamination. A comprehensive subject index is included.

M.V.E.

A72-10818 * **Foundations of planetary quarantine.** L. B. Hall (NASA, Washington, D.C.) and R. G. Lyle (Exotech Systems, Inc., Washington, D.C.). (*Environmental Biology and Medicine*, vol. 1, 1971, p. 5-8.) In: Planetary quarantine: Principles, methods, and problems. New York, Gordon and Breach, Science Publishers, Inc., 1971, p. 5-8. 10 refs. Contract No. NSR-09-010-027.

Discussion of some of the problems in microbiology and engineering involved in the implementation of planetary quarantine. It is shown that the solutions require new knowledge in both disciplines for success at low cost in terms of both monetary outlay and man's further exploration of the planets. A related problem exists in that engineers are not accustomed to the wide variation of biological data and microbiologists must learn to work and think in more exact terms. Those responsible for formulating or influencing national and international policies must walk a tightrope with delicate balance between unnecessarily stringent requirements for planetary quarantine on the one hand and prevention of contamination on the other. The success of planetary quarantine measures can be assured only by rigorous measures, each checked, rechecked, and triple-checked to make sure that no errors have been made and that no factor has been overlooked. M.V.E.

A72-10819 * **Analytical basis for planetary quarantine.** S. Schalkowsky (Exotech Systems, Inc., Washington, D.C.) and R. C. Kline, Jr. (Management and Science Technology, Silver Spring, Md.). (*Environmental Biology and Medicine*, vol. 1, 1971, p. 9-26.) In: Planetary quarantine: Principles, methods, and problems. New York, Gordon and Breach, Science Publishers, Inc., 1971, p. 9-26. 28 refs. Contract No. NSR-09-010-027.

The attempt is made to investigate quarantine constraints, and alternatives for meeting them, in sufficient detail for identifying those courses of action which compromise neither the quarantine nor the space mission objectives. Mathematical models pertinent to this goal are formulated at three distinct levels. The first level of mission constraint models pertains to the quarantine goals considered necessary by the international scientific community. The principal emphasis of modeling at this level is to quantify international considerations and to produce well-defined mission constraints. Such constraints must be translated into explicit implementation requirements by the operational agency of the launching nation. This

produces the second level of implementation system modeling. However, because of the multitude of factors entering into the implementation models, it is convenient to consider these factors at the third level of implementation parameter models. These models are intentionally limited to the inclusion of only those factors which can be quantified realistically, either now or in the near future.

M.V.E.

A72-10820 * **Microbiologic assay of space hardware.** M. S. Favero (U.S. Public Health Service, Center for Disease Control, Phoenix, Ariz.). (*Environmental Biology and Medicine*, vol. 1, 1971, p. 27-36.) In: Planetary quarantine: Principles, methods, and problems. New York, Gordon and Breach, Science Publishers, Inc., 1971, p. 27-36. 31 refs. Contract No. NSR-09-010-027.

Review of the procedures used in the microbiological examination of space hardware. The general procedure for enumerating aerobic and anaerobic microorganisms and spores is outlined. Culture media and temperature-time cycles used for incubation are reviewed, along with assay systems designed for the enumeration of aerobic and anaerobic spores. The special problems which are discussed are involved in the precise and accurate enumeration of microorganisms on surfaces and in the neutralization of viable organisms buried inside solid materials that could be released to a planet's surface if the solid should be fractured. Special attention is given to sampling procedures including also the indirect techniques of surface assays of space hardware such as those using detachable or fallout strips. Some data on comparative levels of microbial contamination on lunar and planetary spacecraft are presented. M.V.E.

A72-10821 * **Control of microbial contamination.** J. J. McDade (Dow Chemical Co., Midland, Mich.). (*Environmental Biology and Medicine*, vol. 1, 1971, p. 37-62.) In: Planetary quarantine: Principles, methods, and problems. New York, Gordon and Breach, Science Publishers, Inc., 1971, p. 37-62. 76 refs. Contract No. NSR-09-010-027.

Two specific applications are discussed of microbial contamination control in planetary quarantine. Under the first concept, using the clean room to control environmental microorganisms, the objective is to reduce the microbial species and keep the numbers of microorganisms within an enclosure at a low level. The clean room concept is aimed at obtaining a product that has a controlled and reduced level of microbial contamination. Under the second concept, using the microbiological barrier to control microbial contamination of a specific product, the barrier techniques are designed to prevent the entry of any microorganisms into a sterile work area. Thus the assembly of space flight hardware within the confines of a microbiological barrier is aimed at obtaining a sterile product. In theory and practice, both approaches are shown to be applicable to the planetary quarantine program. M.V.E.

A72-10822 * **Sterilization of space hardware.** I. J. Pflug (Minnesota, University, Minneapolis, Minn.). (*Environmental Biology and Medicine*, vol. 1, 1971, p. 63-81.) In: Planetary quarantine: Principles, methods, and problems. New York, Gordon and Breach, Science Publishers, Inc., 1971, p. 63-81. 47 refs. Contract No. NSR-09-010-027.

Discussion of various techniques of sterilization of space flight hardware using either destructive heating or the action of chemicals. Factors considered in the dry-heat destruction of microorganisms include the effects of microbial water content, temperature, the physicochemical properties of the microorganism and adjacent support, and nature of the surrounding gas atmosphere. Dry-heat destruction rates of microorganisms on the surface, between mated surface areas, or buried in the solid material of space vehicle hardware are reviewed, along with alternative dry-heat sterilization cycles, thermodynamic considerations, and considerations of final

sterilization-process design. Discussed sterilization chemicals include ethylene oxide, formaldehyde, methyl bromide, dimethyl sulfoxide, peracetic acid, and beta-propiolactone.

M.V.E.

A72-10823 * **Microbial survival in deep space environment.**

G. J. Silverman (U.S. Army, Natick Laboratories, Natick, Mass.). (*Environmental Biology and Medicine*, vol. 1, 1971, p. 83-97.) In: Planetary quarantine: Principles, methods, and problems. New York, Gordon and Breach, Science Publishers, Inc., 1971, p. 83-97. 37 refs. Contract No. NSR-09-010-027.

Review of the knowledge available on the extent to which microorganisms (mainly microbial spores, vegetative cells, and fungi) are capable of surviving the environment of deep space, based on recent simulation experiments of deep space. A description of the experimental procedures used is followed by a discussion of deep space ecology, the behavior of microorganisms in ultrahigh vacuum, and factors influencing microbial survival. It is concluded that, so far, simulation experiments have proved far less lethal to microorganisms than to other forms of life. There are, however, wide gaps in the knowledge available, and no accurate predictions can as yet be made on the degree of lethality that might be incurred by a microbial population on a given mission. Therefore, sterilization of spacecraft surfaces is deemed necessary if induced panspermia (i.e., interplanetary life propagation) is to be avoided.

M.V.E.

A72-10824 * **Contamination of planets by nonsterile flight hardware.**

R. P. Wolfson (General Electric Co., Riverdale, Md.) and C. W. Craven (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). (*Environmental Biology and Medicine*, vol. 1, 1971, p. 99-120.) In: Planetary quarantine: Principles, methods, and problems. New York, Gordon and Breach, Science Publishers, Inc., 1971, p. 99-120. 41 refs. Contract No. NSR-09-010-027.

The various factors about space missions and spacecraft involved in the study of nonsterile space flight hardware with respect to their effects on planetary quarantine are reviewed. It is shown that methodology currently exists to evaluate the various potential contamination sources and to take appropriate steps in the design of spacecraft hardware and mission parameters so that quarantine constraints are met. This work should be done for each program so that the latest knowledge pertaining to various biological questions is utilized, and so that the specific hardware designs of the program can be assessed. The general trend of specific recommendations include: (1) biasing the launch trajectory away from planet to assure against accidental impact of the spacecraft; (2) selecting planetary orbits that meet quarantine requirements - both for accidental impact and for minimizing contamination probabilities due to ejecta; and (3) manufacturing and handling spacecraft under cleanliness conditions assuring minimum bioload.

M.V.E.

A72-10825 * **Back contamination.** G. B. Phillips (Becton, Dickinson Research Center, Raleigh, N.C.). (*Environmental Biology and Medicine*, vol. 1, 1971, p. 121-160.) In: Planetary quarantine: Principles, methods, and problems. New York, Gordon and Breach, Science Publishers, Inc., 1971, p. 121-160. 30 refs. Contract No. NSR-09-010-027.

Discussion of the concept and implications of back contamination and of the ways and means for its prevention. Back contamination is defined as contamination of the terrestrial biosphere with organisms or materials returned from outer space that are capable of potentially harmful terrestrial activity. Since the question of whether or not life exists on other planets may, in reality, not be answered until many samples are returned to earth for detailed study, requirements for the prevention of back contamination are necessary. A review of methods of microbiologic contamination control is followed by a discussion of the nature of back contamina-

tion and its risk levels, contamination sources and locations, and possible defenses against back contamination. The U.S. lunar back contamination program is described and shown to provide a valuable basis for further refining the technology for the control of planetary back contamination.

M.V.E.

A72-10847 **Inhomogeneity effects on O₂ and CO pulmonary diffusing capacity estimates by steady-state methods - Theory.** A. Chinnet, J. L. Micheli, and P. Haab (Fribourg, Université, Fribourg, Switzerland). *Respiration Physiology*, vol. 13, Oct. 1971, p. 1-22. 47 refs. Swiss National Foundation for Scientific Research Grant No. 2718.

Analysis of the effects of pulmonary functional inhomogeneities on steady-state O₂ and CO diffusing capacity estimates in terms of gas transfer resistances for O₂ and for CO. To this end, a mathematical treatment was developed which is applicable to the transfer of any gas in inhomogeneous lungs. Quantitative comparisons of diffusing capacity, D, with its estimates (as obtained by classical steady-state equations) were established on multi-compartmental lung models similar to those used by West (1969). Results show that, for inhomogeneous lungs, diffusing capacity estimates are lower than diffusing capacity. This divergence, which increases with the amount of inhomogeneity, is larger for D sub O₂ than for D sub CO. In contrast, it was also found that, in the particular case where D sub CO estimates are computed according to Filley, these can be higher than D sub CO. These findings can be adequately comprehended in terms of network analysis. They provide an explanation for the well-known discrepancy between morphometric and functional D estimates, as well as for the fact that D sub CO values higher than D sub O₂ values are encountered in the literature. (Author)

A72-10848 **Effects of acute through life-long hypoxic exposure on exercise pulmonary gas exchange.** J. A. Dempsey, W. G. Reddan, M. L. Birnbaum, H. V. Forster, J. S. Thoden, R. F. Grover, and J. Rankin (Wisconsin, University, Madison, Wis.; St. Vincent's Hospital, Leadville, Colo.). *Respiration Physiology*, vol. 13, Oct. 1971, p. 62-89. 62 refs. Research supported by the Wisconsin Heart Association; NIH Grant No. FRO-00249; Grant No. DA-DA-17-68-C-8013.

Comparison of the adequacy, efficiency, and control of pulmonary gas exchange during exercise among groups who were exposed for various durations of time to moderate hypoxia (3100 m altitude, P_I sub O₂ 100 mm Hg). These groups included native lowlanders during acute, short-term (4 to 45 days) and long-term (1 to 16 yr) exposure and native highlanders of 1 to 3 generations exposure. The working sojourner depended almost entirely on his ventilatory adaptation for maintaining adequate pulmonary and systemic O₂ transport at 3100 m. Exercise D sub L sub CO, V sub C, (A-a) D sub O₂, and Hb concentration were unchanged from acute through 21 days exposure, although (A-a) D sub O₂ widened after 45 days at 3100 m. In contrast to the sojourner, the resident of 3100 m hypoventilated during exercise and maintained P_a sub CO₂ at or above resting levels. He depended on a high O₂ carrying capacity and most importantly on an increased D sub L sub CO and V sub C and narrowed (A-a) D sub O₂ for his enhanced systemic O₂ delivery during work. No differences in the pulmonary response to work were found among long-term and native residents of 3100 m. Hence, the highlander avoided the high levels of ventilatory work and exertional dyspnea experienced by the sojourner without compromising systemic O₂ delivery. (Author)

A72-10854 **Signal value and physiological response to affective visual stimuli.** D. Carroll (Australian National University, Canberra, Australia). *Psychonomic Science*, vol. 25, Oct. 25, 1971, p. 94-96. 12 refs.

Forehead pulse amplitude and GSR were monitored while Ss

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viewed a set of affective and neutral slides under two conditions. In one condition, signal value was minimized, in the other it was maximized. The forehead pulse amplitude response was influenced by signal value change. Both GSR and self-report of affect appeared insensitive to changes in signal value. (Author)

A72-10862 **On the birefringence of rods and cones.** R. A. Weale (Institute of Ophthalmology, London, England). *Pflugers Archiv*, vol. 329, no. 3, 1971, p. 244-257. 22 refs.

Measurements were made of the birefringence of bleached rods and cones of six non-mammalian vertebrates. The variables included fixatives and temperature, and the immersing medium namely ethyl alcohol, urea, type of Ringer solution, and sucrose. The temperature variations of the birefringence of rods and cones were similar in frogs and in goldfish, respectively, but showed a significant interspecies difference. Rods fixed faster than cones, and the birefringence of cones is higher than that of rods. The birefringence of frog rods rose with the osmolarity of sucrose, but was unaffected by urea. Over 30% of the rod volume is occupied by solid: fixation is believed to destroy the two types of intrinsic birefringence which are postulated to exist as a result of the experiment on osmolarity, and to leave only form birefringence intact. A theory of receptor birefringence is also tested. (Author)

A72-10932 **Cardiovascular and metabolic effects of bed rest and immobilization - Simulated weightlessness.** M. McCally, L. E. Kazarian, and H. E. Von Gierke (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, Ohio). In: *Astronautical research 1970; International Astronautical Federation, Congress, 21st, Konstanz, West Germany, October 4-10, 1970, Proceedings.*

Amsterdam, North-Holland Publishing Co., 1971, p. 264-282. 12 refs. USAF-sponsored research.

Summary of recent studies of bed rest with human subjects for periods up to 35 days, and of primates immobilized in plaster cases for periods up to 120 days. The studies examined the structural and functional consequences of disuse in the cardiovascular, metabolic, and musculoskeletal physiological systems. Weightlessness, confinement, and inactivity results in orthostatic tachycardia and orthostatic hypotension during post-flight tilt-table testing. A striking metabolic effect produced by inactivity is glucose intolerance. In the skeleton inactivity produces significant osteoporosis, even of the weight-bearing spine. F.R.L.

A72-10933 **Some results of physiological investigations during the flight of the 'Soyuz-9' spacecraft.** O. G. Gazenko and P. V. Vasil'ev. In: *Astronautical research 1970; International Astronautical Federation, Congress, 21st, Konstanz, West Germany, October 4-10, 1970, Proceedings.* Amsterdam, North-Holland Publishing Co., 1971, p. 325-327.

Assessment of medical findings during and after the Soyuz-9 flight, which gives evidence that man can survive an 18-day space flight and retain mental and physical performance. The observations suggest that the entire cycle of adaptation-readaptation to the space-earth requirements makes certain demands upon the adaptive mechanisms of the human body, and that readaptation is a more difficult process. F.R.L.

A72-10934 **Effects of acceleration - A contribution to the study of experiment animals' tolerance to prolonged acceleration.** M. Nieto, Jr. and M. Nieto, Sr. In: *Astronautical research 1970; International Astronautical Federation, Congress, 21st, Konstanz, West Germany, October 4-10, 1970, Proceedings.* Amsterdam, North-Holland Publishing Co., 1971, p. 353-360.

Study of tolerance to and consequences of accelerations or supergravities acting for long periods on an animal with a physiology

suited to terrestrial gravity. Groups of white mice were centrifuged at 4-g acceleration for 30 days or more, and at 2-g for 40 days. It appears that alterations produced by 4-g acceleration are irreversible when a certain intensity is obtained. Every mouse exposed to 2-g acceleration survived for 40 days. No sex-related effects were noticeable, either in development or in growth. F.R.L.

A72-10951 **Preliminary investigations on the root wilt disease in coconut plants in Kerala State /India/ by remote sensing technique /A NASA-ISRO-IARI-CCRS project/.** C. Dakshinamurti, B. Krishnamurthy, A. S. Summanwar, P. Shanta, and P. R. Pisharoty. In: *Astronautical research 1970; International Astronautical Federation, Congress, 21st, Konstanz, West Germany, October 4-10, 1970, Proceedings.* Amsterdam, North-Holland Publishing Co., 1971, p. 850-854.

Review of some of the preliminary results, obtained through remote sensing techniques, on the root wilt disease in coconut plants in Kerala State. The techniques used included photography in several bands with black-and-white, color, and infrared Ektrachrome films. Samples collected for ground truth studies to correlate with infrared pictures are also discussed. M.V.E.

A72-11036 * **Effect of varying ventricular function by extrasystolic potentiation on closure of the mitral valve.** R. A. Vandenberg, J. C. P. Williams (Mayo Clinic and Mayo Foundation, Rochester, Minn.), R. E. Sturm, and E. H. Wood (Minnesota University, Rochester, Minn.). *American Journal of Cardiology*, vol. 28, July 1971, p. 43-53. 30 refs. Research supported by the American Heart Association; NIH Grants No. HE-3532; No. FR-00007; No. HE-4664; Grants No. NsG-327; No. NGR-24-003-002.

Mitral regurgitant indexes were measured by roentgen videodensitometry in anesthetized dogs without thoracotomy before, during and after extrasystolic potentiation of ventricular contraction while the atria and ventricles were driven in normal temporal sequence simultaneously or in such a way as to induce atrial fibrillation. Small amounts of mitral reflux were observed with simultaneous atrial and ventricular driving and with atrial fibrillation in the control measurements before initiation of extrasystolic potentiation. Reflux became negligible during extrasystolic potentiation and increased beyond control levels after termination of extrasystolic potentiation. M.M.

A72-11038 * **A computer-controlled scintiscanning system and associated computer graphic techniques for study of regional distribution of blood flow.** C. M. Coulam, W. H. Dunnette, and E. H. Wood (Mayo Clinic, Rochester, Minn.). *Computers and Biomedical Research*, vol. 3, June 1970, p. 249-273. 34 refs. Research supported by the American Heart Association; NIH Grants No. HE-4664; No. FR-7; No. 1 F2 HE-16-769; Contract No. AF 41(609)-68-C-0022; Grant No. NGR-24-003-002.

Two methods whereby a digital computer may be used to regulate a scintiscanning process are discussed from the viewpoint of computer input-output software. The computer's function, in this case, is to govern the data acquisition and storage, and to display the results to the investigator in a meaningful manner, both during and subsequent to the scanning process. Several methods (such as three-dimensional maps, contour plots, and wall-reflection maps) have been developed by means of which the computer can graphically display the data on-line, for real-time monitoring purposes, during the scanning procedure and subsequently for detailed analysis of the data obtained. A computer-governed method for converting scintiscan data recorded over the dorsal or ventral surfaces of the thorax into fractions of pulmonary blood flow traversing the right and left lungs is presented. M.M.

A72-11039 * Some observations on the three-dimensional growth of L5178Y cell colonies in soft agar culture. H. Dalen and H. J. Burki (California, University, Berkeley, Calif.). *Experimental Cell Research*, vol. 65, 1971, p. 433-438. 17 refs. Research supported by the Southwest Center for Advanced Studies and NASA. NASA Order W-12-792/06/.

The three-dimensional organization of spherical colonies formed by L5178Y cells grown in soft agar cultures was investigated by light and scanning electron microscopy. Visible colonies were formed after 7 days of incubation and increased in size for more than 2 weeks. At this time the colonies contained a central core of necrotic cells surrounded by an outer shell of normal-looking cells in loose contact with each other. Cross sectional radioautographs revealed that tritiated precursors were incorporated only into those cells in the 'viable cell' shell and not in the necrotic center of the colony. It is pointed out that increased knowledge of the factors leading to this type of three-dimensional organization is of particular interest, since it is similar to the conditions found in certain types of solid tumors (Thomlinson and Gray, 1955). M.M.

A72-11040 * A biplane roentgen videometry system for dynamic /60 per second/ studies of the shape and size of circulatory structures, particularly the left ventricle. E. L. Ritman, E. Sturm, and E. H. Wood (Minnesota, University, Rochester, Minn.). In: Roentgen-, cine- and videodensitometry: Fundamentals and applications for blood flow and heart volume determination. Edited by P. H. Heintzen. Stuttgart, Georg Thieme Verlag, 1971, p. 179-211. 9 refs. Research supported by the American Heart Association; NIH Grants No. HE-4664; No. FR-7; No. HE-3532; Grant No. NGR-24-003-001.

A roentgen-television digital-computer technique and a display system developed for dynamic circulatory structure studies are described. Details are given for a videoroentgenographic setup which is used for obtaining biplane roentgen silhouettes of a left ventricle. A 60 per sec measurement of the shape and volume of angiographically outlined cardiac chambers can be made by this technique along with simultaneous ECG, pressure, and flow measurements accessible for real-time digital computer processing and analysis. V.Z.

A72-11138 # Human factors study of keyboards for cockpit data entry. C. A. Fenwick and H. M. Schweighofer (Collins Radio Co., Cedar Rapids, Iowa). *Journal of Aircraft*, vol. 8, Nov. 1971, p. 936-938.

Discussion of the general nature of studies and conclusions influencing the control and design of area navigation control and display units. The standardized operator task in each study involved entering a sequence of vhf communication frequencies taken from sequences used in actual cross-country flights. Response time was measured from the time a start tone sounded and the desired frequency was presented on a 7-bar incandescent display until an insert key was pushed. Each trial ended with the operator pushing a key indicating that he thought the frequency he inserted was either a correct insert, an error insert, or an error corrected. M.M.

A72-11149 * Inhaled ozone as a mutagen. II - Effect on the frequency of chromosome aberrations observed in irradiated Chinese hamsters. R. E. Zelac, H. L. Cromroy, W. E. Bolch, Jr., B. G. Dunavant, and H. A. Bevis (Florida, University, Gainesville, Fla.). *Environmental Research*, vol. 4, Oct. 1971, p. 325-342. 70 refs. AEC Contract No. AT (40-1)-3599; Grant No. NsG-542; Contract No. N 00228-68-C-2658. NASA Project A23.

Exposure-adjusted break frequencies for chromosome aberrations produced in Chinese hamster circulating blood lymphocytes were the quantitative indicator of damage from 5 hrs of exposure to X-radiation and/or to ozone. Radiation produced 5.51×0.0001 breaks/cell rad for cells withdrawn 2 weeks after exposure, a reasonable value when compared with data from in vivo exposure of

human lymphocytes and Chinese hamster bone marrow cells. Animals exposed to the two agents simultaneously exhibited more than 70% of the total breaks anticipated assuming the expected equal contributions to be additive. Extending to humans, at presently permitted levels, exposure to ozone would be much more detrimental than exposure to radiation. M.M.

A72-11185 Localization of the human visual evoked response. Z. Nakamura and W. R. Biersdorf (Ohio State University, Columbus, Ohio). *American Journal of Ophthalmology*, vol. 72, Nov. 1971, p. 988-997. 30 refs. Research supported by the Ohio State University; PHS Grant No. EY-00454.

Visual evoked responses (VERs) were recorded in normal subjects to full-disk and lateral half-disk stimulation in a full-field light adapted situation. Early components of the VER, peaking at 47, 68, and 95 msec, were found to be maximal over the cerebral hemisphere corresponding to the half-field stimulated. From 17 electrode positions on the posterior scalp, detailed potential contour maps were plotted for each component. The maximum focus for the three early components occurred in the parietal to central area of the corresponding hemisphere with a potential near zero at the occipital pole. While early components of the VER were thus specific to the lateral half-field stimulated, this was not true for later components. The results were similar for either right or left eyes. M.M.

A72-11192 * Trends in problem-solving research - Twelve recently described tasks. G. D. Coates, E. A. Alluisi, and B. B. Morgan, Jr. (Louisville, University, Louisville, Ky.). *Perceptual and Motor Skills*, vol. 33, Oct. 1971, p. 495-505. 54 refs. Grant No. NGR-18-002-008.

Review of descriptions of the 12 problem-solving tasks developed since the last review (Ray, 1955) of this topic, indicating that the newer tasks are more sophisticated in design and provide for better experimental control than those used prior to 1953. Validity, reliability, sensitivity, trainability, problem structure, and problem difficulty are discussed as criteria for the selection of tasks to be used in studies of skilled problem-solving performance. (Author)

A72-11193 * Acquisition and performance of a problem-solving skill. B. B. Morgan, Jr. and E. A. Alluisi (Louisville, University, Louisville, Ky.). *Perceptual and Motor Skills*, vol. 33, Oct. 1971, p. 515-523. 11 refs. Grant No. NGR-18-002-008.

The acquisition of skill in the performance of a three-phase code transformation task (3P-COTRAN) was studied with 20 subjects who solved 27 3P-COTRAN problems during each of 8 successive sessions. The purpose of the study was to determine the changes in the 3P-COTRAN factor structure resulting from practice, the distribution of practice-related gains in performance over the nine measures of the five 3P-COTRAN factors, and the effects of transformation complexities on the 3P-COTRAN performance of subjects. A significant performance gain due to practice was observed, with improvements in speed continuing even when accuracy reached asymptotic levels. Transformation complexity showed no effect on early performances but the 3- and 4-element transformations were solved quicker than the 5-element transformation in the problem-solving Phase III of later skilled performances. V.Z.

A72-11194 * Effects on sustained performance of time-sharing a three-phase code transformation task /3P-COTRAN/. E. A. Alluisi and B. B. Morgan, Jr. (Louisville, University, Louisville, Ky.). *Perceptual and Motor Skills*, vol. 33, Oct. 1971, p. 639-651. 10 refs. Grant No. NGR-18-002-008.

A group of 20 highly trained subjects were divided randomly into five equal groups to time-share the 3P-COTRAN task with a different task combination of a multitask performance battery (MTPB) used by Alluisi (1969). The effects of the time-sharing on the 3P-COTRAN performance and the effects of 3P-COTRAN on the time-shared MTPB performances are analyzed. V.Z.

A72-11195 **The acoustic impedance at the surface of the human body in relation to auscultation.** Ö. Amundsen, K. Gjaevenes, and T. Langeland (Oslo Universitetet, Oslo, Norway). *Acustica*, vol. 25, Aug. 1971, p. 89-94.

As part of a study of the acoustical properties of the medical stethoscope the acoustic impedance of the body surface at the thorax and at the abdomen was measured through the frequency range 20 Hz to 1 kHz. The most important element of the measuring set-up was a short cavity where the sound pressure amplitudes and phases are determined first when terminated by the body surface and then by an infinite impedance. The acoustic impedance was found to depend on the frequency, the pressure against the body, the application area, and the position on the body. (Author)

A72-11196 **A mathematical theory of lateral sensory inhibition.** B. D. Coleman (Carnegie-Mellon University, Pittsburgh, Pa.). *Archive for Rational Mechanics and Analysis*, vol. 43, no. 2, 1971, p. 79-100. 58 refs. Grants No. AF AFOSR 68-1538; No. AF AFOSR 71-2057.

Attempt to construct a phenomenological theory of the lateral interactions of sensory receptors. The mathematical framework employed appears appropriate to those senses, such as vision and touch, for which the 'sensory inputs' can be described by real-valued functions on a continuum. Emphasis is laid on the sense of vision. The work is concerned with spatial interactions only, and throughout the discussion achromatic or monochromatic fields are kept in mind. Thus, neither time nor wavelength occur explicitly. The results obtained may be applied to either steady-state experiments or to experiments in which the stimulus (light) is briefly flashed. F.R.L.

A72-11259 # **Effective breath holding time in the measurement of the pulmonary diffusing capacity by single breath method.** M. Mochizuki and S. Takahashi (Hokkaido University, Sapporo, Japan). *Japan Journal of Physiology*, vol. 21, June 1971, p. 241-249. 12 refs.

Discussion of the error arising in pulmonary diffusing capacity measurements by the single-breath method when the inspiration time is included in the breath-holding time. A correction factor is developed to eliminate this error in a modified version of this method which relies on the effective inspiration time. A nomogram is designed to facilitate a convenient determination of the effective inspiration time. V.Z.

A72-11262 * **The influence of starvation upon hepatic drug metabolism in rats, mice, and guinea pigs.** R. L. Furner and D. D. Feller (NASA, Ames Research Center, Moffett Field, Calif.). *Society for Experimental Biology and Medicine, Proceedings*, vol. 137, July 1971, p. 816-819. 7 refs.

Male rats, mice, and guinea pigs were starved for 1, 2, or 3 days, and the metabolism of ethylmorphine, p-nitroanisole, and aniline was studied. Results suggest that the oxidative enzyme systems studied are not interdependent, and the pathways studied appear to be species dependent. O.H.

A72-11286 # **Responses to Coriolis stimulation in non-motionsick and motionsick-prone navigators compared with pilots**

and airman trainees. P. J. Dowd, R. L. Cramer, and H. H. Hanna (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aerospace Medicine*, vol. 42, July 1971, p. 703-705. 11 refs.

The changing of the angular relationships between the head and the axis of rotation, induced by the USAFSAM biaxial stimulator, produces false perceptions of position and/or movement, changes in posture, and visceral disturbances. This stimulator simulates certain flight maneuvers, such as an aircraft banking and turning, resulting in a Coriolis effect. An ex post facto analysis of the dynamic characteristics and the sensitivity of the vestibulo-ocular system was used to determine the differences between navigators who were 'sick' or 'nonsick.' These differences were then compared with similar studies on pilots and airman trainees. Results implied that the more rapid the decay of nystagmus, the more rapid the abatement of autonomic stimulation; and the lesser the sensitivity coefficient of nystagmus is, the greater the resistance to motion sickness. The two-parameter analog used in this Coriolis test is valuable as an indicator of the level of resistance an individual has to Coriolis accelerations and in the selection of a diagnostic program for measuring an individual's resistance to motion sickness. (Author)

A72-11287 **Acute mountain sickness - Reproducibility of its severity and duration in an individual.** S. M. Robinson, A. B. King, and V. Aoki (U.S. Army, Biochemistry and Pharmacology Laboratory, Natick, Mass.). *Aerospace Medicine*, vol. 42, July 1971, p. 706-708.

The severity of acute mountain sickness was followed in 11 subjects by a self-administered questionnaire during two separate sessions at a simulated altitude of 14,000 feet. While variation existed between individuals, nine subjects showed near replication of their previous illness course. The data are suggestive of an inherent characteristic which is involved in each individual's response to hypoxia. (Author)

A72-11288 * **Pilot reports of disorientation across 14 years of flight.** B. Clark (San Jose State College, San Jose, Calif.). *Aerospace Medicine*, vol. 42, July 1971, p. 708-712. 19 refs. Grant No. NGL-05-046-002.

The purpose of this study was to compare recent incidents involving disorientation in flight reported by 336 Air Force, Army, and Navy pilots with incidents reported by 137 pilots in 1956. The pilots reported their experiences using a check list and a written description of an experience with disorientation in the aircraft they were flying at the time. The latter included 40 incidents which occurred in support of operations in Vietnam. The reports of disorientation showed a striking similarity across types of aircraft flown over 14 years of flying, as well as with the incidents occurring in Vietnam. However, some variation in reports between aircraft types was noted. These reports of disorientation suggest that disorientation is currently experienced in a wide variety of flight operations and that it will continue to be experienced by aircraft pilots. (Author)

A72-11289 * **Short term response of insulin, glucose, growth hormone and corticosterone to acute vibration in rats.** C. B. Dolkas, H. A. Leon, and M. Chackerian (NASA, Ames Research Center, Moffett Field, Calif.). *Aerospace Medicine*, vol. 42, July 1971, p. 723-726. 25 refs.

Study carried out to obtain some notion of the initial phasing and interactive effects among some hormones known to be responsive to vibration stress. Sprague-Dawley derived rats were exposed to the acute effects of confinement and confinement with lateral (plus or minus G sub y) vibration. The coincident monitoring of glucose, insulin, growth hormone, and corticosterone plasma levels, during and immediately subsequent to exposure to brief low

level vibration, exhibits the effects of inhibition of insulin release by epinephrine. The ability of insulin (IRI) to return rapidly to basal levels, from appreciably depressed levels during vibration, in the face of elevated levels of glucose is also shown. Corticosterone responds with almost equal rapidity, but in opposite phase to the IRI. The immuno-assayable growth hormone (IGH) dropped from a basal level of 32 ng/ml to 7.3 ng/ml immediately subsequent to vibration and remained at essentially that level throughout the experiment (60 min). Whether these levels represent a real fall in the rat or whether they merely follow the immuno-logically deficient form is still in question. (Author)

A72-11290 **Effect of body cooling on vigilance in hot environments.** D. Benor and E. Shvartz (Negev Institute for Arid Zone Research, Beer-Sheba, Israel). *Aerospace Medicine*, vol. 42, July 1971, p. 727-730. 17 refs.

Study of vigilance under acute heat stress by testing simple reaction time to visual stimuli and auditory signal detection rate. Seven healthy adult men were exposed to ambient temperatures of 30 to 50 C for periods up to 2 hr. They were tested while walking on a treadmill and wearing an impermeable garment. A rapid elevation of body temperature was thus achieved. The tests were replicated with the subjects wearing a cooling suit. Reaction time was unaffected either by the rise in temperature or by the cooling. Signal detection rate deteriorated significantly. The deterioration was directly related both in speed and in point of onset to the environmental temperature. The discrepancy between reaction time and detection rate suggests a short-term 'mobilization' mechanism. The pattern of false reactions indicates a decline in sensitivity rather than criterion changes. Some psychological and practical implications of the results are discussed. (Author)

A72-11291 **Ways to alarm pilots.** M. Munns (U.S. Naval Material Command, Naval Air Development Center, Warminster, Pa.). *Aerospace Medicine*, vol. 42, July 1971, p. 731-734. 13 refs.

Because of the present complexity of signal lights on aircraft instrument panels with their reduced effectiveness as their number grows, and in light of the apparent trend toward the increased use of aural warning signals, a review of the literature pertaining to alerting signals has been conducted and implications for aircraft design have been considered. Proper choice of signal for a given function and categorical grouping are emphasized. Pervading this essay is the concept that an integrated plan might be created for each type of aircraft, to weave all such signals into a complex which is optimum from a safety of flight standpoint. (Author)

A72-11292 # **Testing of the vestibular system.** R. H. Mathog and R. L. Cramer (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aerospace Medicine*, vol. 42, July 1971, p. 741-745. 17 refs.

Since it appears that no single test can adequately describe normal function of the vestibular system, a series of tests may be applied to obtain a better understanding of vestibular capability. Such tests, employing optokinetic, caloric, positional and rotational stimuli, appear to reflect function at different levels of neural integration, thereby giving a more accurate analysis of orientation mechanisms. The functional tests may provide information relative to the interaction of the vestibular system with visual and somato-kinesthetic systems. The optokinetic evaluation may determine normal oculomotor function as well as defects throughout the reflex pathway. The caloric tests describe function at the receptor level, comparing one ear with the other, while rotational determinations evaluate the integration of responses under simultaneous stimulation. Techniques in administering and interpreting such vestibular tests are described. (Author)

A72-11293 **Thermovision and disease diagnostics.** M. M. Miroshnikov and Iu. S. Cherniaev (Akademiia Meditsinskikh Nauk SSSR, Leningrad, USSR). *Aerospace Medicine*, vol. 42, July 1971, p. 746-749. 10 refs.

Recently the possibility of observing the images of slightly heated objects by recording their own infrared radiation is used in various branches of science and technology. The appropriate instruments, which are called thermovisors, are characterized by the following main parameters: threshold sensitivity, field of view, space resolution, rapidity of action, and transformation spectral range. There are two fundamentally different ways of constructing image transformers: they can be either non-scanning or scanning instruments. Scanning thermovisors are very useful due to the high sensitivity of the infrared radiation detectors used. The application of the thermovisors for investigation of the radiation emitted by the human skin permits identification of the important characteristics of the physiological condition of the organism. The authors have studied the possibilities of applying the thermovisors to surgery, oncology, gynaecology, and a number of other branches of medicine. In doing so they have tried various methods of carrying out thermographic investigation in both passive and in active ways. The experience demonstrates the fact that the use of this method in carrying out a number of biomedical investigations and its application to the diagnosis of some diseases are very promising. As a result of the investigations carried out, not only have possible fields of applying thermovision been found, but also a thermodiagnostic complex comprised of a thermovisor and a number of accessory devices has been developed. (Author)

A72-11294 **Effect of earplugs on passenger speech reception in rotary-wing aircraft.** C. E. Williams, J. R. Forstall, and W. C. Parsons (U.S. Naval Aerospace Medical Center, Aerospace Medical Research Laboratory, Pensacola, Fla.). *Aerospace Medicine*, vol. 42, July 1971, p. 750-752. 5 refs. Navy-supported research.

Direct person-to-person speech communication is sometimes required in rotary-wing aircraft where high levels of noise make the use of hearing protective devices desirable. The question arises as to what effect earplugs would have on the intelligibility of speech in rotary-wing aircraft. Intelligibility test data obtained in flight as well as in a simulated flight situation indicate that the use of earplugs in rotary-wing aircraft will improve the reception of direct person-to-person speech communication. Moreover, their use will afford protection against the deafening, fatigue, and annoyance effects of the hazardous noise present in rotary-wing aircraft. (Author)

A72-11295 **Long-term prognosis of transient hypertension in young male adults.** P. E. Rørbek Madsen and J. Buch (Rigshospitalet, Copenhagen, Denmark). *Aerospace Medicine*, vol. 42, July 1971, p. 752-755. 16 refs.

Sixty-nine young men with transient hypertension when accepted as pilot aspirants have been controlled 17 to 20 years later. In this group with primary transient hypertension the frequency of later problems of high blood pressure has been found to be significantly higher than in a control group of 216 pilots with normal blood pressure when accepted as pilot aspirants (11.6% vs. 2.3%). This is in accordance with the results of earlier investigations. On account of too short a period of observation and few individuals controlled we find it necessary to stress the still existing uncertainty of the ultimate importance of transient hypertension. Even though we do not consider it justified to assign to transient hypertension so great importance that this should in itself imply elimination of applicants for pilot education - it should always be taken into account as a negative factor where other partly disqualifying qualities are manifest. (Author)

A72-11296 # **Cumulative flashblindness effects produced by multiple high intensity flashes.** W. H. Cushman (USAF, School of

Aerospace Medicine, Brooks AFB, Tex.). *Aerospace Medicine*, vol. 42, July 1971, p. 763-767. 7 refs.

Study of the effect of high-intensity (1.0 x 10 to the 8th mL.) short-duration (2 msec.) light flashes in subjects seated in an aircraft flight simulator cockpit. Each exposure or trial consisted of one flash or of a series of flashes with 15, 45, 120, or 300 sec between flashes. Flashblindness recovery times (RTs) for the airspeed indicator and the turn and bank indicator for simulated night flying conditions were measured after the last flash of each trial. The RT for the airspeed indicator increased as the number of flashes was increased, and in most cases decreased as the interflash interval was lengthened. The RT for the turn and bank indicator was unaffected by the number of flashes but increased slightly as the interflash interval was lengthened. The potential hazard of multiple flashes to aerospace operations and the effectiveness of two countermeasures are also discussed. (Author)

A72-11297 * **Anaerobic glycolysis and specific gravity of the red blood cells of rats exposed to pure oxygen at 600 torr.** J. C. Sabine and H. A. Leon (NASA, Ames Research Center, Moffett Field, Calif.). *Aerospace Medicine*, vol. 42, July 1971, p. 768-772. 17 refs.

Rats were exposed to 100% oxygen at 600 torr for up to 8 days. Highly significant increases in RBC anaerobic glycolysis occurred during the first 4 days of exposure and then subsided. Two significant peaks were found, one on days 1 and 2 and one on day 4. The first peak is attributed to reticulocytosis, which was maximal after 90 minutes and had disappeared by day 3. A second mechanism must account for the peak on day 4. An interpretation of the second peak is provided by existing evidence that selective removal of older RBCs occurs during the first few days of exposure to hypobaric oxygen, with maximum effect on day 4. Results in splenectomized, sham-operated and intact animals were indistinguishable from each other. A significant decrease in RBC specific gravity was found in exposed animals with spleens intact, but not in splenectomized animals. Theoretical aspects of age-related parameters as an aid to continuous detection and evaluation of changes in RBC populations are discussed. (Author)

A72-11298 **Aeromedical transportation and general aviation.** H. L. Gibbons (FAA, Civil Aeromedical Institute, Oklahoma City, Okla.) and C. Fromhagen (FAA, Civil Aeromedical Institute, Clearwater, Fla.). *Aerospace Medicine*, vol. 42, July 1971, p. 773-779. 35 refs.

The advantages of aircraft in providing military medical evacuation are well documented. Training and experience have resulted in a reliable and safe military medical evacuation system. Many studies have been done or are in process which pertain to civil emergency helicopter evacuation. Fixed-wing secondary ambulance service is growing at a rapid rate without the benefit of studies such as those pertaining to helicopter primary ambulance service. Problems associated with this growth relate to equipment, crew training, and knowledge of the physiology of flight. Legislative and/or educational efforts are needed to assure optimum general aviation patient transportation. (Author)

A72-11299 **Compensated hemolytic anemia associated with Gilbert's syndrome - A case report.** G. M. Stone (U.S. Naval Aerospace Medical Center, Aerospace Medical Institute, Pensacola, Fla.). *Aerospace Medicine*, vol. 42, July 1971, p. 785, 786.

Gilbert's syndrome has been well documented in the scientific literature as a benign disorder requiring no treatment. On occasion, a compensated hemolytic anemia is associated, as evidenced by shortened red blood cell survival time. During times of stress a hemolytic reaction may be precipitated. The purpose of this report is

to discuss the problem of 'secondary selection' in the case of an aviator with Gilbert's syndrome complicated by bouts of hemolytic anemia. (Author)

A72-11324 **Recent results of acoustic data processing (Neuere Ergebnisse der akustischen Informationsverarbeitung).** W. D. Keidel (Erlangen-Nürnberg, Universität, Erlangen, West Germany). *Naturwissenschaftliche Rundschau*, vol. 24, Nov. 1971, p. 461-471. 38 refs. In German.

Review of recent findings obtained in the field of computer simulation of evoked cortical audio potentials in animals and human subjects. It is shown that computer analysis by taking mean values of evoked potentials can be used in the clinic for objective hearing threshold measurement. Certain hitherto unresolved neurophysiological problems connected with the proposed method of averaging potentials are discussed - namely, the question of the point of origin of the potentials, the question of the magnitude of the exponent n in the power function for the measured amplitude values, the type of amplitude evaluation, and the purely technological question of the filtering during the recording. It is concluded that by using appropriate neurostatic computer analysis of both microelectrode and macroelectrode recordings new interesting and clinically useful insights into the functioning of the auditory path neurons can be obtained. A.B.K.

A72-11353 * # **Crew radiation dose from the plume of a high impulse gas-core nuclear rocket during a Mars mission.** C. C. Masser (NASA, Lewis Research Center, Cleveland, Ohio). In: Symposium on Uranium Plasmas: Research and Applications, 2nd, Atlanta, Ga., November 15-17, 1971, Collection of Technical Papers. (A72-11326 01-22) New York, American Institute of Aeronautics and Astronautics, Inc., 1971, p. 225-231. 9 refs.

Analytical calculations are performed to determine the radiation dose rate and total dose to the crew of a gas-core nuclear rocket from the fission fragments located throughout the plume volume. The radiation dose from the plume fission fragments to two crew locations of 100 and 200 meters from the nozzle exit are calculated. It is found that, in the case of the most probable fission fragment retention time of 100 seconds, the crew must be protected from the radiation dose. Five centimeters of lead shielding would reduce the radiation dose by two orders of magnitude thereby protecting the crew. The increase in vehicle weight would be insignificant (7150 kg to a vehicle gross weight of 0.94 million kg). M.V.E.

A72-11422 **Abnormal circulatory responses to high altitude in subjects with a previous history of high-altitude pulmonary edema.** H. N. Hultgren, R. F. Grover, and L. H. Hartley (Stanford University, Palo Alto, Calif.; Colorado, University, Denver, Colo.). *Circulation*, vol. 44, Nov. 1971, p. 759-770. 37 refs. PHS Grant No. HE-08728.

In five men with a history of susceptibility to high-altitude pulmonary edema (HAPE), hemodynamics and pulmonary gas exchange were measured at sea level, and again 24 hr following ascent to an altitude of 3,100 m. At sea level, all findings were essentially normal including a mean pulmonary arterial pressure. None of the subjects developed clinically detectable pulmonary edema at altitude. Wedge pressures and cardiac output remained normal. Mean pulmonary arterial pressure increased remarkably at rest and during moderate exercise. Acute relief of hypoxia only partially relieved this pulmonary hypertension. Arterial blood gases were normal at sea level. The men susceptible to HAPE developed excessive pulmonary hypertension and impaired pulmonary O₂ exchange without detectable pulmonary edema following ascent to high altitude. The increase in pulmonary vascular resistance is only partially explained by hypoxic pulmonary vasoconstriction. M.M.

A72-11423 **Supraventricular tachycardia initiated by sinus beats.** B. N. Goldreyer, M. B. Weiss, and A. N. Damato (U.S. Public Health Service, Hospital, Staten Island, N.Y.). *Circulation*, vol. 44, Nov. 1971, p. 820-825. 15 refs. NIH Grants No. HE-11829; No. HE-12536. PHS Project PY 71-1.

In the present report, A-V dissociation with concealed retrograde conduction into the A-V node, caused SINUS beats to exhibit antegrade A-V nodal conduction delay sufficient to result in episodes of supraventricular tachycardia (SVT). In this patient, atrial ectopic premature depolarizations were never observed. The primary role of A-V nodal conduction delay in the genesis of paroxysmal SVT is substantiated by this unusual electrophysiological observation.

(Author)

A72-11424 **Occurrence of ventricular arrhythmias with exercise as compared to monitoring.** B. D. Kosowsky, B. Lown, R. Whiting, and T. Guiney (Harvard University; Peter Bent Brigham Hospital, Boston, Mass.). *Circulation*, vol. 44, Nov. 1971, p. 826-832. 20 refs. NIH Grants No. HE-07776; No. 5TI-HE-5242; No. P01-HE-11306.

Treadmill exercise testing and prolonged ambulatory electrocardiographic monitoring were compared for their ability to reveal ventricular ectopic activity in 81 patients. Both proved more effective than a 3-minute standard electrocardiogram (ECG) in displaying ventricular arrhythmias. Of 66 patients in whom the resting ECG was normal, prolonged monitoring was positive for arrhythmia in 18, or 27%, whereas exercise was positive in 26, or 39%. In 12 cases ventricular arrhythmia was recorded only with exercise. In addition to displaying an increased incidence of arrhythmia, exercise also revealed more serious rhythm abnormalities which would not have been suspected on monitoring alone. This was true in patients with and without coronary heart disease (CHD). Thus, exercise is an effective means of eliciting suspected arrhythmias. The prognostic significance of exercise-induced arrhythmias in patients with CHD remains to be determined.

(Author)

A72-11425 **Incidence of myocardial infarction and sudden death from coronary heart disease in Nashville, Tennessee.** R. M. Hagstrom, C. F. Federspiel, and Y. C. Ho (Vanderbilt University, Nashville, Tenn.). *Circulation*, vol. 44, Nov. 1971, p. 884-890. 10 refs. Research supported by the Middle Tennessee Heart Association and the Tennessee Mid-South Regional Medical Program.

The incidence rates for myocardial infarction and sudden death attributable to coronary heart disease for adults between the ages of 35 and 74 for black and white populations were studied in Nashville, Tenn. for a 1-yr period from July 1967 to June 1968. The overall incidence rate for myocardial infarction was 3.42 and for sudden coronary death, 1.55 per 1,000 population. The male-to-female ratio for the white population for myocardial infarction was 3:1, and for the black population 2:1. Similar male-to-female ratios were found for those dying suddenly for both races. However, both black males and females died suddenly at a higher rate than did the white. Over half of the sudden deaths occurred within 2 hrs after onset of symptoms. Fifty-two per cent were dead on arrival at a hospital, 31% died at home, and 6% in a public place. Only 4% had either no contact with a source of medical care or had negative disease histories prior to sudden death.

M.M.

A72-11473 **Contribution of His bundle recordings to the understanding of clinical arrhythmias.** A. Castellanos, Jr., C. A. Castillo, and A. S. Agha (Miami University; U.S. Veterans Administration Hospital, Miami, Fla.). *American Journal of Cardiology*, vol. 28, Nov. 1971, p. 499-508. 72 refs.

His bundle electrocardiography has enhanced our knowledge of cardiac electrophysiology. The catheter technique for recording potentials from the specialized conducting tissues is most useful in

determining the site of atrioventricular and ventriculoatrial delays and blocks. Various types of ventricular preexcitation resulting from conduction through Kent, Mahaim and James bundles are adequately identified with this method. In some cases it provides the only means of differentiation between supraventricular and ventricular arrhythmias. A secondary gain obtained from His bundle recordings is the evaluation of the electrophysiologic effects of various drugs. Information thus obtained is not only academically important but also clinically useful, since it is a significant factor in establishing the proper therapy.

M.M.

A72-11474 **The postextrasystolic T wave change.** R. E. Edmands (Indiana University, Indianapolis, Ind.) and J. C. Bailey. *American Journal of Cardiology*, vol. 28, Nov. 1971, p. 536-540. 23 refs. Research supported by the Herman C. Krannert Fund, the Indiana Heart Association, and the American Medical Association; PHS Grants No. HE-6308; No. HTS-5363; No. HE-5749.

Microelectrophysiologic studies of canine and human ventricular myocardium demonstrate characteristic changes in the configuration of the transmembrane action potential upon abrupt rate change. Additional studies have shown also that these action potential changes, involving cellular repolarization, correlate closely with the magnitude of the concurrent postextrasystolic contractile changes. Further experiments in normal anesthetized dogs demonstrate that the postextrasystolic T wave change relates significantly to the magnitude of the postextrasystolic contractile potentiation. In addition, depression of the contractile state by pentobarbital enhanced the relative magnitude of postextrasystolic contractile change, whereas enhancement of the contractile state by acetylthiocholine yielded a lessening of the relative magnitude of postextrasystolic contractile potentiation.

M.M.

A72-11475 * **Peripheral venous scintillation angiography in determination of left ventricular volume in man.** R. W. Sullivan, D. A. Bergeron, W. R. Vetter, K. H. Hyatt, V. Haughton, and J. M. Vogel (U.S. Public Health Service, Hospital, San Francisco, Calif.). *American Journal of Cardiology*, vol. 28, Nov. 1971, p. 563-567. 12 refs. NASA-supported research; Federal Health Programs Service Grant No. MY-70-40. NASA Order T-81035.

Left ventricular end-diastolic volume was determined by cardiac visualization after peripheral venous injection of a gamma-emitting isotope in 10 patients with organic heart disease. The left ventricular end-diastolic volume measured by the isotope method consistently averaged 9% less than that determined by the X-ray method. The mean difference in left ventricular end-diastolic volume was 21 ml. Excellent correlation between the two methods was observed. It is pointed out that peripheral venous scintillation angiography compares well with left ventriculography in the determination of left ventricular end-diastolic volume in man.

M.M.

A72-11476 **Arrhythmia, sudden death and coronary artery disease.** T. Killip (New York Hospital, New York, N.Y.). *American Journal of Cardiology*, vol. 28, Nov. 1971, p. 614-616. 23 refs.

Discussion of factors associated with the potential significance of arrhythmias. Arrhythmias, conduction defects and sudden death are discussed together with prodromata to sudden death, prevention of sudden death, antiarrhythmic agents, and unsolved problems. It is pointed out that digitalis is the only antiarrhythmic agent that comes near to approaching an ideal drug. The drug is highly effective in many atrial arrhythmias and is useful in many patients with ventricular extrasystoles.

M.M.

A72-11543 # **Functional mobility of receptors (Funktsional'naya mobil'nost' retseptorov).** P. G. Sniakin (Akademii

Meditinskikh Nauk SSSR, Moscow, USSR). *Uspekhi Fiziologicheskikh Nauk*, vol. 2, July-Sept. 1971, p. 31-56. 145 refs. In Russian.

Review of studies dealing with processes which control the physiological capability of the organism to vary the activity of its systems by increasing or decreasing the numbers of working functional units. A comparative analysis of clinical and physiological observations and of electrophysiological data suggests that receptor activity control takes place at all central nervous system levels, from peripheral nerves to the cerebrum. Evidence is found to support the conclusion that analysors are self-controlled systems with a feedback and are capable of self-adaptation for the reception and analysis of instantaneous incoming information. V.Z.

A72-11544 # Functional asymmetry of the large cerebral hemispheres of man (Problema funktsional'noi asimmetrii bol'shikh polusharii golovnogo mozga cheloveka). V. M. Mosidze and K. K. Akbardiia (Akademiia Nauk Gruzinskoi SSR, Institut Fiziologii, Tiflis, Georgian SSR). *Uspekhi Fiziologicheskikh Nauk*, vol. 2, July-Sept. 1971, p. 90-104. 84 refs. In Russian.

Review of papers concerning the physiology of a split human cerebrum with particular attention to the interactions of the cerebral hemispheres. The topics include the corpus callosum as the principal channel of interhemispheric nervous process transfer, the isolated functions of the right and left hemispheres, the nature of the functional differentiation of the cerebral hemispheres, and the comparative physiology of their functional asymmetry. The author endorses a view of Bogen (1969) according to whom the creative gains of mankind due to specialization of the hemispheres outweigh the disadvantage of the lower general reliability of individual brains caused by hemispheric asymmetry. V.Z.

A72-11545 # Modern concepts of electroreception (Sovremennye predstavleniia ob elektoretseptsi). G. N. Akoz, N. P. Alekseev, and O. B. Il'inskii (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). *Uspekhi Fiziologicheskikh Nauk*, vol. 2, July-Sept. 1971, p. 123-142. 131 refs. In Russian.

The current status of knowledge of the functional properties of the electroreceptor system of fish is reviewed in the light of Soviet and foreign papers. The morphology, physiology and evolution of various electroreceptor types are discussed. The topics include the action of electric currents on the behavioral characteristics of fish, the peripheral coding activity in their electroreceptor systems, electroreception mechanisms, and the central subsystems of the electroreceptor system. V.Z.

A72-11549 Selective attention and serial processing in briefly presented visual displays. C. W. Eriksen and R. L. Colegate (Illinois, University, Urbana, Ill.). *Perception and Psychophysics*, vol. 10, Nov. 1971, p. 321-326. 11 refs. PHS Grant No. MH-1206.

Displays of eight capital letters were presented in a circular arrangement around a central fixation point at tachistoscopic durations. Under different experimental conditions, one or two indicators, presented either 250 msec before, simultaneously with, or after the display, designated the letters that S was to report. The arrangement of conditions permitted inferences as to the order in which S encoded the letters from the display. The results supported an interpretation in terms of a serial process by which the letters were encoded or transferred from iconic representation to a short-term memory. (Author)

A72-11550 Visual masking by light offset. R. J. Holzworth and M. E. Doherty (Bowling Green State University, Bowling Green, Ohio). *Perception and Psychophysics*, vol. 10, Nov. 1971, p. 327-330. 17 refs.

Two experiments are reported which investigated whether or not the offset of light can serve as a backward masking stimulus (MS). In both studies, human Os made identification responses to graphemes (TS) presented tachistoscopically on a lighted field. Simultaneously with or at short intervals after TS offset, the lighted background field was shut off. The termination of the background field served as the MS. The results indicated a reliable masking effect due to light offset; this effect occurred for TS-MS intervals of 60 msec or less. These results were interpreted as being due to the 'off' response in the visual system. (Author)

A72-11660 * Factors involved in the antinatriuretic effects of acute constriction of the thoracic and abdominal inferior vena cava. R. W. Schrier and M. H. Humphreys (California, University, San Francisco, Calif.). *Circulation Research*, vol. 29, Nov. 1971, p. 479-489. 23 refs. Research supported by the University of California; NIH Grant No. AM-12753; Grant No. NGR-05-025-007.

Study of the antinatriuretic effect of acute thoracic inferior vena cava (TIVC) constriction in the absence of alterations in renal perfusion pressure. A comparison is made of the effects of equivalent degrees of TIVC and abdominal inferior vena cava constriction on arterial pressure, renal hemodynamics, and electrolyte excretion. M.V.E.

A72-11661 * Role of cardiac output and the autonomic nervous system in the antinatriuretic response to acute constriction of the thoracic superior vena cava. R. W. Schrier, M. H. Humphreys, and R. C. Ufferman (California, University, San Francisco, Calif.). *Circulation Research*, vol. 29, Nov. 1971, p. 490-498. 35 refs. Research supported by the University of California; NIH Grants No. AM-12753; No. AM-05670; Grant No. NGR-05-025-007.

Study of the differential characteristics of hepatic congestion and decreased cardiac output in terms of potential afferent stimuli in the antinatriuretic effect of acute thoracic inferior vena cava (TIVC) constriction. An attempt is made to see if the autonomic nervous system is involved in the antinatriuretic effect of acute TIVC or thoracic superior vena cava constriction. M.V.E.

A72-11701 Performance efficiency of men breathing oxygen-helium at depths between 100 feet and 1500 feet. P. B. Bennett and E. J. Towse (Royal Naval Physiological Laboratory, Gosport, Hants., England). *Aerospace Medicine*, vol. 42, Nov. 1971, p. 1147-1156. 27 refs.

Experiments are described in which two subjects were compressed at 16-17 ft/min with 0.45 atms oxygen and helium to 100 ft/24 hrs, 300 ft/24 hrs and 450 ft/24 hrs culminating in a stage compression through 600 ft/24 hrs, 1,000 ft/24 hrs, 1,300 ft/24 hrs to 10 hrs at 1,500 ft. Measurements were made of mental and psychomotor performance, finger tremor and personal comments. The results indicate no mental deterioration at depths as great as 1,500 ft but a decrement in psychomotor performance due to the presence of tremors. Susceptibility to tremors varied significantly, one of the subjects being unaffected while the other showed an increasing postural tremor with depth which was enhanced by each compression phase. These findings are discussed in connection with the effects of rate of compression, introduction of 24-hr stages in compression to great depths, EEG changes and the appearance of sensations of impending loss of consciousness and somnolence (microsleep). It is concluded that helium does not induce an inert gas narcosis similar to that of nitrogen or argon and that the increased tremor and psychomotor decrement, as facets of a high pressure nervous syndrome, are due to the action of pressure per se. (Author)

A72-11702 # Acceleration and human performance. W. F. Grether (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio). *Aerospace Medicine*, vol. 42, Nov. 1971, p.

1157-1166. 43 refs.

Review of research on acceleration (G), such as experienced in aircraft and space vehicles, in terms of effects on human performance capabilities. Almost all such research has been conducted on human centrifuges, with the inertial force vectors in the + sub z direction for seated subjects, and the +G sub x and -G sub x directions for supine and prone subjects. Visual blackout has become the standard indicator of human tolerance to +G sub z acceleration. Other visual functions - namely, absolute thresholds, brightness discrimination, visual acuity, and instrument reading - all have been found to be impaired at G levels well below physiological tolerance limits, for +G sub z, +G sub x and -G sub x vectors. Motor capabilities - namely, tracking, reaction time, reaching, and manipulation - also show impairment at relatively low G levels. Limited data on intellectual or central processes suggest that these are more resistant, but not immune, to effects of exposure to acceleration. Included in the review is a discussion of probable mechanisms causing performance impairment. (Author)

A72-11703 Drive and performance modification following multiple (dark-dark) shifts in the photoperiod. F. H. Rohles, Jr. (Kansas State University of Agriculture and Applied Science, Manhattan, Kan.). *Aerospace Medicine*, vol. 42, Nov. 1971, p. 1167-1172. 7 refs. Contract No. F44620-68-C-0020.

The effects of 12-hour phase shifts in the light-dark cycle on feeding behavior and performance were studied by requiring monkeys to perform an 18 component serial task for all of their food ad lib. The photoperiod of 12 hours light/12 hours dark was reduced by 12 hours (dark-dark shift) and was reduced again when the slowest of the two subjects received none of its food on two consecutive dark periods. Ten shifts were made and the results showed that between six and eight days were required to reach criterion and the first two dark periods following the shift were responsible for the greatest decrement in performance accuracy. Adaptation to the shifts in photoperiod was not evident. (Author)

A72-11704 Application of college and flight background questionnaires as supplementary noncognitive measures for use in the selection of student naval aviators. R. M. Bale and R. K. Ambler (U.S. Navy, Naval Aerospace Medical Research Laboratory, Pensacola, Fla.). *Aerospace Medicine*, vol. 42, Nov. 1971, p. 1178-1181.

The need for supplementary background information in the selection of student naval aviators has become increasingly evident. Recent exit interviews with students who have voluntarily withdrawn from training indicate that factors unrelated to mental (such as attitude toward the military) or physical ability often entered into their decisions. This study utilized a multiple correlation approach to demonstrate that the inclusion of noncognitive college and flight background information would enhance the sensitivity of the selection process, thus reducing the attrition rate. The initial results confirmed this hypothesis and these findings were upheld by cross-validation. Implementation of the suggested technique would have reduced the attrition rate by 4.5 percentage points for the cross-validation sample. Therefore, it is recommended that this technique be incorporated as a management tool at the primary selection level. (Author)

A72-11705 Cortical evoked response and inert gas narcosis in man. K. N. Ackles (Defence and Civil Institute of Environmental Medicine, Downsview, Ontario, Canada) and B. Fowler (York University, Toronto, Canada). *Aerospace Medicine*, vol. 42, Nov. 1971, p. 1181-1184. 7 refs.

Two series of experiments were carried out to investigate the relationship between the depression of the cortical evoked response and inert gas narcosis. In the first series mental arithmetic performance and the auditory evoked response (AER) were measured while breathing air and a 20-80% oxygen-argon mixture at 4 and 7 ATA (atmospheres absolute). Compared to air, performance on the mental

arithmetic task was significantly poorer breathing the oxygen-argon mixture but there was no difference in the degree to which the AER was depressed. In addition there was no correlation between arithmetic performance and the AER with either breathing mixture. In the second series the VER (visual evoked response) was measured as well as the AER at 1 and 7 ATA, breathing the same two gas mixtures. The VER and AER were depressed at 7 ATA but there was no difference in the degree of this depression for either air or the oxygen-argon mixture. It was concluded that the depression of the evoked response while breathing either air or argon-oxygen in hyperbaric conditions is not a valid measure of inert gas narcosis. Moreover, the depression cannot be accounted for in terms of peripheral attenuation of the sensory signal which produces the evoked response, although this may be a contributory factor in the case of the AER. (Author)

A72-11706 * Apollo 14 food system. M. C. Smith, Jr., C. S. Huber, and N. D. Heidelbaugh (NASA, Manned Spacecraft Center, Houston, Tex.). *Aerospace Medicine*, vol. 42, Nov. 1971, p. 1185-1192. 14 refs.

The program for improving foods for use during space flights consists of introducing new foods and food-handling techniques on each successive manned space flight. Because of this continuing improvement program, the Apollo 14 food system was the most advanced and sophisticated food system to be used in the U.S. space program. The food system used during the Apollo 14 mission and recent space-food-system advances are described and discussed in regard to their usefulness for future manned space flights. (Author)

A72-11707 * Biochemical and physiological consequences of the Apollo flight diet. E. W. Hander, C. S. Leach, C. L. Fischer, J. Rummel, P. Rambaut (NASA, Manned Spacecraft Center, Houston, Tex.), and P. C. Johnson (Baylor University, Houston, Tex.). *Aerospace Medicine*, vol. 42, Nov. 1971, p. 1192-1195.

Six male subjects subsisting on a typical Apollo flight diet for five consecutive days were evaluated for changes in biochemical and physiological status. Laboratory examinations failed to demonstrate any significant changes of the kind previously attributed to weightlessness, such as in serum electrolytes, endocrine values, body fluid, or hematologic parameters. O.H.

A72-11708 Effect of chronic microwave irradiation on the blood forming system of guinea pigs and rabbits. S. Baranski (Institute of Aviation Medicine, Warsaw, Poland). *Aerospace Medicine*, vol. 42, Nov. 1971, p. 1196-1199. 16 refs.

One hundred guinea pigs and 100 rabbits were irradiated in an anechoic room with continuous or pulsed microwaves in the 10 cm wave band at 3.5 mW/cm power density for 3 months, 3 hrs/daily. Peripheral blood, bone marrow, lymph nodes and spleen were examined. Increases in absolute lymphocyte counts in peripheral blood, abnormalities in nuclear structure and mitosis in the erythroblastic cell series in the bone marrow and in lymphoid cells in lymph nodes and spleen were observed. These changes are a cumulative result of repeated irradiations. The underlying mechanism seems difficult to explain in terms of thermal effects. Extrathermal complex interactions seem to be more probable. (Author)

A72-11709 Physiological studies of military parachutists via FM/FM telemetry. II - Heart rate and respiration rate response to parachuting. III - Acceleration and opening shock forces during free-fall parachuting: Physiological. D. H. Reid, J. E. Doerr, H. D. Doshier, and D. G. Ellertson (U.S. Navy, Naval Aerospace Recovery Facility, El Centro, Calif.). *Aerospace Medicine*, vol. 42, Nov. 1971, p. 1200-1210. 17 refs. Navy-supported research.

Physiological and force-field data have been telemetered from 18 parachutists during 88 free-fall parachute jumps from 5 types of aircraft with varying egress altitude. The heart rate profile exhibits a double peaked curve with the highest values near parachute deployment and the second-highest rates near landing, compared with baseline values 1-hr prejump. The data indicate that egress, parachute deployment, and landing are the three most critical psychophysiological events during free-fall parachuting. Heart rate decreases in a given subject as experience increases. The type of parachute equipment used has a significant effect on the heart rate response to free-fall parachuting. Respiratory rate values more than double during the jump when compared with baseline conditions.

M.M.

A72-11710 **Comments on Sjöberg's hypothesis for the mechanism of the inversion illusion under zero-gravity conditions.** E. Dzendolet (Massachusetts, University, Amherst, Mass.). *Aerospace Medicine*, vol. 42, Nov. 1971, p. 1211-1213. 10 refs.

Seated subjects entering the zero-gravity condition produced by an aircraft in a parabolic flight path have reported experiencing a rotation to an upside-down position, the so-called 'inversion illusion.' It is shown that the rotation is most likely produced by a force, parallel to the flight path, acting on the maculae. The resulting deflection of the otolithic membrane is maintained by the zero-gravity condition, as Sjöberg suggested, so that the sensation of inversion continues until normal gravity forces return at the end of the maneuver, and restore the otolithic membrane to its normal position.

(Author)

A72-11711 **'Chin-sternum-heart syndrome' - Cardiac injury associated with parachuting mishaps.** L. R. Simson, Jr. (Air Training Command, Randolph AFB, Tex.). *Aerospace Medicine*, vol. 42, Nov. 1971, p. 1214-1217. 11 refs.

Incomplete deployment or partial failure of a parachute sometimes results in the victim striking the ground in the upright position, partially suspended by his harness, and with sufficiently reduced vertical velocity that there may be some hope for survival. Multiple fractures of legs, pelvis, and vertebrae are common and severe, as are abdominal and head injuries. Seldom, however, is the possibility of closed-chest cardiac injury considered in potential survivors of such mishaps. One pattern of cardiac injury, multiple atrial endocardial and myocardial lacerations, is frequently associated with evidence of sternal compression and chin laceration. This 'chin-sternum-heart syndrome' occurs in parachutists wearing protective helmets. An additional case, with 54 hour survival, is reported and the probable mechanism of injury is discussed.

(Author)

A72-11712 **Case report of student aviator with unusual psychosomatic symptoms.** J. R. Anderson (NAS, Beeville, Tex.). *Aerospace Medicine*, vol. 42, Nov. 1971, p. 1217, 1218.

Discussion of the case of a psychosomatic student aviator who was dropped from the advanced jet training command when nearing completion of the program. The symptomatology involved during early visits to the flight surgeon represents the only case of psychosomatic Lymphogranuloma venereum (L.G.V.) known to the author. It seems apparent that the final symptomatology related to the vestibular apparatus was a manifestation of disguised fear of flying.

M.M.

A72-11713 **Hazard rate of recurrence in patients with malignant melanoma.** F. G. Conrad, R. G. Rossing, M. F. Allen, and H. R. Bales, Jr. (USAF, Wilford Hall Medical Center, Lackland AFB, Tex.). *Aerospace Medicine*, vol. 42, Nov. 1971, p. 1219-1225. 5 refs.

Description of the possibility of analyzing total Air Force experience concerning cancer treatment and survival through the facilities of the Central Tumor Registry (CTR). Raw survival data may be extrapolated by the Life Table method, and two functions, which describe different aspects of survival, may be computed. One of these, the 'Hazard Function,' provides information on the likelihood of developing recurrent disease almost immediately for all patients who have survived to the beginning of any given time period. This allows accurate prediction, for a group of patients, as to the percentage of those patients who, having survived for a certain period of time following definitive surgery, will fail during the immediately succeeding time period. Since one has to accept a certain degree of risk of recurrence at every point in time, even twenty years following definitive surgery, one may determine the acceptable risk.

M.M.

A72-11714 **Non-fatal ejection vertebral fracture, U.S. Navy fiscal years 1959 through 1965 - Costs.** C. L. Ewing (U.S. Navy, Naval Aerospace Medical Research Laboratory, Pensacola, Fla.). *Aerospace Medicine*, vol. 42, Nov. 1971, p. 1226-1228.

A master list of all persons who ejected from naval aircraft during FY 59-65 was prepared by the Naval Aviation Safety Center. All persons coded as having suffered a vertebral fracture were indicated on the list. Ninety-nine cases were studied. The health records of each individual were obtained and reviewed. Information extracted was voluminous. This report covers only (1) number of individuals, among the 99 probable ones, who actually were found to have a fracture, (2) number of days of hospitalization for each, (3) number of days of suspension from flying duties, (4) number of patients returned to full flying duties, (5) number of patients permanently disabled, and (6) the military rank of each. From these data, costs of this particular injury can be determined.

(Author)

A72-11715 **Report of a rapid decompression of a Boeing 707.** S. O'Quigley (Aer Lingus, Dublin Airport, Ireland). *Aerospace Medicine*, vol. 42, Nov. 1971, p. 1229, 1230.

This is an account of a rapid decompression of a Boeing 707 in a freight/passenger configuration. Decompression occurred at 25,000 feet. There were no serious injuries to crew or passengers. Decompression was caused by fatigue in the rivet holes forward of frames 550 and 560. Possible cause of fatigue - a manufacturing discrepancy.

(Author)

A72-11740 # **Studies of the inertia of human directional hearing in the median and frontal planes (Untersuchungen zur Trägheit des Richtungshörens des Menschen in der Median- und Frontalebene).** G. Klepper. Aachen, Rheinisch-Westfälische Technische Hochschule, Fakultät für Medizin, Doktor der Medizin Dissertation, 1971. 38 p. 24 refs. In German.

Study of the direction change perception threshold in groups of normal patients, patients with dizziness, and patients with symmetrical hearing difficulty in the frontal and median planes with rising and falling noise frequency. It is found that in all three groups of subjects the hearing inertia in the median plane is greater than that in the frontal plane. In both hearing planes the measurement values for rising noise frequency are higher than those obtained for falling noise frequency. In the case of rising frequencies a decrease in inertia is noted in patients with dizziness as against patients with normal hearing. In the case of the hard of hearing a decrease in inertia in comparison with patients with normal hearing is noted only in the frontal plane.

A.B.K.

A72-11757 # **Postsynaptic potentials of auditory cortex neurons in the cat (Postsinapticheskie potentsialy neuronov slukhovoï kory koshki).** F. N. Serkov and E. Sh. Ivanovskii (Akademiia Nauk

Ukrainskoi SSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Neirofiziologiya*, vol. 3, July-Aug. 1971, p. 339-349. 30 refs. In Russian.

Evaluation of the electrical responses to a click of a large number of auditory cortex neurons in immobilized cats. A variety of intracellular responses were observed - namely, a spike without slow oscillations of the membrane potential, EPSP, EPSP-spike, EPSP-spike-IPSP, EPSP-IPSP, and primary IPSP (some followed by after-discharges). It is suggested that two kinds of inhibition arise in the auditory cortex neurons in response to a click - namely, recurrent and afferent. The functional significance of the recurrent inhibition consists in limiting the duration of the discharges in a particular neuron, while the afferent inhibition prevents extension of excitation to other neurons, thus localizing the zone of neuronal activity.

A.B.K.

A72-11758 # Changes in the responses of visual cortex neurons to light flashes in the presence of hypothalamic and reticular stimulation (Izmenenie reaktsii neuronov zritel'noi kory na vspyshki sveta pri gipotalamicheskoj i retikulinoj stimulatsii). L. P. Latash and E. A. Kyman (Akademii Nauk SSSR, Laboratoriia Problem Upravleniia Funktsiami v Organizme Cheloveka i Zhivotnykh, Moscow, USSR). *Neirofiziologiya*, vol. 3, July-Aug. 1971, p. 359-368. 18 refs. In Russian.

Study of the effect of electrical stimulation of the hypothalamic positive reinforcement zone (PRZ), the neutral hypothalamic zone, and the midbrain reticular formation (RF) on the impulse activity of single visual cortex neurons evoked by light flashes in unanesthetized white rats. Poststimulus histograms of neuron responses are compared, revealing a qualitative difference in the effects of PRZ and RF stimulations. The effects of PRZ stimulation are characterized in one-third of the responding neurons by invariability or a decrease of the neuron discharge frequency during a short-latency response and an increase in this frequency during a long-latency response. The effects of RF stimulation in one-half of the responding neurons are characterized by an intensification of the neuron discharge during a short-latency response and a reduction of these discharges during a long-latency response.

A.B.K.

A72-11759 # Functional changes in the neurosecretory cells of the anterior hypothalamic nuclei after stimulation of the midbrain reticular formation (Funktsional'nye izmeneniia neurosekretornykh kletok iader perednego gipotalamusa pri razdrazhenii retikulinoj formatsii srednego mozga). E. A. Vashchenko (Akademii Nauk Ukrainskoi SSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Neirofiziologiya*, vol. 3, July-Aug. 1971, p. 394-400. 24 refs. In Russian.

Study of the functional activity of the neurosecretory cells of the supraoptic and paraventricular nuclei in white rats at different times after electrical stimulation of the midbrain reticular formation. It is found that such stimulation causes an increase in the functional activity of the neurosecretory cells of the anterior hypothalamic nuclei, characterized by an intensification of the synthesis and transport of the neurosecretory material. These changes were most pronounced one hour after stimulation of the reticular formation. Unidirectional changes were found in both neurosecretory centers, although their degree of manifestation varied. The responses in the supraoptic nucleus were more intense and short-lived, while the responses in the paraventricular nucleus were less intense and longer-lasting.

A.B.K.

A72-11760 # Reticulospinal and vestibulospinal synaptic effects on lumbar motoneurons in monkeys (Retikulo-spinal'nye i vestibulo-spinal'nye sinapticheskie vlianiia na poiasnichnye motoneirony obez'iany). A. I. Shapovalov, Z. A. Tamarova, O. A. Karamian, and G. G. Kurchavyi (Akademii Nauk SSSR, Institut Evoliutsionnoi Fiziologii i Biokhimii, Leningrad, USSR). *Neirofiziologiya*, vol. 3, July-Aug. 1971, p. 408-417. 18 refs. In Russian.

Study of the synaptic mechanisms which ensure the transmission of vestibulospinal and reticulospinal effects to the motoneurons of primates. By means of intracellular recording and averaging on a computer it is established that fast-conducting reticulospinal and vestibulospinal fibers form monosynaptic excitatory contacts with lumbar alpha motoneurons. Monosynaptic bulbospinal effects can be elicited after acute pyramidotomy or after chronic destruction of the motor cortex. The mean amplitude of reticulospinal EPSPs is less than that of cortico-motoneuronal EPSPs. However, the mean amplitudes of EPSPs of individual motoneurons can reach similar values. In contrast to cortico-motoneuronal projections, bulbo-motoneuronal projections are directed primarily toward motoneurons of proximal muscles. In addition to monosynaptic EPSPs, reticulospinal and vestibulospinal volleys evoke in the lumbar motoneurons of monkeys disynaptic EPSPs and IPSPs which are very similar to the disynaptic effects noted in subprimates.

A.B.K.

A72-11761 On the rate of molecular evolution. M. Kimura and T. Ohta (National Institute of Genetics, Mishima, Japan). *Journal of Molecular Evolution*, vol. 1, no. 1, 1971, p. 1-17. 46 refs.

Uniformity of individual molecules and a high general rate of evolution are discussed as the characteristic features of population dynamics due to mutant substitution. Formulas are given for the measurement of amino acid substitution rates. Hemoglobin chains of humans and fish are compared. It is contended that not the natural selection but random fixation of neutral mutants is largely responsible for evolutionary changes in amino acids of proteins. V.Z.

A72-11762 On the constancy of the evolutionary rate of cistrons. T. Ohta and M. Kimura (National Institute of Genetics, Mishima, Japan). *Journal of Molecular Evolution*, vol. 1, no. 1, 1971, p. 18-25. 20 refs.

The evolutionary changes in hemoglobins and cytochrome c in various vertebrate species are analyzed. The uniformity of amino acid substitution rates in different vertebrate species is believed to suggest an evolution mechanism involving random fixation of neutral or slightly deleterious mutations in the process of amino acid mutant substitution. V.Z.

A72-11763 The structure of cytochrome c and the rates of molecular evolution. R. E. Dickerson (California Institute of Technology, Pasadena, Calif.). *Journal of Molecular Evolution*, vol. 1, no. 1, 1971, p. 26-45. 24 refs. NSF Grant No. GB-6617; NIH Grant No. GM-12121.

X-ray structure analysis of ferricytochrome c is made to determine the cause of the evolutionary conservatism of hydrophobic and aromatic side chains, lysines and glycines which was established by observations of amino acid sequences from over 30 species. The results suggest that the interaction between the molecule and two other large macromolecule complexes may be the cause of the unusual evolutionary conservation of the surface features of cytochrome c. V.Z.

A72-11764 * Comparisons of the polypeptide chains of globins. T. H. Jukes (California University, Berkeley, Calif.). *Journal of Molecular Evolution*, vol. 1, no. 1, 1971, p. 46-62. 49 refs. Grant No. NGR-05-003-020.

Discussion of the amino acid differences and minimum base differences per codon due to mutations which took place during divergent evolution of vertebrates from a common ancestral gene. The 'random mutation model' of evolution is examined by comparing a carp alpha Hb chain and six mammalian alpha Hb chains in terms of the genetic code. The occurrence of recognizable three-base

changes is analyzed and a summary of the distribution of changes in the hemoglobin and myoglobin chains is given for 148 sites. V.Z.

A72-11765 * Experimental investigation on the origin of the genetic code. C. Saxinger and C. Ponnampuram (NASA, Ames Research Center, Exobiology Div., Moffett Field, Calif.). *Journal of Molecular Evolution*, vol. 1, no. 1, 1971, p. 63-73. 37 refs.

A simple model of interacting complex systems of species is tested to assess the binding behavior of monomeric nucleic acid and protein components during evolution. Nine representative amino acids are immobilized by the formation of an amide linkage on a prepared chromatographic support. Selective binding of ribonucleoside 5-phosphates in these amino acids is achieved under standardized conditions, and a site-binding model is derived to characterize the binding. It is shown that the binding behavior of the reactants during nucleic acid-protein interactions depends on the nature of the base and the amino acid. The results of the study are assessed as useful for the interpretation of more complex nucleic acid-protein systems and of their role in the evolution of the cell.

V.Z.

A72-11768 # Inhibition in somatosensor cortical neurons and the possibility of intracortical propagation of excitation (Tormozhenie v neuronakh somatosensornoj kory i vozmozhnost' vnutrikorkovogo rasprostraneniia vozvuzhdeniia). V. M. Storozhuk (Akademiia Nauk Ukrainskoi SSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Neirofiziologija*, vol. 3, Sept.-Oct. 1971, p. 465-473. 17 refs. In Russian.

Attempt is made to verify the hypothesis that inhibition in somatosensor cortical neurons may obstruct intracortical stimulation of the pyramidal tract. Extracellular and intracellular potential outlets are used to investigate pyramidal tract neuron reactions to antidrome and afferent stimuli in cats. It is found that neither antidrome nor afferent inhibition obstruct the responses of somatosensor cortical neurons to stimulation of the pyramidal tract. V.Z.

A72-11769 # Electrical responses of the auditory cortex of bats to ultrasonic stimuli of different frequencies (Elektricheskie reaktsii slukhovoii oblasti kory letuchikh myshei na ul'trazvukovye stimuly s raznoi chastotoi zapolneniia). L. M. Kotelenko and A. G. Vasil'ev (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR). *Neirofiziologija*, vol. 3, Sept.-Oct. 1971, p. 526-532. 19 refs. In Russian.

Responses to acoustic signals of 10 to 120 kHz at wavelengths from 4 to 100 msec were studied in anesthetized *Rhinolophus ferrum equinum* and *Moytis oxygnathus* bats. The highest sensitivity to acoustic signals was at 10 to 50 kHz in *Moytis* bats and at 10 to 40 and 82 to 84 kHz in *Rhinolophus* bats. The shape of responses was generally similar in both species. V.Z.

A72-11897 Spatial parameters of eye-hand adaptation to optical distortion. J. C. Hay (Wisconsin, University, Milwaukee, Wis.), B. Langdon (California, University, Los Angeles, Calif.), and H. L. Pick, Jr. (Minnesota, University, Minneapolis, Minn.). *Journal of Experimental Psychology*, vol. 91, Nov. 1971, p. 11-17. 9 refs. NIH Grant No. MH-97588.

This study sought to identify the modifiable parameters of eye-hand coordination in the prism-adaptation situation. The most readily modified parameter was found to be a displacement applying equally to all target positions. A magnification parameter could also be partially modified, in the sense that a wider range of hand movements became identified with a fixed eye-movement range. No nonlinear changes in the eye-hand mapping were found. (Author)

A72-11898 Perception of rotation in figures with rectangular and trapezoidal features. M. L. Braunstein (California, University, Irvine, Calif.). *Journal of Experimental Psychology*, vol. 91, Nov. 1971, p. 25-29. 7 refs. NSF Grants No. GB-5545; No. GB-8251.

The figural basis for the effect of perspective changes on accuracy of direction of rotation judgments was investigated. Forms varying in angles of contour convergence, relative extent of vertical contours, and horizontal position of the axis of rotation were displayed in rotation about a vertical axis at five perspective levels. Accuracy, averaged across perspective levels, was ordered primarily by angle relationships. Accuracy was greatest for forms containing right angles, even when the vertical contours were unequal, and lowest for forms in which one vertical contour was enclosed in acute angles and the other in obtuse angles, even when the vertical contours were equal. Within angle relationships, accuracy was generally greater when the vertical contours were equal. (Author)

A72-11954 # Ventilatory and metabolic responses of un-anesthetized dogs to CO₂ at 2 and 18 C. S. M. Cain (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Journal of Applied Physiology*, vol. 31, Nov. 1971, p. 647-650. 19 refs.

Ventilatory and metabolic responses were studied in seven dogs having chronic tracheostomy for one to several months and exposed for 20 min at 2 and 18 C to nitrogen atmospheres containing 21% O₂ and 2, 4, or 6% CO₂, with and without beta-blocks. The slope and x-intercept of the CO₂ response curves increased in the cold. The increase of oxygen uptake with CO₂ partial pressure was greater at 2 than at 18 deg and faster than the increase in ventilation. V.Z.

A72-11955 Physiological effects of localized ventilation. N. Z. Azer, P. E. McNall, and H. C. Leung (Kansas State University of Agriculture and Applied Science, Manhattan, Kan.). *Journal of Applied Physiology*, vol. 31, Nov. 1971, p. 669-674. 7 refs. Contract No. F44620-68-C-0020. Project THEMIS.

Demonstration that in a 35 C and 50% RH environment, the average thermal vote of clothed-seated subjects, engaged in a central tracking and peripheral tasks, was between warm and hot, while their average comfort vote was between uncomfortable and very uncomfortable. It was possible, by locally ventilating the head from the front, to improve both sensory votes, moving them toward 'thermal neutrality' and 'comfortable' sensations. The ventilating jet which resulted in the best improvement in sensory votes had a velocity of 3.8 m/sec and a temperature of 10 C at its outlet. Its outlet was located 40 cm from the subject's face. The improvements in sensory votes were associated with reductions in average skin temperature and sweat rate from their corresponding values measured during experiments without localized ventilation. Localized ventilation had no significant effects on the rectal temperature or the heart rate.

(Author)

A72-11956 * Effect of gravito-inertial force on ocular counter-rolling. E. F. Miller, II and A. Graybiel (U.S. Naval Aerospace Medical Center, Aerospace Medical Research Laboratory, Pensacola, Fla.). *Journal of Applied Physiology*, vol. 31, Nov. 1971, p. 697-700. 17 refs. NASA-supported research. NASA Order T-81633; NASA Order L-43518.

The effect of G loading on the magnitude of ocular counter-rolling at various angles of tilt up to 63 deg. was measured on normal subjects and compared with the effect on persons with severe or complete loss of vestibular function. The group of six normal subjects manifested a compensatory eye roll which increased as a direct and essentially linear function of the component of the gravito-inertial force acting laterally on the subject. This increase in response was not observed in the five deaf subjects with severe or complete bilateral loss of their vestibular organs. These findings confirmed similar results found by other authors using other

measuring techniques which show that the reflex eye movement is dependent on and limited to the magnitude of the gravito-inertial stimulus (within the range used) when the otolithocular system is functioning normally. However when this function is severely impaired or lost, the magnitude of the compensatory eye roll is limited to that manifested at 1 G and possibly to nonotolithoc contributions. These findings offer means for differentiation between otolithoc-defective and 'normal' persons who exhibit little counter-rolling. (Author)

A72-11957 **Effect of short periods of hypoxia, hyperoxia, and hypercapnia on brain O₂ supply.** H. Metzger, W. Erdmann, and G. Thews (Mainz, Universität, Mainz, West Germany). *Journal of Applied Physiology*, vol. 31, Nov. 1971, p. 751-759. 38 refs. Research supported by the Deutsche Forschungsgemeinschaft.

The time variations of oxygen partial pressure after an abrupt change in respiratory O₂ and CO₂ concentrations were measured in frontal and occipital portions of the cortex of 29 anesthetized albino rats. The time variations of oxygen partial pressure were in the range of 2 to 20 sec for hypoxia and hyperoxia and in the range of 7 to 70 sec for hypercapnia. The tissue oxygen partial pressure under hypoxia decreased linearly with increasing oxygen concentration. Hyperoxia increased the tissue oxygen partial pressure only near the capillary artery ends while under hypercapnia the increase was throughout the vessels. V.Z.

A72-11958 **Static pulmonary compliance of man during altitude hypoxia.** L. Raymond and J. W. Severinghaus (California, University, San Francisco, Calif.). *Journal of Applied Physiology*, vol. 31, Nov. 1971, p. 785-787. 15 refs. Navy-supported research; NIH Grant No. HE-06288.

The relationship between static transpulmonary pressure and inspired volume was determined in four male subjects during 10 days at 14,246 ft. Mean values of pulmonary compliance were found to be greater at altitude than at sea level (236 to 291 vs 218 ml cm water); the observed differences however were not statistically significant. Earlier reports on reduced pulmonary compliance in subjects who had developed abnormalities of alveolar-arterial oxygen differences and of wasted ventilation during altitude hypoxia are therefore not confirmed. V.P.

A72-12012 # **Respiration changes in the presence of diencephalic syndromes (Zmini dikhannia pri diencefal'nikh sindromakh).** G. D. Dinaburg, A. D. Lauta, O. M. Maksimova, and T. I. Kamenets'ka (Akademiia Nauk Ukrainskoi RSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal*, vol. 17, Sept.-Oct. 1971, p. 596-604. 31 refs. In Ukrainian.

An investigation of the nervous respiratory disorder observed in patients with vegetative vascular and diencephalic syndromes brings to light an increase in the physiological dead space, a decrease in the ratio between alveolar ventilation and minute respiratory capacity, and physiological blood shunting. This leads to the development of arterial hypoxemia. Ineffective and inefficient oxygen supply of the organism ensues. M.V.E.

A72-12013 # **Search for optimum muscle work conditions guided by muscle-work dependent temperature dynamics (Poshuk optimal'nogo rezhimu roboti m'iaziv za dinamikoiu temperaturi, zumovlenoiu ikh diial'nistiu).** M. D. Zozulia (Kiivs'kii Medichnii Institut, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal*, vol. 17, Sept.-Oct. 1971, p. 615-621. 21 refs. In Ukrainian.

Results are presented of experiments conducted under specified conditions upon rabbits in a search for optimum muscle-work conditions guided by muscle-work dependent temperature dynamics.

The results obtained make it possible to identify the muscle work conditions optimal in terms of power output, as well as those optimal in terms of total work performance. There are indications that variations in muscle temperature can convey information on readiness of the muscle for work and that work capacity fluctuations are reflected in, and correlated with temperature variations in the work-performing muscle. M.V.E.

A72-12014 # **Physiological mechanism of the onset of third-order waves in arterial blood pressure (Pro fiziologichnii mekhanizm viniknennia khvil' tret'ogo poriadku arterial'nogo tisku krovi).** S. S. Romanov (L'vivs'kii Zooveterinarnyi Institut, Lvov, Ukrainian SSR). *Fiziologichnii Zhurnal*, vol. 17, Sept.-Oct. 1971, p. 691-693. 17 refs. In Ukrainian.

Tests were conducted with narcotized dogs using the classical kymograph method of recording respiratory movements of the chest and blood pressure in the femoral artery. Fifteen minutes after intravenous administration of ephedrine, a silver nitrate solution was injected in the same vein. Control animals were not given any ephedrine. Third-order waves (Traube-Hering waves) in arterial pressure arose in the test-group animals at the stage where silver nitrate began to take effect. This was preceded and accompanied by changes in blood and respiration dynamics which are characteristic for hypoxia and for increased tonus of the synaptic part of the nervous system. T.M.

A72-12015 # **Neurotropic effect of deep hypercapnia (Neirotropnii efekt glibokoi giperkapnii).** A. G. Massarigin (Sums'kii Derzhavnii Pedagogichnii Institut, Sumy, Ukrainian SSR). *Fiziologichnii Zhurnal*, vol. 17, Sept.-Oct. 1971, p. 695-697. 8 refs. In Ukrainian.

Changes in the nervous system of rabbits were investigated after a 1-min exposure to carbon dioxide producing acute hypercapnia. Previously conditioned defensive reflexes were maintained after hypercapnia. The development of hypercapnia is divided into three stages, beginning with a pre-narcotic phase during inhalation of carbon dioxide. The subsequent narcotic phase covers a portion of the inhalation period and continues some time after removal of the animal from the carbon dioxide atmosphere. The last stage entails a phase of recovery to normal activity of the organism. T.M.

A72-12016 # **Certain theoretical problems of gravitational biology (Pro deiaiki teoretichni problemi gravitatsiinoi biologii).** V. I. Danileiko (Akademiia Nauk Ukrainskoi RSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal*, vol. 17, Sept.-Oct. 1971, p. 702-708. 19 refs. In Ukrainian.

A review of current space and time concepts of living organisms indicates that they are founded on a simplified approach to observed factors and on a limited scope of scientific research. The space-time metric of biological objects existing in noninertial (accelerated) or inertial (nonaccelerated) systems cannot be expressed by any currently available formula or series of formulas. Thus far, there are no grounds for applying to living objects those laws which explain relativistic phenomena in electrodynamics. Attempts at using these laws to describe the slowing of biological time for living beings in noninertial systems (or in inertial systems during motion in space at velocities approaching the speed of light) must be considered as unfounded. T.M.

A72-12036 **A feedforward-feedback mechanism for human thermoregulation.** C. E. Huckaba, J. A. Downey, and R. C. Darling (Columbia University, New York, N.Y.). *Chemical Engineering Progress, Symposium Series*, no. 114, 1971, p. 1-7. 20 refs.

A control mechanism using the central hypothalamic temperature as the only required set point is proposed to describe human

short-term thermoregulation. A signal flow diagram is evolved to represent this mechanism on the basis of advanced engineering control concepts and existing physiological knowledge. Essential in the proposed mechanism is a feedforward loop activated by peripheral sensors and serving as a logical anticipatory function. The loop utilizes dT sub s/dt as the motivating potential which is in agreement with the distinction between cold and warm receptors. The feedback portion of the signal flow diagram is consistent with well-established physiological evidence concerning the basic role of the hypothalamic temperature in delicate temperature regulation.

V.Z.

A72-12037 **A mathematical simulation of oxygen transport in the human brain under conditions of countercurrent capillary blood flow.** D. D. Reneau (Louisiana Polytechnic Institute, Ruston, La.) and M. H. Knisely (South Carolina, University, Charleston, S.C.). *Chemical Engineering Progress, Symposium Series*, no. 114, 1971, p. 18-27. 16 refs. PHS Grants No. NS-08228; No. NB-08228; No. HE-14176; No. HE-5340.

Mathematical considerations are given for a better quantitative understanding of the oxygen distribution in the cerebral gray matter when the blood stream in the adjacent capillaries of the Krogh arrangement is equal in magnitude but opposite in direction. An attempt is made to set forth a mathematical technique to solve the equations describing transport in the Krogh system in the presence of a countercurrent capillary flow. A mathematical model is derived to describe the variations in the oxygen partial pressure in capillary blood and tissues as a function of time, location, flow rate, pH, oxygen capacity, metabolic rate, diffusion coefficients and solubility. A procedure is given for numerically solving the countercurrent transport equations. The oxygen diffusion zones and oxygen tension in the cerebral cortex are discussed.

V.Z.

A72-12038 * **Continuous propagation of microalgae. III.** D. T. Hanson (Texas A & M University, College Station, Tex.), A. G. Fredrickson, and H. M. Tsuchiya (Minnesota, University, Minneapolis, Minn.). *Chemical Engineering Progress, Symposium Series*, no. 114, 1971, p. 151-164. 9 refs. NSF Grant No. GH-26; Grant No. NSG-79-60.

Data are presented which give the specific photosynthetic rate and the specific utilization rates of urea and carbon dioxide as functions of specific growth rate for *Chlorella*. A mathematical model expresses a set of mass balance relations between biotic and environmental materials. Criteria of validity are used to test this model. Predictive procedures are complemented by a particular model of microbial growth. Methods are demonstrated for predicting substrate utilization rates, production rates of extracellular metabolites, growth limiting conditions, and photosynthetic quotients from propagator variables.

(Author)

A72-12039 * **Physiological control - A physical view: Life and the biochemical oscillator.** A. S. Iberall. (General Technical Services, Inc., Upper Darby, Pa.). *Chemical Engineering Progress, Symposium Series*, no. 114, 1971, p. 190-194. 28 refs. Army-supported research; Contract No. NASW-1815.

The history and progress of physical interpretations of physiological control, viewing life as a biochemical oscillator, are surveyed. Special attention is given to the author's studies (1964, 1965, 1968 and 1969) and to studies of Katchalsky (1969) who demonstrated a 1,000-A scale which may provide a basis for a biochemical oscillator.

V.Z.

A72-12040 **Control theory applied to the chemical regulation of breathing.** P. J. Stoll, R. E. Burger (California, University, Davis, Calif.), J. A. Estavillo (California, University, Los Angeles,

Calif.), and J. L. Osborne (Johns Hopkins University, Baltimore, Md.). *Chemical Engineering Progress, Symposium Series*, no. 114, 1971, p. 202-210. 11 refs. Research supported by the University of California; PHS Grant No. RR-06138.

A study of frequency responses in the respiratory system of man is described. A technique is set forth for the measurement of ventilatory and tidal volume responses to sinusoidal variations of carbon dioxide concentration in the inhaled air. A least-square parameter estimation procedure is used in a best-fit curve analysis. Preliminary data are given to demonstrate the application of step functions and sinusoids in the estimation of the dynamic properties of pulmonary afferent responses to carbon dioxide in chickens. A time-domain method, using responses to stepwise and random inputs, is found to be promising in deciphering some of the more nonlinear responses.

V.Z.

A72-12041 **The role of skin temperature in human thermoregulation.** J. A. Downey, C. E. Huckaba, R. C. Darling, L. E. Bonilla, and W. K. Luke. *Chemical Engineering Progress, Symposium Series*, no. 114, 1971, p. 211-216. 16 refs.

A technique has been developed for observing human thermoregulatory responses elicited by skin sensors independent of action generated by central sensors. Data obtained in these studies provide a basis for developing a control mechanism to account for peripheral effects.

(Author)

A72-12051 **International Congress on Protection Against Accelerator and Space Radiation, Geneva, Switzerland, April 26-30, 1971, Proceedings. Volume 1 - Health physics.** Congress sponsored by the Organisation Européenne pour la Recherche Nucléaire, the Société Française de Radioprotection, and the Fachverband für Strahlenschutz. Edited by J. Baarli and J. Dutrannois (Organisation Européenne pour la Recherche Nucléaire, Geneva, Switzerland). Geneva, Organisation Européenne pour la Recherche Nucléaire (CERN-71-16), 1971. 591 p. In English and French. Price of two volumes, \$11.60.

Dose-effect relations in radiation damage to mammalian cells, radiobiological effect of nonuniform absorbed-dose distribution, and nonuniform irradiation of dogs with high-energy protons and prediction of its biological effects are among the topics covered in contributions concerned with various biological aspects of space and accelerator produced radiation. Other areas include: irradiation dosimetry, radiation problems in space and supersonic transport, and radiation protection in accelerator installations.

M.V.E.

A72-12052 **A mathematical model for the dependence of radiation injury cross section on LET.** E. E. Kovalev and V. A. Sakovich (Ministerstvo Zdravookhraneniia SSSR, Institut Mediko-Biologicheskikh Problem, Moscow, USSR). In: International Congress on Protection Against Accelerator and Space Radiation, Geneva, Switzerland, April 26-30, 1971, Proceedings. Volume 1. Geneva, Organisation Européenne pour la Recherche Nucléaire, 1971, p. 3-8; Discussion, p. 9-12.

A mathematical model is proposed of radiation damage cross section dependence on the linear energy transfer (LET), taking into account irradiation parameters other than LET. It is shown that the proposed model provides an explanation for a variety of experimental values of relative biological effectiveness (RBE) and valuable help for specifying maximum RBE and high LET values.

M.V.E.

A72-12053 **Radiation-induced disease - Problems of response in relation to dose, dose-rate and radiation quality.** P. R. J. Burch (Leeds University, Leeds, England). In: International Congress

on Protection Against Accelerator and Space Radiation, Geneva, Switzerland, April 26-30, 1971, Proceedings. Volume 1.

Geneva, Organisation Européenne pour la Recherche Nucléaire, 1971, p. 13-27; Discussion, p. 28-30. 30 refs.

The attempt is made to relate the development of radiation-induced disease, in response to dose, dose rate, and kind of radiation, with a unified theory of growth and age-dependent autoaggressive malignant, nonmalignant, infectious, and noninfectious diseases. The pathogenesis of naturally occurring age-dependent disorders is discussed, with special attention to disease distribution by sex and age and to the anatomical distribution of lesions of those diseases that can exhibit a multicentric origin. In the light of two models of acute irradiation presented, the prediction from theory of chronic-irradiation-induced disease and the effects of dose rate and kind of radiation on mice and man is considered. M.V.E.

A72-12054 * **RBE for late somatic effects in mice irradiated with 60 MeV protons relative to X-rays.** E. B. Darden, Jr., N. K. Clapp, R. S. Bender, M. C. Jernigan, and A. C. Upton (Oak Ridge National Laboratory, Oak Ridge, Tenn.). In: International Congress on Protection Against Accelerator and Space Radiation, Geneva, Switzerland, April 26-30, 1971, Proceedings. Volume 1.

Geneva, Organisation Européenne pour la Recherche Nucléaire, 1971, p. 31-42; Discussion, p. 43. 5 refs. NASA-AEC-sponsored research.

Investigation of the relative biological effectiveness of energetic protons for the induction of somatic effects in a mammal (mice) following whole body irradiation. The proton energy used approximates the mean energy for proton spectra accompanying solar events. The effects on longevity and the incidence of major neoplastic diseases are summarized. The results obtained suggest that medium energy proton irradiation is no more effective, and on the whole, probably less effective, than conventional X radiation for the induction of late radiation effects in the mouse. M.V.E.

A72-12055 **Cytogenetical analysis of corneal and intestinal epithelium damage after irradiation with high energy protons.** V. M. Mastriukova and A. D. Strzhizhovskii (Ministerstvo Zdravookhraneniia SSSR, Institut Mediko-Biologicheskikh Problem, Moscow, USSR). In: International Congress on Protection Against Accelerator and Space Radiation, Geneva, Switzerland, April 26-30, 1971, Proceedings. Volume 1.

Geneva, Organisation Européenne pour la Recherche Nucléaire, 1971, p. 44-51. 6 refs.

Data obtained in a study of the mitotic index and aberrant mitose frequency in epithelial cells of mice exposed to 50-630 MeV protons in doses of 200-750 rads are presented. Relative biological efficiency coefficients for high energy protons are estimated in accordance with specified criteria. M.V.E.

A72-12056 * **Late effects of 2.2 GeV protons on the central nervous system.** S. W. Lippincott (Virginia Commonwealth University, Richmond, Va.; Ulm, Universität, Ulm, West Germany) and W. Calvo (Brookhaven National Laboratory, Upton, N.Y.). In: International Congress on Protection Against Accelerator and Space Radiation, Geneva, Switzerland, April 26-30, 1971, Proceedings. Volume 1.

Geneva, Organisation Européenne pour la Recherche Nucléaire, 1971, p. 52-59; Discussion, p. 60, 61. 9 refs. AEC-supported research; Grant No. NGR-47-002-018.

Investigation of late pathological effects of high-energy (2.2 GeV) protons on the brain of rabbits, in a postirradiation period of up to 16 months following exposure at fluxes of 30, 100, and 1000 billion protons per sq cm. At the latter two irradiation-intensity levels, the kinds of brain lesions inflicted include large venous dilatation, thickening of vessel walls with deposit of amorphous PAS positive substance, thrombosis, perivascular infiltration of leukocytes and macrophages, mobilization of microglia cells, gliosis, demyelination, and multiple small pseudocyst formation. M.V.E.

A72-12057 **The estimation of biological efficiency of secondary radiation of 70 GeV protons.** I. G. Akoev, B. S. Fomenko, G. A. Leont'eva, A. H. Achmadiyeva, I. A. Livanova, V. N. Lebedev, W. S. Lukanin, and S. S. Iurov (Akademiia Nauk SSSR, Institut Biologicheskoi Fiziki, Pushchino; Institute of Physics of High Energies, Serpuchov, USSR). In: International Congress on Protection Against Accelerator and Space Radiation, Geneva, Switzerland, April 26-30, 1971, Proceedings. Volume 1.

Geneva, Organisation Européenne pour la Recherche Nucléaire, 1971, p. 122-131; Discussion, p. 132. 6 refs.

The biological action of the secondary radiation resulting from an interaction of 70 GeV protons with a target has been studied in the Serpuchov synchrotron. The influence of this secondary radiation on the survival of phages and *Vicia faba* is reported and discussed. The results indicate that secondary 70 GeV proton radiation is more effective than Cs 137 gamma rays. Distinct dose dependences of relative-biological-effectiveness values and of relative rates of restoration processes were obtained. M.V.E.

A72-12058 **Investigation made at CERN into the biological effectiveness of high-energy radiations.** J. Baarli, A. H. Sullivan, M. Bianchi (Organisation Européenne pour la Recherche Nucléaire, Geneva, Switzerland), and M. Quintiliani (Istituto Superiore di Sanità, Rome, Italy). In: International Congress on Protection Against Accelerator and Space Radiation, Geneva, Switzerland, April 26-30, 1971, Proceedings. Volume 1.

Geneva, Organisation Européenne pour la Recherche Nucléaire, 1971, p. 133-146; Discussion, p. 147-150. 14 refs. Discussion in English and French.

The relative biological effectiveness (RBE) of high-energy radiations determined from the experiments carried out at CERN are summarized. The RBE values range from 1 to 6 depending on the kind of radiation, the system studied, and the range of dose and dose rate employed. RBE values for the 600 MeV proton beam are very near unity. RBEs for neutron beams and the capture region of negative pions are similar. RBE values for spermatogonia survival are given for 50 per cent survival when compared to Co 60 or X radiation. The survival curves obtained with this system tend to show an inverse shoulder when radiation capable of producing nuclear interactions is used. M.V.E.

A72-12059 **Effective dose and several factors of its identification - Assessment of radiation hazard in space flights.** Iu. V. Farber, Iu. G. Grigor'ev, L. A. Tabakova, and V. G. Gorlov. In: International Congress on Protection Against Accelerator and Space Radiation, Geneva, Switzerland, April 26-30, 1971, Proceedings. Volume 1.

Geneva, Organisation Européenne pour la Recherche Nucléaire, 1971, p. 167-173. 10 refs.

Review of experimental data on the change of effective dose occurring after repeated radiation exposures as a function of time intervals between fractions. These data indicate that, in evaluating space-flight radiation hazards, the effective dose should be taken into account. Otherwise, in repeated exposures of the body to ionizing irradiation, expected radiobiological effects are likely to be overestimated. It is shown that, with increases in time between radiation exposures, the value of the effective dose decreases. M.V.E.

A72-12060 **Non-uniform distribution of the absorbed dose and radiobiological effect - Assessment of radiation hazard in space flights.** Iu. G. Grigor'ev, V. G. Gorlov, V. N. Budylin, M. P. Kalandarova, H. Ia. Savchenko, and Iu. V. Farber. In: International Congress on Protection Against Accelerator and Space Radiation, Geneva, Switzerland, April 26-30, 1971, Proceedings. Volume 1.

Geneva, Organisation Européenne pour la Recherche Nucléaire, 1971, p. 174-188. 9 refs.

The results of an investigation of the radiobiological effects of nonuniform body irradiation obtained from experiments with

animals are shown to indicate that, in planning permissible radiation doses for cosmonauts, it is necessary to account for a distribution coefficient indicating by how many times efficiency of nonuniform irradiation is less than that of uniform irradiation. The obtained experimental results make it possible to assume that the bone marrow after irradiation by a dose of the order of 30 rads retains its regeneration ability. It is felt that it may also be assumed that a partially shielded part of bone marrow stimulates regeneration processes in all irradiated parts. M.V.E.

A72-12061 Biological effects and their prediction during nonuniform irradiation of dogs with high energy protons. G. M. Abramova, G. F. Nevskaja, and V. V. Iurgov (Ministerstvo Zdravookhraneniia SSSR, Institut Mediko-Biologicheskikh Problem, Moscow, USSR). In: International Congress on Protection Against Accelerator and Space Radiation, Geneva, Switzerland, April 26-30, 1971, Proceedings, Volume 1. Geneva, Organisation Européenne pour la Recherche Nucléaire, 1971, p. 189-202. 6 refs.

Various procedures for the performance of quantitative evaluations of nonuniform irradiation of a living organism are compared. It is shown that a preferential application of this or that method depends on the information available to the investigator. A combined application of these procedures will not only yield a large amount of data but also help to correlate them and improve their accuracy. A number of examples illustrate the application of the procedures and their respective merits. M.V.E.

A72-12062 Effect of lateral scattering on absorbed dose from 400 MeV neutrons and protons. H. A. Wright, R. N. Hamm, and J. E. Turner (Oak Ridge National Laboratory, Oak Ridge, Tenn.). In: International Congress on Protection Against Accelerator and Space Radiation, Geneva, Switzerland, April 26-30, 1971, Proceedings, Volume 1. Geneva, Organisation Européenne pour la Recherche Nucléaire, 1971, p. 207-219. 13 refs. AEC-sponsored research.

The results are presented of two types of calculations designed to determine the effects of lateral scattering of 400 MeV proton and neutron beams by a water absorber. In one type, the particles were incident along the axis of a cylindrical water phantom of a radius of 25 cm. In the second type of calculation, the particles were incident uniformly over one end of a cylindrical water phantom of a radius of 15 cm. The dose per incident particle per square centimeter that would be measured by detectors of various sizes was calculated as a function of depth behind the end of the phantom. The results obtained indicate that, for both 400 MeV protons and 400 MeV neutrons, a significant fraction of the total energy will be deposited several centimeters away from the primary particle track. M.V.E.

A72-12063 Some studies in pion beam dosimetry. J. E. Turner, H. A. Wright, R. N. Hamm (Oak Ridge National Laboratory, Oak Ridge, Tenn.), J. Baarli, J. Dutrançois, and A. H. Sullivan (Organisation Européenne pour la Recherche Nucléaire, Geneva, Switzerland). In: International Congress on Protection Against Accelerator and Space Radiation, Geneva, Switzerland, April 26-30, 1971, Proceedings, Volume 1. Geneva, Organisation Européenne pour la Recherche Nucléaire, 1971, p. 231-245. AEC-sponsored research.

Results are presented that were obtained with the aid of a detailed Monte Carlo program for the penetration of charged pions, muons, and electrons in matter, used for analyzing absorbed doses at various depths in a water target exposed to beams of such particles. These calculation results are compared with experimental data, and the calculated effects of various parameters on detector responses are discussed. M.V.E.

A72-12064 A calculation of the L.E.T. distribution from negative pi mesons in tissue. P. D. Holt (Atomic Energy Research Establishment, Harwell, Berks., England). In: International Congress on Protection Against Accelerator and Space Radiation, Geneva, Switzerland, April 26-30, 1971, Proceedings, Volume 1.

Geneva, Organisation Européenne pour la Recherche Nucléaire, 1971, p. 246-257; Discussion, p. 258, 259. 15 refs. Discussion in English and French.

The linear energy transfer (LET) distribution for an average nuclear star is calculated, and the energy spread of the pion beam, the LET distribution from ionization by pions that have not yet stopped, and the relative dose fractions from ionization loss and from stars at different depths are discussed. The results of performed relative-biological-efficiency and oxygen-enhancement-ratio calculations are reviewed, and the obtained LET distribution data for pions are compared with Bewley's (1968) results for 14 MeV neutrons. M.V.E.

A72-12065 Radiation dosimetry for heavy Z not less than 2/ particles with the aid of a nuclear emulsion and solid detectors of tracks (Dosimétrie des rayonnements corpusculaires lourds Z not less than 2/ à l'aide de l'émulsion nucléaire et des détecteurs solides de traces). D. Hășeganu and M. Nicolae (Academia Română, Institutul de Fizică Atomică, Bucharest, Rumania). In: International Congress on Protection Against Accelerator and Space Radiation, Geneva, Switzerland, April 26-30, 1971, Proceedings, Volume 1. Geneva, Organisation Européenne pour la Recherche Nucléaire, 1971, p. 260-270. 12 refs. In French.

A nuclear-emulsion based method of heavy-particle radiation dosimetry is proposed that blankets a fairly large interval of the energy spectrum of the ions present in primary cosmic rays and thus makes it possible to divide the ion spectrum into ionization groups. A sensitivity superior to that of a cellulose nitrate detector is obtained. Relativistic particles beyond Z equals 12 values can be detected by this method even in group III, whereas Z equals 26 represents the relativistic threshold of cellulose nitrate. M.V.E.

A72-12066 Use of visual solid detectors in high-energy radiation dosimetry (Utilisation de détecteurs solides visuels en dosimétrie de rayonnements de haute énergie). J. Dutrançois (Organisation Européenne pour la Recherche Nucléaire, Geneva, Switzerland). In: International Congress on Protection Against Accelerator and Space Radiation, Geneva, Switzerland, April 26-30, 1971, Proceedings, Volume 1. Geneva, Organisation Européenne pour la Recherche Nucléaire, 1971, p. 271-281. 9 refs. In French.

Experimental evaluation of the merits of an organic polymer, Makrofol E (a polycarbonate), as a visual solid detector in high-energy radiation dosimetry for a mixed-radiation case such as that encountered in the vicinity of large particle accelerators, where spallation reactions may become significant in terms of occurrence rate and of special biological effects and make desirable their relative quantification. The results obtained with Makrofol E indicate that gamma doses of kilorad order entail no increase in background tracks and that protons contribute to track formation only by the secondary effects of their spallation products or recoiling nuclei. This makes it possible to realize the desired dosimetric objectives. M.V.E.

A72-12067 High-energy nucleon tissue doses. I. M. Dmitrievskii, J. I. Kabakov, E. L. Potiomkin, and V. V. Frolov (Moskovskii Inzhenerno-Fizicheskii Institut, Moscow, USSR). In: International Congress on Protection Against Accelerator and Space Radiation, Geneva, Switzerland, April 26-30, 1971, Proceedings, Volume 1. Geneva, Organisation Européenne pour la Recherche Nucléaire, 1971, p. 328-343. 19 refs.

A method of calculating the dose characteristics of nucleons with energies up to 3 GeV for use in calculations of radiation shields

is extended to cover nucleons with energies up to 30 GeV. The method is based on the use of averaged characteristics of nuclear interactions. The nuclear cascade equation is solved under the assumptions that both the nucleon and meson cross sections are constant, that neutral pions decay instantaneously, without participating in the cascade, and that the difference between positively and negatively charged particles, and variations of cascade particle energy may be neglected. A procedure for calculating absorbed and equivalent dose distributions is proposed. The absorbed and equivalent dose distributions obtained for energies ranging from 0.4 to 30 GeV are diagrammed. V.P.

A72-12068 **Depth-dose experiments with mono-directional 14 MeV neutrons in a low scatter environment.** E. W. Fuller and R. C. Eustace (Atomic Weapons Research Establishment, Aldermaston, Berks., England). In: International Congress on Protection Against Accelerator and Space Radiation, Geneva, Switzerland, April 26-30, 1971, Proceedings. Volume 1. Geneva, Organisation Européenne pour la Recherche Nucléaire, 1971, p. 344-357; Discussion, p. 358, 359. 12 refs.

Depth dose experiments performed with phantoms of elliptical (30 and 20 cm axes) and circular (30 cm diam) cross sections, both 40 cm high, using the HENRE (High Energy Neutron Reaction Experiment) facility at the Nevada Test Site are discussed. The HENRE facility is described, and the degree to which the experiment simulated the theory is evaluated. The results are diagrammed and analyzed. V.P.

A72-12069 **The methods of remetry in the fields of mixed radiation.** I. B. Keirim-Markus, V. V. Markelov, and I. V. Chernykh (Ministerstvo Zdravookhraneniia SSSR, Institut Mediko-Biologicheskikh Problem, Moscow, USSR). In: International Congress on Protection Against Accelerator and Space Radiation, Geneva, Switzerland, April 26-30, 1971, Proceedings. Volume 1. Geneva, Organisation Européenne pour la Recherche Nucléaire, 1971, p. 360-369; Discussion, p. 370.

A method measuring average radiation Q factors and a method of determining dose radiation spectra are proposed. Results obtained from measurements performed with phantoms irradiated by proton beams are presented and discussed. Dose equivalents obtained from plots of the radiation Q factor vs linear energy transfer are given, along with two-dimensional spectra obtained with phantoms irradiated by 240 MeV protons. V.P.

A72-12070 **Dose-equivalent measurement in mixed radiation field - The tissue-equivalent counter and processing of data.** D. Srdoč and B. Breyer (Institut Rudjer Bošković, Zagreb, Yugoslavia). In: International Congress on Protection Against Accelerator and Space Radiation, Geneva, Switzerland, April 26-30, 1971, Proceedings. Volume 1. Geneva, Organisation Européenne pour la Recherche Nucléaire, 1971, p. 371-384; Discussion, p. 385-387. 11 refs.

An effective and relatively simple dose equivalent counter is described. The counter body is made of tissue-equivalent plastic enclosed in a thin aluminum case. The 25-micron stainless-steel anode wire is supported by two araldite insulators. A 12-micron aluminum foil window, transparent to soft X rays, is provided for calibration purposes. A cartridge filled with silica gel prevents buildup of water vapor pressure from slow outgassing of the tissue-equivalent plastic. The assembled counter, pumped for 100 hr at 75 C, is filled with a tissue-equivalent mixture of the following composition: 64.4% CH₄, 32.2% CO₂, and 3.2% N₂. V.P.

A72-12071 **The NE 102A organic scintillator as an acceptable LET-dependent detector for quality factor and dose equivalent determinations in mixed radiation field.** S. Pszona (Polska

Akademia Nauk, Instytut Badań Jądrowych, Świerk, Poland). In: International Congress on Protection Against Accelerator and Space Radiation, Geneva, Switzerland, April 26-30, 1971, Proceedings. Volume 1. Geneva, Organisation Européenne pour la Recherche Nucléaire, 1971, p. 388-402. 18 refs.

Discussion of the LET response of a polyvinyltoluene plastic scintillator. Experimental data are presented concerning quality factor and dose equivalent determinations in low- and high-energy radiation by means of this scintillator in a conjugated detector system. A study is made of the manner in which the deviation of the so-called 'quality index' of radiation from the quality factor affects the difference between the means value of these parameters in high- and low-energy radiation fields. A.B.K.

A72-12072 **An ionization chamber for the direct measurement of dose equivalent.** A. H. Sullivan (Organisation Européenne pour la Recherche Nucléaire, Geneva, Switzerland). In: International Congress on Protection Against Accelerator and Space Radiation, Geneva, Switzerland, April 26-30, 1971, Proceedings. Volume 1. Geneva, Organisation Européenne pour la Recherche Nucléaire, 1971, p. 415-429; Discussion, p. 430.

Description of a device for measuring dose equivalent by measuring the ionization current at two selected polarizing voltages to obtain a difference current which is proportional to the dose equivalent. The device described is an attempt to overcome the difficulties inherent in measuring the difference current by using a double chamber where the polarizing voltage is made to alternate between the two values required to give the correct response. The output current is then the mean of the difference current from both halves of the chamber and is independent of uniformity of radiation field and whether or not the two halves of the chamber have identical volumes. A.B.K.

A72-12075 **Results of the integrated radiation dose measurements on the 'Soyuz' spaceships.** Iu. A. Akatov, V. V. Arkhangel'skii, V. A. Blashkovskii, V. V. Markelov, and L. N. Smirenniyi (Ministerstvo Zdravookhraneniia SSSR, Institut Mediko-Biologicheskikh Problem, Moscow, USSR). In: International Congress on Protection Against Accelerator and Space Radiation, Geneva, Switzerland, April 26-30, 1971, Proceedings. Volume 1. Geneva, Organisation Européenne pour la Recherche Nucléaire, 1971, p. 492-498; Discussion, p. 499, 500. 11 refs. Discussion in English and French.

Data on the radiation doses received in the manned Soyuz (3 to 9) spaceships by the cosmonauts at different body points, obtained immediately after each mission from the thermoluminescent glass dosimeters retrieved, are reviewed. The average dose rates in millirad per day range from 13 to 30.5. M.V.E.

A72-12079 **Evaluation of the density of cosmic ray ends in human tissue from solar minimum to maximum at the level of SST flight.** K. Fukui (USAF, Cambridge Research Laboratories, Bedford, Mass.) and P. S. Young (Mississippi State University, State College, Miss.). In: International Congress on Protection Against Accelerator and Space Radiation, Geneva, Switzerland, April 26-30, 1971, Proceedings. Volume 1. Geneva, Organisation Européenne pour la Recherche Nucléaire, 1971, p. 557-569; Discussion, p. 570-572. 12 refs. Contract No. F19628-71-C-0060.

A study was made to evaluate the density of heavy thindown tracks observed at the level of SST flight, and the change of the density from solar minimum period to solar maximum period. The exposure was made on board the Air Force planes in 1970. Data of this exposure are presented and compared with previous measurements. Results indicate that there will be approximately 0.09 hit per sec by N nuclei during the solar minimum period, while only 0.03 hit during the minimum year. O.H.

A72-12089 * Deep-body temperature changes in rats exposed to chronic centrifugation. J. Oyama, W. T. Platt, and V. B. Holland (NASA, Ames Research Center, Environmental Biology Div. and Instrumentation Div., Moffett Field, Calif.). *American Journal of Physiology*, vol. 221, Nov. 1971, p. 1271-1277. 25 refs.

Deep-body temperature was monitored continuously by implant biotelemetry in unrestrained rats before, during, and after exposure to prolonged and almost continuous centrifugation. Rats subjected to centrifugation for the first time at various G loads ranging up to 2.5 G show a rapid and significant fall in temperature which is sustained below normal levels for periods as long as 3 days. The magnitude of the temperature fall and the recovery time were generally proportional to the G load imposed. The initial fall and recovery of body temperature closely parallels the decrease in food consumption and to a lesser degree the decrease in body mass experienced by centrifuged rats. After exposure to 2 weeks of centrifugation, rats show either no change or only a small transient increase in temperature when decelerated to a lower G level or when returned to normal gravity. Rats repeatedly exposed to centrifugation consistently showed a smaller temperature response compared to the initial exposure. Implant temperature biotelemetry has been found to be a sensitive, reliable, and extremely useful technique for assessing the initial stress of centrifugation and in monitoring the time course of recovery and acclimation of rats to increase as well as decrease G. (Author)

A72-12090 Effects of altered autonomic control on left ventricular function in conscious dogs. V. S. Bishop and L. D. Horwitz (Texas University, San Antonio, Tex.). *American Journal of Physiology*, vol. 221, Nov. 1971, p. 1278-1282. 11 refs. NIH Grant No. 5-R01-HE-12415-02.

In eight conscious dogs, effects of beta-adrenergic, vagal, and combined beta-adrenergic and vagal blockage on left ventricular internal diameter, pressure, and outflow were measured at rest and during acute volume loading. At rest, beta-adrenergic blockage resulted in a decrease in heart rate with no change in stroke volume but increased end-diastolic and end-systolic diameters, whereas vagal blockage resulted in an elevated heart rate with reductions in stroke volume, end-diastolic, and end-systolic diameters. Combined blockage, at rest, was associated with elevations in heart rate, diminished stroke volume, and increases in end-diastolic and end-systolic diameters. Stroke volume was found to be dependent not only on the initial fiber length but also on the sympathetic innervation. This was demonstrated by the increase in end-systolic diameter following beta-adrenergic blockage. M.M.

A72-12134 Radiotelemetric cardiorespiratory determinations during submaximal dynamic exercise. R. Crane (CBMI, Elmont, N.Y.) and S. S. Steen (Harbor General Hospital, Los Angeles, Calif.). In: International Telemetering Conference, Washington, D.C., September 27-29, 1971, Proceedings. Woodland Hills, Calif., International Foundation for Telemetering, 1971, p. 122-129. 14 refs.

Measurements of airway resistance (Ra) and thoracic gas volume (Vtg) during dynamic exercise pose complex instrumentation problems. Radiotelemetric determination of specific airway conductance (Ga/Vtg, where Ga equals 1/Ra) now appears practicable. The acquisition of such data in conjunction with other telemetered parameters (heart rate from the R-R interval) indicates that patients with chronic bronchospastic disease may tolerate physical exercise more safely when treated with bronchodilators. T.M.

A72-12138 FM/FM telemetry of physiological and force data during military parachuting and during high speed aerial tow. D. H. Reid, J. E. Doerr, J. D. Martin, and D. M. Terry (U.S. Navy, Naval Aerospace Recovery Facility, El Centro, Calif.). In: International Telemetering Conference, Washington, D.C., September 27-29, 1971, Proceedings. Woodland Hills, Calif., International

Foundation for Telemetering, 1971, p. 218-229. 7 refs. Navy-USAF-supported research. Task A510-5104/202-D/OW4554.

Review of the results of studies designed to accrue and correlate physiological and force data from parachutists participating in intentional parachute jumps and being towed behind aircraft. The objective of these studies is to provide better human engineered egress and retardation equipment for the aircrewmember, to describe parachutists physiologically, and to assess biomedical response to aerial tow so that midair retrieval systems can be developed for rescuing ejectees over enemy territory. Parameters obtained are either biopotential changes (e.g., ECG, EEG) or parameters which utilize simple and easy to calibrate transducers (e.g., thermistors, strain gauges, pressure transducers, accelerometers). M.V.E.

A72-12139 * Electrocardiogram transmission - The state of the art. A. Firstenberg, S. W. Huston, D. E. Olsen, and P. M. Hahn (California University, Los Angeles, Calif.). In: International Telemetering Conference, Washington, D.C., September 27-29, 1971, Proceedings. Woodland Hills, Calif., International Foundation for Telemetering, 1971, p. 230-238. 9 refs. Contract No. NSR-05-007-158; Grant No. NGL-05-077-195.

A comparative analysis of available clinical EKG telemetry systems was conducted. Although present day electrocardiogram diagnosis requires a high degree of measurement accuracy, there exists wide variations in the performance characteristics of the various telemeters marketed today necessitating careful consideration of specifications prior to procurement. The authors have endeavored to provide the physicians with a clear understanding, in terms of the effects on the electrocardiogram, of the factors he must evaluate in order to ensure high fidelity EKG reproduction. A tabulation of comparative parameter values for each unit obtained from manufacturers' specifications and substantiated by standardized performance tests conducted in our laboratory is presented. (Author)

A72-12140 * Applicability of implantable telemetry systems in cardiovascular research. R. W. Krutz (USAF, School of Aerospace Medicine, Brooks AFB, Tex.), R. D. Rader, J. P. Meehan, and J. P. Henry (Southern California University, Los Angeles, Calif.). In: International Telemetering Conference, Washington, D.C., September 27-29, 1971, Proceedings. Woodland Hills, Calif., International Foundation for Telemetering, 1971, p. 239-243. Contract No. NSR-05-018-087.

This paper briefly describes the results of an experimental program undertaken to develop and apply implanted telemetry to cardiovascular research. Because of the role the kidney may play in essential hypertension, emphasis is placed on telemetry's applicability in the study of renal physiology. Consequently, the relationship between pressure, flow, and hydraulic impedance are stressed. Results of an exercise study are given. (Author)

A72-12209 Stereoscopic depth movement - Two eyes less sensitive than one. C. W. Tyler (Northeastern University, Boston, Mass.). *Science*, vol. 174, Nov. 26, 1971, p. 958-961. 10 refs.

Visual sensitivity to stimuli with sinusoidal movement was examined under a number of conditions of binocular stimulation. Sensitivity to stereoscopic movement in depth was reduced in comparison to that for monocular movement. The reduced sensitivity appeared to be due to the presence of stereoscopic depth movement, as opposed to stereoscopic stimulation, binocular movement, or fusion of the images. (Author)

A72-12250 # Tonic vibration reflex in human and monkey subjects. S. Homma, K. Kanda, and S. Watanabe (Chiba University, Chiba, Japan). *Japanese Journal of Physiology*, vol. 21, Aug. 1971, p. 419-430. 18 refs.

Both in human subjects and monkeys, the tonic vibration reflex, TVR, was observed during vibratory stimulation of the muscle. In the latter, TVR reaches its maximum soon after vibratory application. In the monkey, unitary EMG was recorded during vibratory stimulation and nonsequential interspike interval histograms were obtained. Intervals of unitary EMG were shown to occur on the principle of integer multiplication of the vibratory cyclic time. A gradual increase or decrease of TVR during vibratory stimulation in the human subject or the monkey is effected by the EMG discharges of shorter or longer firing intervals which occur on this principle. Both in human subjects and monkeys, the TVR becomes larger with the higher range of vibratory frequency. Beyond a certain vibratory frequency the TVR shows a gradual decrease. The relationship between the TVR and the vibratory frequency was called the TVR-f relation. M.M.

A72-12294 # Certain glycosidases of the human placenta (O nekotorykh glikozidazakh platsenty cheloveka). G. Ia. Vidershain, E. L. Rozenfel'd, A. I. Brusilovskii, and L. G. Kolibaba (Akademiia Meditsinskikh Nauk SSSR, Moscow; Krymskii Gosudarstvennyi Meditsinskii Institut, Simferopol, USSR). *Akademiia Nauk SSSR, Doklady*, vol. 199, Aug. 21, 1971, p. 1436-1438. 5 refs. In Russian.

The changes in the activity of alpha-D-fucosidase, beta-D-galactosidase, alpha-D-galactosidase, and alpha-D-mannosidase in human placenta at various phases of embryogenesis are studied. The results are given in tabular form. V.P.

A72-12346 # New approaches to some physiological problems (Tendentsii razvitiia nekotorykh problem fiziologii). V. N. Chernogovskii (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). *Akademiia Nauk SSSR, Izvestiia, Seriya Biologicheskaiia*, Sept.-Oct. 1971, p. 661-672. 25 refs. In Russian.

An attempt is made to define the difference between the concepts of foresight, forecast and prognosis in modern physiology. The role of intuition in prognostic processes and the relation between molecular and cellular processes on the one hand and the activity of the organism as a whole on the other hand are discussed. The physiological role of the glia and its relations with nervous elements and capillaries are also treated in detail. Considerations are given concerning forecasts in the problem of motion control in the event of decreased, increased and normal forces of gravity. V.Z.

A72-12347 # External respiration, gas metabolism and energy consumption during human activity of various types in a state of weightlessness (Vneshnee dykhanie, gazoobmen i energotraty pri razlichnoi deiatel'nosti cheloveka v usloviakh nevesomosti). I. I. Kas'ian, G. F. Makarov, and V. I. Sokolov. *Akademiia Nauk SSSR, Izvestiia, Seriya Biologicheskaiia*, Sept.-Oct. 1971, p. 673-681. 19 refs. In Russian.

Respiration, gas metabolism and energy consumption were measured in 38 test pilots who performed various physical work during 92 flights along a parabolic trajectory, and in 21 weightlessness simulation experiments on three subjects in water and on an unsupported test stand. The metabolic processes were generally more intensive during weightlessness than under normal conditions in experiments with and without physical activity of the subjects. V.Z.

A72-12348 # Participation of free radicals in the generation of membrane potentials (Ob uchastii svobodnykh radikalov v generatsii membrannogo potentsiala). L. A. Piruzian and V. M. Aristarkhov (Akademiia Nauk SSSR, Institut Khimicheskoi Fiziki, Moscow, USSR). *Akademiia Nauk SSSR, Izvestiia, Seriya Biologicheskaiia*, Sept.-Oct. 1971, p. 697-703. 12 refs. In Russian.

Analysis of a possible contribution of free radicals to the generation of biopotentials in cell membranes. Properties of protein molecules are compared with those of semiconductors in an attempt

to explain the mechanism of biopotential generation. The existence of a relation between the conductivity of a cell membrane and the free radical concentration in the cell is indicated. A diagram is given to show a possible relation between biopotentials and free radicals. V.Z.

A72-12413 Threshold levels for damage of the cornea following irradiation by a continuous wave carbon dioxide (10.6 microns) laser. R. G. Borland, D. H. Brennan, and A. N. Nicholson (RAF, Institute of Aviation Medicine, Farnborough, Hants., England). *Nature*, vol. 234, Nov. 19, 1971, p. 151, 152.

Study of corneal damage of varying severity in the rabbit and monkey following exposure to a laser. Three grades of corneal damage were recognized. These were (1) a very faint opalescence of the epithelium, (2) epithelial loss, and (3) coagulation of the substantia propria with scarring of the cornea. It is recommended that the derivation of hazard levels should be based on the lowest power observed to produce minimal corneal damage (4.0 W/sq cm). F.R.L.

A72-12484 Retinomotor responses - Their characteristics and mechanisms (Les réponses rétinomotrices - Caractères et mécanismes). M. A. Ali (Montréal, Université, Montréal, Canada). *Vision Research*, vol. 11, Nov. 1971, p. 1225-1288. 171 refs. In French.

The rods, cones, and retinal epithelial pigment of teleosts, anurans, urodeles, and birds undergo positional changes in response to light or darkness. The changes may take from a few minutes to several hours for completion. The phylogenetic variations observed represent an adaptive radiation of the retinomotor responses. In fishes and amphibians there is an ontogenetic parallel between the structural and functional development of the retinal elements. There is also a good correlation between retinal structure, responses, habitat, and behavior. This helps an understanding of phenomena such as phototaxis, feeding, and migration. Light intensity and wavelength influence the positions of the retinal elements. Temperature and time of day do so to a lesser extent in continuous darkness and to a still lesser extent in constant light. M.M.

A72-12485 Binocular addition of the visual response evoked by dichoptic patterned stimuli. L. Cigánek (Slovak Academy of Sciences, Institute of Normal and Pathological Physiology, Bratislava, Czechoslovakia). *Vision Research*, vol. 11, Nov. 1971, p. 1289-1297. 19 refs.

Different flashed patterns were presented monocularly and dichoptically in different combinations in man. Different patterns presented monocularly result in more or less specific evoked potential forms. With dichoptic stimulation the response to a white field or a big square checker board pattern from one eye is suppressed by a simultaneously evoked response to a small square checker pattern from the other eye. Dichoptic presentation of patterns with small details shows a tendency to integration rather than suppression of the corresponding monocularly evoked response forms. The leading eye and attention focused on one of the dichoptically presented patterns do not decisively influence the reported process of binocular addition. The physiological mechanisms of the reported results are discussed on the basis of the cortical visual field concept, and perspective possibilities of the method in studying visual perception in man are outlined. M.M.

A72-12486 Binocular depth perception without geometrical cues. A. Fiorentini and L. Maffei (CNR, Laboratorio di Neurofisiologia, Pisa, Italy). *Vision Research*, vol. 11, Nov. 1971, p. 1299-1305. 12 refs.

Binocular depth perception arising from stereoscopic presentation of two gratings of different spatial frequencies is investigated.

The angle of tilt of the stereoscopic image from the frontal plane is a function of the perceptual frequency difference as well as of the average frequency of the two gratings. A stereoscopic effect is described: a tilt of the stereoscopic image can be induced by lowering the contrast of one of two gratings having the same spatial frequency. A model is proposed for a mechanism of stereoscopic depth perception based on the comparison of spatial frequency content in the two retinal images. M.M.

A72-12487 Some dynamic features of colour vision. D. Regan and C. W. Tyler (Keele, University, Keele, Staffs., England). *Vision Research*, vol. 11, Nov. 1971, p. 1307-1324. 28 refs. Research supported by the Medical Research Council.

Experiments analogous to classical studies of threshold luminance perception, with wavelength changes replacing intensity changes, were made. Throughout the spectrum the shapes of the sensitivity vs frequency curves for the perception of wavelength modulation are quite different from the shapes of the analogous curves for luminance modulation. These curves are interpreted as descriptions of the different attenuation characteristics of the neural mechanisms which underlie the perception of threshold changes of stimulus wavelength and intensity, respectively. The classical bipartite-field method gives little information as to the dynamics of wavelength discrimination. It is reported that the shape of the wavelength discrimination curve is a function of stimulus repetition frequency. Although the yellow minimum is little affected, the blue-green minimum shifts from 500 to below 480 nm when stimulus frequency is reduced from 5 to 0.5 Hz. M.M.

A72-12488 Sensitization by annular surrounds - Temporal /masking/ properties. D. Y. Teller (Washington, University, Seattle, Wash.). *Vision Research*, vol. 11, Nov. 1971, p. 1325-1335. 30 refs. PHS Grant No. EY-00421.

Description of experiments showing that there is a minimum in the threshold near the instant of onset of the annulus of the retina and a (highly variable) maximum in the threshold near the instant of offset of the annulus. It is pointed out that the experimental data do not support the notion of a relative delay in the neural signals generated by light falling on the annular region, nor do they support the notion that the time courses of these threshold changes are similar to those occurring in classical 'early' dark and light adaptation. M.M.

A72-12489 The influence of peripheral and central factors on the way stabilized images disappeared. B. Cardu, M. Gilbert, and M. Strobel (Montréal, Université, Montreal, Canada). *Vision Research*, vol. 11, Nov. 1971, p. 1337-1343. 8 refs. National Research Council of Canada Grant No. APA-271.

Investigation of the influence of lateral inhibition on the mode of disappearance of stabilized visual perceptual units (lines and angles). Human subjects were presented with the outline of a geometric figure with either a broken angle or line, the break varying from 5 to 40 min of angle. The results tend to show that the percentage of local disappearance (in perceptual units) is minimal, that the whole type of disappearance constitutes 73 per cent of the total, and that the phenomenon of lateral inhibition seems to influence the type of disappearance. It is argued that the different types of disappearance can better be explained in terms of lateral inhibition than by cell assemblies. M.M.

A72-12490 Hippus of the pupil - Periods of slow oscillations of unknown origin. H. Bouma and L. C. J. Baghuis (IPO, Institute for Perception Research, Eindhoven, Netherlands). *Vision Research*, vol. 11, Nov. 1971, p. 1345-1351. 21 refs.

Hippus is described as a sustained oscillation of the pupil, with a period of about 5 sec. The amplitude is about 1 mm, and the average diameter is decreased by 1-2 mm. Hippus was found in almost every subject tested. Usually, Hippus seems to occur spontaneously, but it is more prone to appear when subjects are relaxed and passive. A repeated light step and a repeated accommodation may induce the occurrence of Hippus. Mental activity causes an immediate disappearance of Hippus. To prevent Hippus from contaminating pupillary measurements, a continuous monitoring of the pupil seems desirable. M.M.

A72-12494 Monotonous stimulation, sleep onset and habituation of the orienting reaction. G. Bohlin (Uppsala, University, Uppsala, Sweden). *Electroencephalography and Clinical Neurophysiology*, vol. 31, Dec. 1971, p. 593-601. 36 refs.

This investigation was made on 30 subjects in a condition of repetitive auditory stimulation, and a control condition of no such stimulation. The results of the assessment verified the hypothesis of parallel effects of frequency of stimulation on the orienting reaction (OR) habituation and sleep onset - namely, both were faster with more frequent stimulation. In addition, the findings from a first experiment regarding time to sleep onset during stimulation, as compared to no stimulation, was confirmed. M.M.

A72-12511 # Types of fibers mediating impulses during nociceptive action on the skin (Tipy volokon, provodiashchikh impul'sy pri notsitseptivnom deistvii na kozhu). A. V. Zeveke and G. I. Malysheva (Gor'kovskii Gosudarstvennyi Universitet, Gorki, USSR). *Biulleten' Eksperimental'noi Biologii i Meditsiny*, vol. 72, Sept. 1971, p. 3-5. 12 refs. In Russian.

It is shown that fibers of the C(1) and A(beta) groups mediate the impulsion arising during the administration of a nociceptive concentration (250 mM/1) of KCl into the skin vessels of cats. The participation of fibers from the C(2) and A(delta) groups in the transmission of impulses during nociceptive chemical action was not regular; activity in these fibers was observed in only some of the tests after administration of KCl (250 mM/1). Small concentrations of KCl did not exhibit nociceptive effects. T.M.

A72-12512 # Evoked potentials of vestibular nuclei during stimulation of visceral and somatic nerves (Vyzvannyye potentsialy vestibuliarnykh iader pri razdrzhenii vistseral'nykh i somaticheskikh nervov). A. A. Shliakhovenko (Ivano-Frankovskii Meditsinskii Institut, Ivano-Frankovsk, Ukrainian SSR). *Biulleten' Eksperimental'noi Biologii i Meditsiny*, vol. 72, Sept. 1971, p. 6-9. 8 refs. In Russian.

Evoked potentials in the bulbar complex of vestibular nuclei were examined upon stimulation of somatic and visceral afferents in acute experiments on cats under chloralose-nembutal anesthesia. Evoked potentials upon stimulation of the vagus, splanchnic, pelvic, brachial, and sciatic nerves were recorded in the medial and lateral vestibular nuclei. The interaction between somatic and visceral signals at the level of vestibular nuclei was examined. Single conditioning stimulation of the somatic nerve suppressed the response of the visceral nerve to subsequent stimulation (after 10 to 75 msec). T.M.

A72-12513 # Extracardial chronotropic effects on the heart during fatigue (Ekstrakardial'nye khronotropnyye vlianiia na serdtse pri utomlenii). A. I. Vaisman (Nauchno-Issledovatel'skii Institut Gigieny Truda i Profzabolevanii, Gorki, USSR). *Biulleten' Eksperimental'noi Biologii i Meditsiny*, vol. 72, Sept. 1971, p. 13-16. 19 refs. In Russian.

Variational pulsometry, autocorrelation analysis, and spectral analysis were used to study variations of the cardiac rhythm in 35 chauffeurs throughout a daily period of professional activity. It is demonstrated that changes in the nature of sympathetic and

parasympathetic effects on the cardiac rhythm may serve as an index of fatigue. Professional activity causes simultaneous prolonged activation of both sympathetic and parasympathetic portions of the vegetative nervous system. The activation of the parasympathetic system is considered to be an indication of the asthenic reaction induced by complex functions of driving an automobile, while the enhancement of the sympathetic effects characterizes the degree to which the organism mobilizes its reserves in attempting to maintain a high level of efficiency. T.M.

A72-12514 # Mechanism of the Bainbridge effect (O mekhanizme efekta Beinbridzha). Iu. E. Maliarenko and I. I. Mirushchenko (Rostovskii-na-Donu Meditsinskii Institut, Rostov, USSR). *Biulleten' Eksperimental'noi Biologii i Meditsiny*, vol. 72, Sept. 1971, p. 19-23. 19 refs. In Russian.

It is shown that vagotomy and removal of stellate ganglia do not prevent the development of tachycardia in response to the introduction of Ringer's solution into the jugular vein. The onset of tachycardia is systematically observed when chemical stimulants are applied to the region of the sinoatrial ganglion. The results do not confirm the hypothesis of a reflex (in any case extracardiac) mechanism for the Bainbridge effect, and indicate a prominent role of the sinus ganglion in enhancement of the cardiac rate. T.M.

A72-12515 # Determination of the nonuniformity of pulmonary ventilation during a single calm expiration (Opredelenie neravnomernosti ventilatsii legkikh vo vremia spokojnogo odinokhnogo vydokha). T. S. Tsuzmer and R. S. Vinitaskaia (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR). *Biulleten' Eksperimental'noi Biologii i Meditsiny*, vol. 72, Sept. 1971, p. 23-26. 11 refs. In Russian.

The nitrogen concentration curve in the second calm expiration after beginning to breathe with pure oxygen was used to study pulmonary ventilation in healthy subjects and in patients with lung disease. Factors indicating irregular ventilation included a reduced nitrogen concentration at the beginning of the alveolar phase, enhancement of nitrogen concentration toward the end of the alveolar phase, and an increased ratio of growth in nitrogen concentration to the duration of the alveolar phase. T.M.

A72-12516 # Influence of hypoxic hypothermia on the phospholipid metabolism of endocrine organs in rats during chronic hypoxic hypoxia (Vliianie 'gipoksicheskoi' gipotermii na metabolism fosfolipidov endokrinnnykh organov krys pri khronicheskoi gipoksicheskoi gipoksii). G. A. Gribanov (Kalininskii Meditsinskii Institut, Kalinin, USSR). *Biulleten' Eksperimental'noi Biologii i Meditsiny*, vol. 72, Sept. 1971, p. 42-44. 21 refs. In Russian.

Hypoxic hypothermia during chronic hypoxia exerts an inhibiting influence on the metabolism of adrenal phospholipids and does not affect the phospholipid metabolism in thyroid glands and testes. Disturbance of the heat output during chronic hypoxic hypoxia sharply enhances the incorporation of the radioactive tracer (P-32) into phospholipids of endocrine organs. T.M.

A72-12517 # Influence of adrenalin and noradrenalin on the cerebral blood circulation volume and oxygen tension in cerebral tissues (Vliianie adrenalina i noradrenalina na ob'emnuu skorost' mozgovogo krvotoka i napriazhenie kisloroda v tkani mozga). M. D. Gaevyi (Semipalatinskii Meditsinskii Institut, Semipalatinsk, USSR). *Biulleten' Eksperimental'noi Biologii i Meditsiny*, vol. 72, Sept. 1971, p. 57-60. 15 refs. In Russian.

In acute experiments on cats under conditions of controlled respiration, intravenous injections of epinephrine and norepinephrine (10 microgram/kg) resulted in increased cerebral circulation volume

due to a substantially increased total arterial pressure. During stable arterial pressure or moderate hypertension, the blood circulation in cerebral vessels decreased and subsequently often increased gradually. Oxygen tension in cerebral tissues to a substantial degree depended on changes in blood circulation. T.M.

A72-12518 # Use of an electrical thermometer for recording external respiration (Primenenie elektricheskogo termometra dlia registratsii vneshnego dykhaniia). V. V. Kravtsov (Donetskii Nauchno-Issledovatel'skii Institut Travmatologii i Ortopedii, Donetsk, Ukrainian SSR). *Biulleten' Eksperimental'noi Biologii i Meditsiny*, vol. 72, Sept. 1971, p. 122, 123. In Russian.

Description of an electrical thermometer mounted at the outlet of a breathing mask for recording electropneumograms. Respiration curves are obtained by measuring temperature changes caused by the air flow during respiration. The instrument does not restrict the mobility of the test animal, and no tracheotomy is required. The sensor element consists of a thermistor wired into one branch of a Wheatstone bridge circuit. T.M.

A72-12519 # Method of recording the velocity of pulse wave propagation in man by radio (K metodike registratsii po radio skorosti rasprostraneniia pul'sovoi volny u cheloveka). M. L. Rimskikh (Sverdlovskii Institut Gigieny Truda i Profzabolevani, Sverdlovsk, USSR). *Biulleten' Eksperimental'noi Biologii i Meditsiny*, vol. 72, Sept. 1971, p. 123, 124. In Russian.

Description of a biotelemetry system for recording the pulse wave propagation velocity in healthy human subjects performing physical tasks. The sensor elements consist of photoresistors illuminated by 2.5-V endoscopic lamps. These elements are characterized by high sensitivity, small dimensions, and high stability against noise caused by movements of the subject. Depending on the pickup point, the sensors measure either light transmitted through a thin body region (ear and fingers) or light reflected from a pulsating vessel surface beneath the skin. In dynamic conditions, readings are taken across the shoulder-finger area. Signals are relayed by a portable transmitter to a receiver connected with a two-channel electrocardiograph recorder. T.M.

A72-12525 The effect of elevated temperatures on Sidman avoidance. I. Barofsky (U.S. Army, Research Institute, Natick, Mass.). (Conference on Behavioral Thermoregulation, Lyons, France, Sept. 1970.) *Psychonomic Science*, vol. 25, Nov. 10, 1971, p. 139, 140. 8 refs.

Sidman avoidance performance persists during heat exposure. Disruption of avoidance performance coincided with disruption of the thermoregulatory capacity of the organism. The results suggest that avoidance performance not only regulates shocks received but also contributes to the regulation of body temperature. (Author)

A72-12660 # Dynamic characteristics measurement of human operator using pseudo-random binary signals. S. Hui (Yonsei University, Seoul, South Korea). In: Symposium on Simulation of Complex Systems, Tokyo, Japan, September 3-7, 1971, Proceedings. Tokyo, Society of Analog Technique of Japan, 1971, p. H-1/1 to H-1/6. 8 refs.

Determination of human operator dynamics by impulse estimation, using pseudorandom binary signals as test signals and mathematical models forming an element of a closed-loop control system. Aspects of research into the choice and properties of the test signal are discussed. Results of an experimental study of a simulated human operator in closed-loop control systems consisting of idealized disturbance patterns support theoretical predictions. F.R.L.

A72-12661 # On-line quick identification of human describing function using iterative differential analyzer. T. Tsumura

and M. Kajita (Osaka Prefecture, University, Sakai, Japan). In: Symposium on Simulation of Complex Systems, Tokyo, Japan, September 3-7, 1971, Proceedings. Tokyo, Society of Analog Technique of Japan, 1971, p. H-2/T to H-2/5. 6 refs.

Outline of a new method for identifying incrementally changing describing functions quickly during operation of a Link trainer (an example of an operator trainer). As a form of human describing function a well known 'Tustin model' with rate feedback was considered. For on-line identification an iterative-type analog computer was used. Detailed circuit configurations and a flow chart for three-parameter identification are discussed. Experimental results show that the proposed method is valuable for man-machine systems and on-line adaptive control systems. F.R.L.

A72-12662 # Methods of phenomenological biorhythms study with the aid of hybrid computers. M. K. Chernyshev (Academy of Sciences, Laboratory for Studying Problems of Functions Control in the Human and Animal Body, Moscow, USSR). In: Symposium on Simulation of Complex Systems, Tokyo, Japan, September 3-7, 1971, Proceedings. Tokyo, Society of Analog Technique of Japan, 1971, p. H-4/1 to H-4/10.

Study of the isolation of regular information, and biorhythms in particular, from biological noise, with quantitative definition of their basic parameters. To solve this problem hierarchical resonant-iterative methods are developed, and a structural scheme for reproducing these methods with the aid of hybrid computers is suggested. It is to be noted that the methods, combined with the suggested structural scheme of their resolution, permits the problem of quantitative determination of parameters and correlations for various waves in physiological processes to be solved effectively. F.R.L.

A72-12834 Effect of high altitude on lactic dehydrogenase isozymes and anoxic tolerance of the rat myocardium. G. L. Anderson (Missouri, University, Columbia, Mo.) and R. W. Bullard (Indiana University, Bloomington, Ind.). *Society for Experimental Biology and Medicine, Proceedings*, vol. 138, Nov. 1971, p. 441-443. 10 refs.

Changes in lactic dehydrogenase (LDH) isozyme complement, as well as the anoxic tolerance of the heart, in response to the hypoxia of altitude have been investigated. The question as to whether shifts in LHD complement are of any physiological advantage is discussed. O.H.

A72-12835 Thirst immediately following removal of rats from graded levels of hypoxia. M. J. Fregly (Florida, University, Gainesville, Fla.). *Society for Experimental Biology and Medicine, Proceedings*, vol. 138, Nov. 1971, p. 448-453. 17 refs. Contract No. N00014-68-A-0173-0007.

Experiments in rats are described the objective of which was to determine whether the magnitude of water intake measured immediately following return from hypoxia to normoxia was a function of the percentage of oxygen to which the rats had been exposed. Results suggest that the extent of the posthypoxic thirst, and perhaps the relative dehydration induced, are inverse linear functions of the degree of hypoxia to which the rats were exposed. O.H.

A72-12845 * Brain serotonin content - Increase following ingestion of carbohydrate diet. J. D. Fernstrom and R. J. Wurtman (MIT, Cambridge, Mass.). *Science*, vol. 174, Dec. 3, 1971, p. 1023-1025. 31 refs. Research supported by the Barra Foundation; NIH Grant No. AM-14228; Grant No. NGR-22-009-272.

In the rat, the injection of insulin or the consumption of carbohydrate causes sequential increases in the concentrations of tryptophan in the plasma and the brain and of serotonin in the brain.

Serotonin-containing neurons may thus participate in systems whereby the rat brain integrates information about the metabolic state in its relation to control of homeostasis and behavior. M.M.

A72-12846 Formaldehyde and ammonia as precursors to prebiotic amino acids. Y. Wolman, S. L. Miller, J. Ibañez, and J. Oró (Stanford University, Stanford, Calif.). *Science*, vol. 174, Dec. 3, 1971, p. 1038, 1039.

Critical review of speculations on the relation between the existence of molecules of interstellar formaldehyde and ammonia and the origin of life on earth, with reference to the findings of Fox and Windsor (1970). It is pointed out that interstellar formaldehyde and ammonia probably had little effect on the composition of the atmosphere of the primitive earth or on prebiological evolution here. M.M.

A72-12852 # The effect of preliminary cueing signals of the required choice reaction on the reaction time (Über den Einfluss von Vorankündigungen der geforderten Wahlreaktion auf die Reaktionszeit). F. Merz (Marburg, Universität, Marburg an der Lahn, West Germany). *Zeitschrift für experimentelle und angewandte Psychologie*, vol. 18, no. 4, 1971, p. 629-647. 10 refs. In German.

Two experiments have been performed to study the effect on reaction time (RT) of an additional cueing signal which contains information designed to limit the types of alternatives called for by the reaction task itself. The cue signal preceded the actual reaction signal, these delays being systematically varied. Results show that, as predicted, the additional cueing signal clearly shortens RTs. The minimum values were obtained for intervals of approximately 0.5 sec. Results also show that, with increases in the amount of information with which the subjects have to deal, the time between the information cue and the traditional starting signal has to be increased proportionately to effect the shortest RTs. O.H.

A72-12881 # Dynamics of the individual hippocampus rhythms and the correlation between the theta and cardiac rhythms in response to stimulation of the central gray matter by currents of various intensity (Dinamika otdel'nykh ritmov gippokampa i korreliatsiia teta-ritma s chastotoi serdtsebieniia pri razdrashenii tsentral'nogo serogo veshchestva tokom raznoi sily). N. R. Kiknadze (Akademiiia Nauk Gruzinskoi SSR, Institut Fiziologii, Tiflis, Georgian SSR). *Akademiia Nauk Gruzinskoi SSR, Soobshcheniia*, vol. 63, Sept. 1971, p. 693-696. 7 refs. In Russian.

The electric activity of the hippocampus and the change in the cardiac rhythm in response to electric stimulation of the central gray matter were studied in cats by implantation of metal electrodes in different areas of the brain. Stimulation at intensities causing emotional reactions of alertness and anxiety was found to increase appreciably the hippocampal theta rhythm without affecting any other rhythm. Stronger stimulation, causing fear and escape reactions, produced a pronounced increase in the cardiac rhythm (up to 300 beats per minute), accompanied by an appreciable decrease in the hippocampal theta and delta rhythms. V.P.

A72-12891 Effect of exercise on the atrial recovery wave. D. P. Riff (Rush Medical College, Chicago, Ill.) and R. A. Carleton (Presbyterian-St. Luke's Hospital; Rush Medical College, Chicago, Ill.). *American Heart Journal*, vol. 82, Dec. 1971, p. 759-763. 8 refs. PHS Grant No. HE-05714.

The effect of physical exercise on the duration and magnitude of the atrial recovery wave is studied in nine patients with second and third degree A-V block of different causal background. EKGs were taken in patients after walking on a treadmill or running in place and were compared with control EKGs of patients without heart block. It is found that up to 160 msec of the S-T segment may be distorted by T sub a. The distortion can go up to 0.19 mv at the junction point and becomes progressively less thereafter. V.Z.

STAR ENTRIES

N72-10067*# Techtran Corp., Glen Burnie, Md.
**THE TYPES OF ACID PHOSPHATASE OF RED CELLS.
 STUDY OF 134 FAMILIES [LES TYPES DE PHOSPHATASE
 ACIDE DES GLOBULES ROUGES ETUDE DE 134
 FAMILLES]**

Van Nguyen Cong and J. Moulllec Nov. 1971 6 p refs Transl. into ENGLISH from Rev. Eur. Etud. Clin. Biol., France, v. 12, 1967 p 574-576

(Contract NASw-2037)

(NASA-TT-F-14015) Avail: NTIS CSCL 06P

A study of 134 unrelated French families, with 485 children, was used to test the inheritance of the acid phosphatase types as recognized by starch gel electrophoresis of human red cell hemolysates. No exception was found to the three alleles rule previously established. The gene frequencies in Paris were PA=0.3214, PB=0.6386, and PC=0.0400. An example of the rare homozygous type C was found in the offspring of an AC x BC family. It is almost the mirror image of the type B. Using concentrated red cell hemolysates provided the opportunity to observe two fast additional zones. The alpha-zone was present in all phenotypes A, AB, and AC. The beta-zone was present in all phenotypes B, AB, and BD. Author

N72-10068*# Techtran Corp., Glen Burnie, Md.
**THE OXIDATION OF PYRUVIC ACID IN YEAST
 [L'OXIDATION DE L'ACIDE PYRUVIQUE CHEZ LA
 LEVURE]**

A. Alvarez, E. Vanderwinkel, and Y. M. Wiame Washington NASA Nov. 1971 15 p refs Transl. into ENGLISH from Biochem. Biophys. Acta (Netherlands), v. 28, 1958 p 333-341

(Contract NASw-2037)

(NASA-TT-F-14003) Avail: NTIS CSCL 06M

The methodology and the products used to describe the possible presence of pyruvic acid oxidation in yeast are presented. The yeast proteinic fraction obtained by a 20% to 75% saturation with ammonia sulfate was used for tests of pyruvic oxidase activity while parallel tests were conducted with the proteinic extracts from a mutant. The effects of replacing the pyruvate by ethanol or acetaldehyde were also studied. Results indicate that the pyruvic oxidation system exists in the yeast and also in the mutants grown with impaired respiration, the normal yeast grown anaerobically, and the industrially produced yeast from aerobic cultures. Evidences of paths which by-pass the free acid steps were also found. Author

N72-10069*# Translation Consultants, Ltd., Arlington, Va.
**METHODS OF EVALUATING PULSED VIBRATIONS
 (VIBRATION EVALUATION METHODS 3) [SHOGEKI
 SHINDO NO HYOKAHO (SHINDO NO HYOKAHO 3)]**

T. Miwa and Y. Yonekawa Washington NASA Nov. 1971 15 p refs Transl. into ENGLISH from J. Acoust. Soc. Japan (Japan) v. 27, no. 1, Jan. 1971 p 33-39

(Contract NASw-2038)

(NASA-TT-F-13987) Avail: NTIS CSCL 06P

A method for evaluating pulsed vibrations of the type encountered in pile driving and forging work is proposed. Pulsed sinusoidal vibrations, damped vibrations, built-up vibrations, and a combination of damped and built-up vibrations were treated separately. J.G.M.

N72-10070*# Translation Consultants, Ltd., Arlington, Va.
**METHODS OF EVALUATING COMPOUND SINUSOIDAL
 AND RANDOM VIBRATIONS [FUKUGO SEIGEN SHINDO
 TO RANDOMU SHINDO NO HYOKAHO (SHINDO NO
 HYOKAHO 2)]**

T. Miwa and Y. Yonekawa Washington NASA Nov. 1971 24 p refs Transl. into ENGLISH from Nippon Onkyo Gakkaishi (Tokyo), v. 27, no. 1, Jan. 1971 p 21-32

(Contract NASw-2038)

(NASA-TT-F-13986) Avail: NTIS CSCL 06P

A method for evaluation compound sinusoidal vibrations with several frequency components and random vibrations of a continuous wide frequency band is proposed. To evaluate sinusoidal vibrations, the vibration acceleration levels of their frequency components were converted into vibration greatness (VG) values and summed up in a method similar to one devised for assessment of noise. For random vibrations, threshold and equal sensation curves were determined for the random vibration with 1 and 1/3 octave-band. The effect on the whole body was measure and VG values were computed. The VG values were then summed up in the same method as in the compound sinusoidal vibrations. J.G.M.

N72-10071*# Translation Consultants, Ltd., Arlington, Va.
**METHODS OF EVALUATING SINUSOIDAL VIBRATIONS
 (VIBRATION EVALUATION METHODS 1) [SEIGEN
 SHINDO NO HYOKAHO (SHINDO NO HYOKAHO 1)]**

T. Miwa and Y. Yonekawa Washington NASA Nov. 1971 23 p refs Transl. into ENGLISH from Nippon Onkyo Gakkaishi (Tokyo), v. 27, no. 1, Jan. 1971 p 11-20

(Contract NASw-2038)

(NASA-TT-F-13985) Avail: NTIS CSCL 06P

Psychological experiments were carried out by using vibration tables of the electrodynamic type in vertical and horizontal directions, to establish a systematic method of evaluation. Threshold levels and equal sensation levels, were observed by the method of paired comparisons on the whole body in sitting, standing, and lying postures and on the hand. It was shown that there is no difference in the threshold curves (T curves) between sitting and standing postures, and that the T curve of the horizontal vibration is higher by 10 dB than that of the vertical vibration in the domain above 5 Hz. A characteristic feature of the T curve of the lying posture is its dip near 80 Hz for the vertical vibration due to skull resonance. No clear differences in the equal sensation curves between sitting and standing postures were observed. The sensation difference between vertical and horizontal vibrations was also observed. Author

N72-10072*# Scientific Translation Service, Santa Barbara, Calif.

**FURTHER STUDIES ON THE RELATION BETWEEN
 MITOCHONDRIA AND GLYCOLYSIS [WEITERE UNTER-
 SUCHUNGEN UEBER DIE BEZICHUNG ZWISCHEN
 MITOCHONDRIEN UND GLYKOLYSE]**

E. J. Schneider, A. Graffi, H. Bielka, and L. Venker Washington NASA Nov. 1971 4 p refs Transl. into ENGLISH from Naturwissenschaften (W. Berlin), v. 44, 1957 p 446

(Contract NASw-2035)

(NASA-TT-F-14034) Avail: NTIS CSCL 06E

The relation between mitochondria and glycolysis is studied. It is found that mitochondria influences glycolysis even when glucose alone is used as the substrate, and not combined with HDP. Author

N72-10073*# Translation Consultants, Ltd., Arlington, Va.
**CONDITION OF THE HUMAN CARDIOVASCULAR SYSTEM
 IN TRUE AND SIMULATED WEIGHTLESSNESS**

V. A. Degtyarev and V. M. Khayutin Washington NASA Oct. 1971 20 p refs Transl. into ENGLISH of the conf. paper "Sostoyaniye Serdechno-Sosudistoy Sistemy Cheloveka Pri Deystviy Nevosomosti i Pri Yeyo Modelirvaniy" Moscow, Acad. of Sci., 1971 p 1-17 Presented at the 4th Intern. Symp. "Man in Space", Yerevan, USSR, Oct. 1971

(Contract NASw-2038)

(NASA-TT-F-14030) Avail: NTIS CSCL 06P

The experience of manned space flights proves that weightlessness also has an effect on the cardiovascular system. Experiments were conducted, measuring diastolic, mean, marginal, and terminal systolic pressure, velocity of pulse-wave spread frequency of heartbeat, length of phase of the cardiac cycle, pulse, and minute volume of blood. Author

N72-10074*# Scientific Translation Service, Santa Barbara, Calif.

THE VARIATIONS OF NEUROMUSCULAR EXCITABILITY IN THE COURSE OF ACUTE GLUCIDIC NUTRITIONAL IMBALANCE [LES VARIATIONS DE L'EXCITABILITE NEUROMUSCULAIRE AU COURS DU DESEQUILIBRE ALIMENTAIRE GLUCIDIQUE AIGU]

R. Lecoq, Paul Chauchard, and H. Mazoue Washington NASA Nov. 1971 5 p refs Transl. into ENGLISH from Compt. Rend. (Paris), v. 216, 1943 p 211-213 (Contract NASw-2035)

(NASA-TT-F-14035) Avail: NTIS CSCL 06P

Neuromuscular excitability during acute glucidic imbalance was measured on pigeons. A state of cephalic excitation and an augmentation of the muscular chronaxies were found result. Author

N72-10075*# Scripta Technica, Inc., Washington, D.C.

INTEGRATISM: A PATH FROM THE SIMPLE TO THE COMPLEX IN UNDERSTANDING LIFE PHENOMENA [INTEGRATIZM: PUT OT PROSTOGO K SLOZHNOMU V POZNANII YAVLENIY ZHIZNI]

V. A. Engelhardt NASA Oct. 1971 28 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Biol. (Moscow), no. 6, Nov. - Dec. 1970 p 799-822 (Contract NASw-2038)

(NASA-TT-F-13729) Avail: NTIS CSCL 06C

In modern theoretical biology, two opposing trends are apparent: organicism and reductionism. Efforts are being made to overcome their contradictions and to achieve a synthesis of their methods of approach in tackling fundamental problems. Recent advances in molecular biology justify the opinion that increased attention be paid to studies along a line defined as integratism. Integratism attempts to elucidate the principles and mechanisms involved in the transition from the primitive and elementary biological level to levels of increasing complexity and organization, reversing the principle of reductionism. The basis of the transition from component parts to a complex whole is the integration of lower level elements into the whole of the next higher organizational level. The aim of integratism is to understand the factors which constitute the difference between the whole and the sum of its parts in the hierarchy of biological organization. Author

N72-10076*# Sandia Corp., Albuquerque, N.Mex. Planetary Quarantine Dept.

PLANETARY QUARANTINE PROGRAM Quarterly Progress Report; period ending 30 Sep. 1971

Sep. 1971: 51 p refs Sponsored in part by AEC

(NASA-Order W-12853; Project 0064010)

(NASA-CR-122848; QPR-22) Avail: NTIS CSCL 06M

A quantitative means was developed to investigate the sensitivity of current spacecraft sterilization plans to variations in D-values: A quantitative expression was derived to represent the distribution of D-values among a population of naturally occurring organisms. An investigation was made of (1) the inactivation of both *Bacillus subtilis* var. niger spores and Cape Kennedy soil spores by gamma-radiation at room temperature in a nitrogen environment, and (2) the thermoradiation resistance of Cape Kennedy soil spores at elevated temperatures below 125 C. The relation between standard survival experiments with bacterial spores in soils and results obtained on spacecraft surfaces is discussed. Sporocidal properties of aqueous formaldehyde can be increased by elevating the temperature. Author

N72-10077*# National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.

MEDICAL INFORMATION MANAGEMENT SYSTEM (MIMS): AN AUTOMATED HOSPITAL INFORMATION SYSTEM.

Sidney Alterescu, Paul B. Simmons (United Computing Systems, Inc.), and Ronald A. Schwartz (Federal City Coll., Washington, D. C.) Sep. 1971 103 p

(NASA-TM-X-65747; X-751-71-438) Avail: NTIS CSCL 06E

An automated hospital information system that handles all data related to patient-care activities is described. The description is designed to serve as a manual for potential users, nontechnical medical personnel who may use the system. Examples of the system's operation, commentary on the examples, and a complete listing of the system program are included. Author

N72-10078# Pittsburgh Univ., Pa. Dept. of Chemistry. **BIOLOGICAL APPLICATIONS OF MOESSBAUER SPECTROSCOPY Progress Report, Feb. 1970 - May 1971**

L. M. Epstein and Darel K. Straub May 1971 52 p refs

(Contracts AT(30-1)-3859; AT(30-1)-3514)

(NYO-3859-13) Avail: NTIS

Various unsuccessful attempts to synthesize iron dinitrogen complexes containing sulfur ligands are summarized. Measurements of tris(N,N-disubstituted dithiocarbamato)iron(+3) solution magnetic moments by NMR methods and Mossbauer spectra of aryl substituted derivatives and cyclic derivatives of iron tris dithiocarbamates are discussed. The characteristics of the products of gaseous boron trifluoride reactions with benzene solutions of ferric tris dithiocarbamates are outlined, based on data from elemental analyses; conductivity measurements; and visible, infrared, and Mossbauer spectra, as well as chemical methods. The development of methods for preparing bis(N,N-disubstituted dithiocarbamato)iron(+3) complexes with moderate ligands is also included. J.M.

N72-10079# Forschungsinstitut fuer Anthropotechnik, Meckenheim (West Germany).

PSYCHOLOGICAL PERCEPTION PRINCIPLES OF CHARACTER RECOGNITION [WAHRNEHMUNGSPSYCHOLOGISCHE GRUNDLAGEN DER SYMBOLERKENNUNG]

Hannelore Radl-Koethe Nov. 1969 44 p refs In GERMAN *Its Anthropotech. Mitt. Nr. 4/69*

Avail: NTIS

The principles of physico-optical stimuli, photometry and colorimetry are discussed. Using a functional description of the eye, the psycho-physical effects of luminosity and color perception are examined. The psychological regularities of visual perception are critically reviewed. Finally, two experiments with direction indicators and signals drowned in noise are reported. ESRO

N72-10080# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

HEMATOLOGICAL EFFECTS OF LONG-TERM CONTINUOUS ANIMAL EXPOSURE TO CARBON MONOXIDE

Edmond H. Vernot, William F. MacKenzie, James D. MacEwen, Paul N. Monteleone, Jr., Marilyn E. George, Paul M. Chikos, Kenneth C. Back, Anthony A. Thomas, and Charles C. Haun Dec. 1970 17 p refs Presented at 1st Ann. Conf. on Environ. Toxicol., Fairborn, Ohio, 9-11 Sep. 1970; sponsored by SysteMed Corp. *Its Paper No. 1*

(Contract F33615-70-C-1046; AF PROJ. 6302)

(AD-727804; AMRL-TR-70-102-Paper-1) Avail: NTIS CSCL 06/20

Long-term continuous exposures of dogs and monkeys to CO produce a series of measurable changes resulting from the development of normocytic, normochromic polycythemia.

Author (GRA)

N72-10081# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

PATHOLOGY IN ANIMALS EXPOSED TO HIGH CONCENTRATIONS OF CARBON MONOXIDE FOR SIX MONTHS

William F. MacKenzie, Roman L. Patrick, Jr. (Lab. for Exptl. Biol.), and Paul N. Monteleone, Jr. (Johnstown Mem. Hosp.)

Dec. 1970 8 p refs Presented at 1st Ann. Conf. on Environ. Toxicol., Fairborn, Ohio, 9-11 Sep. 1970; sponsored by SysteMed Corp. *Its Paper No. 2*
(Contract F33815-70-C-1046; AF PROJ. 6302)
(AD-727505; AMRL-TR-70-102-Paper-2) Avail: NTIS
CSCL 08/20

Rats, mice, baboons, rhesus monkeys, and beagle dogs were exposed to 460 mgm/cu. M CO for 71 days followed by 575 mgm/cu. M CO for 97 days in a 68% O₂, 32% N₂, 5 psi environment. Anatomic changes found were confined to rodents and consisted of an increase in heart and spleen weights. This can be explained on the basis of increased RBC volume and blood viscosity. The possibility that the rats had begun to reach the maximum tolerable compensatory increase in RBC volume must be considered based on the death of two rats on the 166th day of exposure with lesions suggestive of circulatory complications. No anatomic changes were found in the other species. Based on the pathologic studies, it is indicated that CO has no direct effect on the body that produces a degenerative anatomic change. The animals at risk in this experiment were young healthy adults in the case of the rodents and dogs and healthy adolescent primates. They are not representative of human population at risk in a civilian community or, for that matter, in the Air Force as a whole. However, it does seem that the body's ability to adjust to high CO levels is much greater than had been previously suspected and is limited mainly by available circulatory reserve. Author (GRA)

N72-10082# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

ACUTE TOXICITY OF OXYGEN DIFLUORIDE

Harvey V. Davis Dec. 1970 13 p refs Presented at 1st Ann. Conf. on Environ. Toxicol., Fairborn, Ohio, 9-11 Sep. 1970; sponsored by SysteMed Corp. *Its Paper No. 21*
(Contract F33815-70-C-1046; AF PROJ. 6302)
(AD-727525; AMRL-TR-70-102-Paper-21) Avail: NTIS
CSCL 08/20

Because of the potential use of oxygen difluoride (OF₂) being used as an oxidizing fuel in the missile industry, it became necessary to define and characterize the hazards associated with the handling of this compound. The assessment of OF₂ toxicity in this study was made by exposing four species of animals (monkeys, dogs, rats and mice) to various concentrations of the gas for 15 and 60 minutes. The acute effects of OF₂ inhalation were shown mainly to be respiratory in nature. Tachypnea was the most prominent toxic sign observed in rodents. Upper respiratory and gastrointestinal tract irritations were observed in dogs and monkeys. The mortality response demonstrated a significant difference in the susceptibility of the various species to the toxic effects of the gas. Rats and mice were found to be much more susceptible than monkeys or dogs. Author (GRA)

N72-10083# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

CHRONIC EXPOSURE TO LOW CONCENTRATIONS OF MONOMETHYLHYDRAZINE

Charles C. Haun Dec. 1970 14 p refs Presented at 1st Ann. Conf. on Environ. Toxicol., Fairborn, Ohio, 9-11 Sep. 1970; sponsored by SysteMed Corp. *Its Paper No. 22*
(Contract F33815-70-C-1046; AF PROJ. 6303)
(AD-727526; AMRL-TR-70-102-Paper-22) Avail: NTIS
CSCL 08/20

The increased use of MMH as a rocket fuel suggested the need for reevaluation of the current threshold limit value of 0.2 ppm. Tests were undertaken to determine the biological response of 4 animal species to repeated daily exposures to 2 and 5 ppm MMH for a 6-month period. Exposures were conducted on a 6 hour/day, 5 day/week basis covering a 26-week period. Both experimental groups as well as the control set of animals consisted initially of 8 beagle dogs, 4 rhesus monkeys, 50 Wistar rats and 40 ICR mice. The Thomas Domes were operated at 725 mm Hg pressure (normal ambient pressure is 740 mm Hg) to avoid leakage of MMH, with nominal air flows of 40 cfm. Continuous monitoring of MMH concentrations was performed with an Auto Analyzer. Of the

various parameters selected to measure the chronic toxicity of MMH, a significant number did show positive indications of toxic stress. Furthermore, in many cases, the effects were clearly dose related. GRA

N72-10084# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

HUMAN SLEEP PATTERNS AND PSYCHOMOTOR PERFORMANCE DURING EXPOSURE TO MODERATE CONCENTRATIONS OF CARBON MONOXIDE

Robert D. O'Donnell, Paul M. Chikos, and James Theodore Dec. 1970 18 p refs Presented at 1st Ann. Conf. on Environ. Toxicol., Fairborn, Ohio, 9-11 Sep. 1970; sponsored by SysteMed Corp. *Its Paper No. 3*
(Contract F33815-70-C-1046; AF PROJ. 6302)
(AD-727506; AMRL-TR-70-102-Paper-3) Avail: NTIS
CSCL 08/20

When subjects are allowed to sleep for a normal period of time in the presence of CO at a level up to 150 ppm, there is no major disruption of either their sleep patterns or subsequent psychomotor performance involving time estimation, mental arithmetic, tracking, or vigilance under either moderate or high workloads. With respect to the performance measures, no patterns were isolated which would indicate that more detailed study under the same conditions would yield any significant effects of CO exposure. Some extremely tenuous indications of possible changes in the mobility of subjects during their early stages of sleep were uncovered, and these should be investigated further. Author (GRA)

N72-10085# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

ACUTE TOXICITY OF CARBON MONOXIDE UNDER HYPERBARIC CONDITIONS

Charles S. Rose (National Naval Medical Center, Bethesda, Md.) Dec. 1970 10 p refs Presented at the 1st Annual Conf. on Environmental Toxicology, Fairborn, Ohio, 9-11 Sep. 1970; sponsored by SysteMed Corp., Dayton, Ohio *Its Paper No. 5*
(AF PROJ. 6302)
(AD-727508; AMRL-TR-70-102-Paper-5) Avail: NTIS
CSCL 08/20

The toxicity of carbon monoxide was evaluated under conditions of elevated pressure to determine if a pressurized environment would result in an altered response of an animal to the gas. The results indicate that the toxicity of carbon monoxide is not altered by increases in ambient pressure up to approximately 8 ATA provided the partial pressure of oxygen in the atmosphere remains constant. Carbon monoxide, however, is unique in its mode of action and no attempts were made to evaluate any subjective effects, chronic effects, behavioral effects or measurements of decrements in performance during the exposures. Therefore, one should not generalize from data on carbon monoxide as to the toxicity of other materials under hyperbaric conditions. GRA

N72-10086# Ohio State Univ., Columbus.

THE EFFECT OF EXPOSURE TO LOW CONCENTRATIONS OF CARBON MONOXIDE

John Schulte Dec. 1970 6 p Presented at 1st Ann. Conf. on Environ. Toxicology, Fairborn, Ohio, 9-11 Sep. 1970; sponsored by SysteMed Corp., Dayton, Ohio *Its Paper No. 6*
(Contract F33815-70-C-1046)
(AD-727509; AMRL-TR-70-102-Paper-6) Avail: NTIS
CSCL 08/20

Preliminary results of a study on low concentrations of carbon monoxide on human behavior and performance are summarized. GRA

N72-10087# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

EXPERIMENTAL HUMAN EXPOSURE TO CARBON MONOXIDE < 1 TO 1000 PPM

Richard D. Stewart, Jack E. Peterson, Michael J. Hosko, Edward

D. Baretta, Hugh C. Dodd, Paul E. Newton, Terrance N. Fisher, and Anthony A. Herrmann Dec. 1970 28 p refs Presented at the 1st Ann. Conf. on Environ. Toxicol., Fairborn, Ohio, 9-11 Sep. 1970 *Its* Paper No. 4
(Contract F33615-70-C-1046; AF PROJ. 6302)
(AD-727507; AMRL-TR-70-102-Paper-4) Avail: NTIS
CSCL 06/20

As man grapples with the problems of air pollution in an attempt to establish air quality standards, he finds he possesses limited information regarding the biological effects of short-term and continuous exposure to low concentrations of carbon monoxide (CO). Only a few investigations have been conducted in which sophisticated instrumentation was used to search for minute changes in human performance induced by exposure to low concentrations of CO. Lacking is the information as to whether these minor alterations in function which have been reported are of any practical significance to the health, performance, or judgment of man as he performs his daily tasks. In an attempt to gather additional human toxicological information about CO, a series of experimental exposures to known concentrations of the gas was conducted. These exposures were designed to simulate the type encountered for industry and in urban areas where CO is absorbed over a period of hours. GRA

N72-10088# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
BEHAVIORAL RESPONSES TO SMALL DOSES OF CARBON MONOXIDE

Rodney R. Beard and Netta Grandstaff Dec. 1970 14 p Presented at the 1st Ann. Conf. on Environ. Toxicol., Fairborn, Ohio, 9-11 Sep. 1970; sponsored by Systemed Corp. *Its* Paper no. 7
(Contract F33615-70-C-1046; AF PROJ. 6302)
(AD-727510; AMRL-TR-70-102-Paper-7) Avail: NTIS
CSCL 06/20

Previous reports by several authors have emphasized that learned behavior patterns are more vulnerable to disruption by drugs when there is an increase in the complexity of the discriminative stimuli that control a given response or sequence of responses. The effects of low concentrations of CO on a series of complex sequential problems were determined to establish baseline data for further research on relative cognitive tasks. The CO went on after 30 minutes, remained on for 90 minutes, and was off for the remainder of the session for all days of testing when CO was given. The subjects completed an average of about 12 single tests on any one day of testing (a session). Only the effect of 250 ppm of CO were tested. There were four sessions with CO, three without. The results of tests indicated that only with an exposure to 250 ppm is there a significant decrement in performance, and this only in one subject among four. GRA

N72-10089# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

THE EFFECTS OF CARBON MONOXIDE ON CORONARY HEMODYNAMICS AND LEFT VENTRICULAR FUNCTION IN THE CONSCIOUS DOG

Jim D. Adams (School of Aerospace Medicine, Brooks AFB, Tex.), Howard H. Erickson (School of Aerospace Medicine, Brooks AFB, Tex.), and Hubert L. Stone (School of Aerospace Medicine, Brooks AFB, Tex.) Dec. 1970 19 p Presented at the 1st Ann. Conf. on Environmental Toxicology, Fairborn, Ohio, 9-11 Sep. 1970 *Its* Paper No. 8
(Contract F33615-70-C-1046; AF PROJ. 6302)
(AD-727511; AMRL-TR-70-102-Paper-8) Avail: NTIS
CSCL 06/20

Low levels of carboxyhemoglobin can cause significant changes in coronary blood flow. Hypoxia induced by the elevation of COHb appears to have a different effect on the cardiovascular system than hypoxia induced by lowering the inspired oxygen. If the inspired O₂ is lowered, the arterial Po₂ is decreased. Under this condition, an increase is observed in coronary flow, heart rate, coronary stroke volume, and left ventricular dP/dt. When the inspired oxygen is held constant and the COHb is elevated, there is no change in the arterial Po₂.

An increase is observed in coronary flow, heart rate and coronary stroke volume but no changes in left ventricular dP/dt occur. The difference between the two modes of hypoxia is in the contractile force of the myocardium. The mechanism involved in the changes observed does not seem to be related to arterial Po₂, since the carotid and aortic chemoreceptors are not known to be stimulated by increased concentrations of COHb. However, the heart rate increased with both modes of hypoxia, suggesting that the mechanism may involve central nervous system structures. Author (GRA)

N72-10090# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
ANALYSIS OF SPONTANEOUS ACTIVITY FILMS BY A FULLY AUTOMATED ANALYZER

Anthony A. Thomas and Barrett L. Myers (Technology, Inc., Dayton, Ohio) Dec. 1970 12 p refs Presented at the 1st Ann. Conf. on Environmental Toxicology, Fairborn, Ohio, 9-11 Sep. 1970 *Its* Paper No. 11
(Contract F33615-70-C-1046; AF Proj. 6302)
(AD-727514; AMRL-TR-70-102-Paper-11) Avail: NTIS
CSCL 06/20

Space cabin toxicology experiments conducted by the Air Force Aerospace Medical Research Laboratories concluded that spontaneous activity of unrestricted dogs measured by time lapse photography would furnish good behavioral information when properly analyzed. Several hundred hours of photographic data were obtained and a large amount was analyzed using visual and rudimentary electronic techniques. Due to the time consuming task of analyzing the large amount of data, it was theorized that an electronic system could be developed which would automatically categorize and display the change in spontaneous activities and further refine the experimental and analysis techniques used to analyze the time lapse photographic data. Author (GRA)

N72-10091# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
PERMEATION TUBES AS CALIBRATED SOURCES OF GAS

Bernard E. Saltzman (Cincinnati Univ., Ohio) Dec. 1970 15 p refs Presented at the 1st Ann. Conf. on Environmental Toxicology, Fairborn, Ohio, 9-11 Sep. 1970 *Its* Paper No. 12
(Contract F33615-70-C-1046; Grants ES00159; AP-00812; AF Proj. 6302)
(AD-727516; AMRL-TR-70-102-Paper-12) Avail: NTIS
CSCL 14/2

Known low concentrations of gases are needed for toxicological studies, for calibration of instruments and for validation of analytical methods. Permeation tubes were developed as convenient sources. Liquefied gases such as sulfur dioxide, nitrogen dioxide, hydrocarbons and hydrogen sulfide are sealed in Teflon tubing and permeate through the walls for long periods at relatively constant rates of a few milligrams per day. The report discusses the use of these tubes in toxicology studies. Permeation tubes have been found to be simple, convenient and relatively constant sources for periods as long as a year. Although they have been applied mainly for calibration of instruments, by appropriate modifications they should be suitable for toxicological chamber work. Author (GRA)

N72-10092# National Academy of Sciences-National Research Council, Washington, D.C. Committee on Toxicology
BASIS FOR ESTABLISHING GUIDES FOR SHORT-TERM EXPOSURES OF THE PUBLIC TO AIR POLLUTIONS
May 1971 16 p
(Contract CPA-70-57)
(PB-199904; APTD-0884) Avail: NTIS CSCL 06T

The basic rationale used in the preparation of a series of guides for short-term exposure to air pollutants are presented. The assumptions underlying guide preparations are given. The factors and considerations in guide preparation are outlined. The evaluation of the relationship between exposure to a pollution and its effect on the population are discussed. Also included is a

discussion of the selection of short-term Public Limit and Public Emergency Limits. GRA

N72-10093# National Academy of Sciences-National Research Council, Washington, D.C. Committee on Toxicology.
GUIDES FOR SHORT-TERM EXPOSURES OF THE PUBLIC TO AIR POLLUTANTS. 1: GUIDE FOR OXIDES OF NITROGEN

1 Apr. 1971 33 p refs
(Contract CPA-70-57)

(PB-199903; APTD-0867) Avail: NTIS CSCL 13B

Guides for brief, intermittent exposure to nitrogen oxides are compiled and presented. The oxides of greatest concern are nitric oxide, nitrogen dioxide and nitrogen pentoxide. Toxicological data is presented on these. Factors and conditions that can, modify and significantly alter human response to nitrogen dioxide are discussed. The most important ones are: temperature, predisposing disease, heredity, age and interactions to other environmental pollutants. Values for short term exposure to NOx are tabulated. Experimental data on humans and laboratory animals exposed to NO2 are included in the appendices. GRA

N72-10094# Naval Ship Research and Development Center, Washington, D.C.

TESTING AND MODELING STANDING MAN'S RESPONSE TO IMPACT WITH APPLICATIONS TOWARD PREDICTING LEG FRACTURE TO SHIPBOARD PERSONNEL

Joseph Gesswein and Paul Corrao Jun. 1971 44 p refs
(AD-727133; NSRDC-3858) Avail: NTIS CSCL 06/19

As a preliminary step in providing more effective protection for shipboard personnel against shock-excited deck motions, tests were conducted wherein human subjects were dropped stiff legged onto a force gage. The experimental results showed a linear relationship between the logarithm of the peak forces and the kinetic energy at impact. A mathematical model was devised to reproduce this relationship and to reflect the general shape of human force-time response to impact. The model was then used to develop a family of curves which would provide designers with a means of predicting conditions under which shipboard personnel would sustain leg fractures as the result of shock-excited deck motions. Author (GRA)

N72-10095# School of Aerospace Medicine, Brooks AFB, Tex.
EFFECTS OF INJECTED HISTAMINE ON INTRACRANIAL PRESSURE AND SYSTEMIC BLOOD PRESSURE Technical Report, Mar. - May 1970

John W. Watters, Hughes P. Rue, and Samuel J. McChesney Apr. 1971 17 p refs
(AF Proj. 7757)

(AD-726543; SAM-TR-71-9) Avail: NTIS CSCL 06/16

To measure intracranial and systemic arterial pressures, ten Macaca mulatta monkeys were surgically prepared with catheters in the subdural space and in the abdominal aorta (via the femoral artery). The monkeys were stabilized in a state of light surgical anesthesia, then administered 50 micrograms/kg. of histamine intravenously over a 30-second injection period. ICP and blood pressure were monitored for 30 minutes. ICP reached a maximum pressure of 165% of baseline value at 2 minutes post-injection and was down to 110% of baseline at the end of the 30-minute observation period. Blood pressure reached the nadir of 72% of baseline at 4 minutes postinjection, and at the end of 30 minutes the pressure had returned to 102% of baseline value. Author (GRA)

N72-10096# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

STERILITY OF WATER RECOVERED FROM HUMAN WASTE DURING EXTENDED MISSIONS IS ATTAINABLE WITHOUT POST-TREATMENT: AN ENGINEERING APPROACH

Courtney A. Metzger Apr. 1970 10 p refs
(AF Proj. 6373)

(AD-727040; AMRL-TR-70-19) Avail: NTIS CSCL 06/11

The paper summarizes the results of an engineering approach to the problem of producing bacteria-free (viable or nonviable) water from human waste in an earth environment and/or during an aerospace mission. Author (GRA)

N72-10097# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

DYNAMIC CHARACTERISTICS OF HUMAN SIGHT

A. A. Averyanov and V. S. Babenko 16 Mar. 1971 17 p refs Transl. into ENGLISH from Tekhn. Kino Televideniya (USSR), v. 14, no. 5, 1970 p 60-63

(AD-727174; FTD-MT-24-343-70) Avail: NTIS CSCL 06/16

Discussed are the method and results of experimental investigations of human sight dynamic characteristics and requirements for television systems parameters designed for transmitting the images of moving objects. Author (GRA)

N72-10098# Army Medical Research Lab., Fort Knox, Ky.
THE SUSCEPTIBILITY OF THE CHINCHILLA EAR TO DAMAGE FROM IMPULSE NOISE Progress Report

George A. Luz and James D. Mosko 12 Mar. 1971 16 p refs
(DA Proj. 3AO-81102-B-71R)

(AD-726333; USAMRL-921) Avail: NTIS CSCL 06/19

Five monaural chinchillas were exposed to impulses of 168 dB SPL, and the loss of sensitivity for the pure tones of .3, .75, 1.5, 4.0, 6.0, 7.9, 11.0, 14.5, and 16.5 kHz was determined through an avoidance conditioning technique. The recovery of sensitivity was studied over 64 days after exposure. The chinchillas proved to be much more susceptible to this noise than the rhesus monkey. Author (GRA)

N72-10099# California Univ., Santa Barbara.
THERMAL EQUILIBRIUM STUDIES ON MEN BREATHING HELIUM-OXYGEN MIXTURES Final Report, 1 Mar. 1966 - 30 Jun. 1968

Steven M. Horvath, Fred. W. Kasch, Ernest D. Michael, Seward E. Miller, and Ethan R. Nadel 14 Jul. 1971 11 p
(Contract NONR-4222(07))

(AD-726753) Avail: NTIS CSCL 06/19

Studies which were conducted on divers before and after their Sea Lab exposures indicated that as a consequence of this exposure, a reduction in their maximal work capacity occurred and that the cost of submaximal work was greater. The men showed some evidences of acclimatization to cold. Additional studies were made to determine the relative contributions of core and surface receptors to the maintenance of thermal balance. It was shown that the thermal regulatory system was directly responsive to the thermal input from skin and that this has direct application to the problems faced by divers working in cold water. Studies of subjects working in helium-oxygen atmospheres (1 AA) at different ambient temperatures indicated a marked subjective impression of greater cooling which was not borne out by objective data. Progress was made towards developing a system to measure body temperatures in working divers. Considerable difficulty was experienced with tape deck systems, attempting to obtain eight hours continuous data on a single small spool, because battery life and power were markedly influenced by low temperatures. A new approach of considerable promise is under development which would eliminate most of the problems present in the initial systems. Author (GRA)

N72-10100# School of Aerospace Medicine, Brooks AFB, Tex.
UNDESIRABLE EFFECTS IN WORKING WITH LASERS [O DEISTVII NEBLAGOPRIYATNYKH FACTOROV PRI RABOTE S OPTICHESKIMI KVANTOVYMI GENERATORAMI]

A. B. Butman, E. A. Ermolaev, V. P. Zhokhov, R. I. Kovach, and A. I. Semenov [1970] 10 p refs Transl. into ENGLISH from Voenno-Med. Zh. (Moscow), no. 7, 1968 p 43-47

(AD-726558; SAM-TT-R-1088-0771) Avail: NTIS CSCL 06/18

The laser radiation does not only cause local changes in the eyesight, skin and other organs, but may also lead to general changes in the organism. In the experiment, it was established

that after the eyes of the animals were subjected to laser radiation of low intensity, certain changes in the cardiac system, metabolism, hypophysial system -- cortex of adrenal glands -- and others were observed. In a number of cases these changes were quite manifest and persistent in character. The work with lasers may cause various local and general changes in the organism. This fact indicates that when operating a laser preventive and protective measures from possible detrimental effects caused by this basically new type of radiation should be taken. In addition, special attention must be paid to the preventive protection of the eyes. Author (GRA)

N72-10101# Yonsei Univ., Seoul (South Korea). Dept. of Physiology.
METABOLIC ADAPTION TO COLD Final Report, Sep. 1968 - Sep. 1969
 Bok Soon Kang San Francisco Army Res. and Develop. Group (Far East) Jun. 1971 24 p refs
 (Grant DA-CRD-AFE-S92-544-67-G76; AF PROJ. 9777)
 (AD-726467; J-292-3; ARDG(FE)-J-292-3; FR-3) Avail: NTIS CSCL 06/16

Experiments on thermoregulatory responses to cold immersion stimulus were carried out in September, 1968 (summer studies) and February, 1969 (winter studies). Eight each of ama and control subjects were selected at random from a same community in Yong-Do Island, Pusan. The rate of fall in muscle temperature of forearm during a 30 minutes immersion in 6 C water bath was significantly slower in the ama in winter and was about the same in the two groups in summer. However, the magnitude of change in the skin temperature and the heat fluxes observed during immersion period was not significantly different either between groups or between seasons. Both finger blood flow and skin temperature during one hour immersion in 6 C water bath decreased significantly in the ama as compared to the control. The magnitude of cold-induced vasodilatation during immersion period was significantly greater in the control in winter. The magnitude of reactive hyperemia after a 5 minutes arterial occlusion in both air and 15 C water bath was significantly lower in the ama than in the control. In control subjects, post-occluded blood flow to resting values in the air was faster in the ama than in the control but was the same in the two groups. The results suggest that vasoconstrictor tone increased in the ama in winter, indicating the development of vascular adaptation as a part of cold acclimatization. Author (GRA)

N72-10102# School of Aerospace Medicine, Brooks AFB, Tex.
UTILIZATION OF LASERS IN BIOLOGICAL STUDIES [OB ISPOLZOVANII LAZEROV V BIOLOGICHESKIKH ISSLEDOVANYAKH]
 L. B. Rubin [1970] 19 p refs Transl. into ENGLISH from Usp. Sovrem.
 (AD-726557; SAM-TT-R-1084-0771) Avail: NTIS CSCL 06/18

The article discusses the questions associated with wide possibilities of laser utilization in experimental biology. The author also emphasizes the possibility of studies of all possible action mechanisms during the interaction of laser radiation with biological systems. Author (GRA)

N72-10103# Kansas State Univ., Manhattan. Inst. for Environmental Research.
PHYSIOLOGICAL EFFECTS OF LOCALIZED VENTILATION
 N. Z. Azer, Preston E. McNall, Jr., and H. C. Leung Feb. 1971 48 p refs
 (Contract F44820-68-C-0020; AF PROJ. 7921; Proj. Themis)
 (AD-727072; AFOSR-71-1986TR) Avail: NTIS CSCL 06/19

Localized ventilation was applied frontally to the head and neck of seated, clothed subjects, engaged in central tracking and peripheral tasks, in a 95F and 50% RH environment. Eight different ventilating jet properties were tested. Thermal and comfort sensations were recorded, and their associated physiological responses were measured, for each subject during each test. In the 95F and 50% RH environment, the average

thermal vote of all subjects was between warm and hot, while the comfort vote was between uncomfortable and very uncomfortable. It was possible, by applying local ventilation, to improve both sensory votes towards thermal neutrality and comfortable sensations. The ventilating jet which resulted in the best improvements in sensory votes had a velocity 750 f.p.m. and a temperature 50F at its outlet. Localized ventilation had no significant effects on the heart rate and rectal temperature.

Author (GRA)

N72-10104# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
EFFECTS ON HUMAN PERFORMANCE OF COMBINED ENVIRONMENTAL STRESSES
 Walter F. Grether Sep. 1970 21 p refs
 (AF PROJ. AF-7222)

(AD-727041; AMRL-TR-70-68) Avail: NTIS CSCL 06/19

Research studies of environmental effects normally expose subjects to only one stress at a time, while in operational flying there are usually several stresses acting simultaneously. The possibility exists that effects of such combined stresses may be greater than would be predicted from single stress studies. There have been relatively few laboratory studies of human performance in which the subjects have been exposed to such combined stresses. This paper presents a critical review of these past studies from the particular viewpoint of whether performance decrements from combined stresses are more severe than would be predicted from single stress studies. Although the number of past studies is not sufficient to present a consistent or conclusive picture, they do suggest that combinations of environmental stresses do not present a special hazard in flying that could not be anticipated from results of single stress studies. Author (GRA)

N72-10105# Forschungsinstitut fuer Anthropotechnik, Mueckenheim (West Germany).
EXAMPLES FOR THE HANDLING OF PSYCHOPHYSIOLOGICAL DATA USING A HYBRID ANALOG COMPUTER [BEISPIELE FUER DIE AUSWERTUNG PSYCHOPHYSIOLOGISCHER MESSDATEN MIT DEM HYBRIDEN ANALOG-RECHNER]
 G. Radl Oct. 1970 17 p refs GERMAN; ENGLISH summary
 /ts Anthropotech. Mitt. Nr. 2/70
 Avail: NTIS

Analog-hybrid computing circuits are described for the preprocessing of the following measurement data: electrocardiographic signals of heart action; electromyographic signals of eyelid movements; electromyographic signals of the steady tone of a muscle group; and thermoelectric signals of a respiratory rate measuring device. The circuits are realized on a hybrid analog computer and the electrophysiological data are stored on a multichannel analog tape. To control program operation the input, intermediary, and output values are recorded with a 6-channel analog recorder. The data acquisition system interrogates and digitalizes the results of the preprocessing, and generates punched tape. Interrogation interval is 30 sec. ESRO

N72-10106# Navy Experimental Diving Unit, Washington, D.C.
NOISE: A HAZARD TO DIVERS AND HYPERBARIC CHAMBER PERSONNEL Final Report
 James K. Summitt and Stephen D. Reimers 15 May 1971 33 p refs
 (AD-725144; NEDU-RR-5-71) Avail: NTIS CSCL 06/19

Quantitative information describing ambient noise in the diving environment is almost non-existent. Sensorineural hearing deficits that have been observed in some diving groups have been attributed to previous noise exposure in non-diving situations such as exposure to small arms fire, engine room noise or flight deck noise. This report describes a series of experiments conducted at the Navy Experimental Diving Unit to determine the sound level in a variety of helmet diving and hyperbaric chamber situations from the surface to a depth of 200 feet. The data is defined in terms of the hearing damage risk criteria currently in use by the Navy. Results indicate that operations

involving both diving helmets and hyperbaric chambers frequently expose personnel to hazardous levels of noise depending on the length of time of the exposure. Three cases of temporary sensorineural hearing loss thought to be related to noise exposure during air helmet dives are also presented.

Author (GRA)

N72-10107# School of Aerospace Medicine, Brooks AFB, Tex. **STUDY OF THE PECULIARITIES OF THE THALAMUS AND CORTICAL RECRUITMENT REACTION [K VOPROSU OB OSOBENNSTYAKH TALAMO-KORKOVOIREAKTSII VOYLECHENIYA]**
V. V. Fanardzhyan 1971 22 p refs Transl. into ENGLISH from the Russian
(AD-725322; SAM-TT-R-1054-0571) Avail: NTIS CSCL 08/8

A review of the literature concerning the functional organization of the unspecific thalamo-cortical projection system is presented. Certain characteristic properties of the recruitment reaction are analyzed. Results of personal investigations concerning the mechanism of the electrotonic distribution of recruitment potentials are reported. It is demonstrated that the latter part is taken to be a true phenomenon of recruitment. Data, allowing the differentiation between these two effects are cited. According to the author one has no right to speak about recruit phenomena only on a basis of its monopolar study. The creation of a powerful electrical field, detectable at a considerable distance, through the stimulation of subcortical structures, is proposed as an explanation of the mechanism of the physical distribution of potentials of the recruit reaction. The generation, by these structures, of discharges of high voltage, enables their registration independent of their synaptic conduction.

Author (GRA)

N72-10108# Forschungsinstitut fuer Anthropotechnik, Meckenheim (West Germany). **INTRODUCTION TO EXPERIMENTAL PSYCHOLOGY [EINFUEHRUNG IN DIE EXPERIMENTELLE PSYCHOLOGIE]**

Gerald W. Radl Dec. 1969 71 p refs In GERMAN; ENGLISH summary /ts Anthropotech. Mitt. Nr. 6/69
Avail: NTIS

Two lectures are presented as an introduction to psychology for engineers and technicians working in human engineering technology. The development of psychology from philosophically based concepts to an experimental science is treated. The possibilities and limitations of experimental work in psychology are demonstrated. Special experimental methods in different branches of psychology (perception, learning, diagnostics, and sociology) are discussed.

Author (ESRO)

N72-10109*+ National Aeronautics and Space Administration, Washington, D.C.

AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 94)

Oct. 1971 136 p refs
(NASA-SP-7011(94)) Avail: NTIS CSCL 08E

Subject coverage 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 on 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. Each entry consists of a standard citation accompanied by its abstract.

Author

N72-10110# Atomic Energy Establishment, Cairo (Egypt). Radiation Protection Dept.

CHARACTERISTICS OF THE COLLIMATOR CONSTRUCTED FOR THE INCHASS WHOLE BODY MONITOR

S. M. Morsy and A. A. Allouah 1969 22 p refs
(UARAE-82) Avail: AEC Depository Libraries

The properties of a multi-slit collimator designed for the 8 x 4 in. crystal of the Inchass whole body monitor are given. The minimum detectable activity using the collimator is calculated at two different energies. Septa penetration was taken in consideration by assuming the activity to be represented by a line source in the mid line of the subject. Factors affecting the absolute activity determination are studied.

Author (NSA)

N72-10111*# Bionetics Corp., Hampton, Va. **BIOWASTE RESISTOJET PROPPELLANT SYSTEM, BIOLOGICAL AND FUNCTIONAL ANALYSIS, TASK 1 AND 2 Summary Final Report**
Sep. 1971 95 p ref
(Contract NAS1-10431)
(NASA-CR-111977) Avail: NTIS CSCL 08K

The influence of chemical contaminants in potential biowaste sources upon the design and interface requirements of a biowaste resistojet propulsion system for a space station and/or base are evaluated. Chemical contaminants are defined as all compounds present in biowaste other than carbon dioxide, water, and methane. The latter are the nominal effluent candidates for the biowaste resistojet.

Author

N72-10112# California Univ., Berkeley. Lawrence Radiation Lab.

TECHNIQUES FOR MAPPING THE SPATIAL DISTRIBUTION OF STOPPING PION(MINUS) MESONS IN TISSUE

J. Sperindle, L. E. Temple, V. Perez-Mendez, A. J. Miller, and A. Rindi 3 Mar. 1971 16 p refs

(Contract W-7405-eng-48)
(UCRL-20291; UC-48; TID-4500) Avail: NTIS

A number of processes leading to the emission of photons and neutrons in negative pion capture reactions are discussed for potential use in radiation therapy to determine the stopping negative pion region. It is concluded that the scheme of detecting collimated medium energy gamma rays is the most effective.

Author (NSA)

N72-10113# Ohio State Univ., Columbus. Communication and Control Systems Lab.

STABILITY AND CONTROL OF LEGGED LOCOMOTION SYSTEMS Ph.D. Thesis

Ammemba Lakshmana Pai Jun. 1971 186 p refs
(Grants AF-AFOSR-1901-70; NSF GK-25292; Project AF-9769)
(AD-727806; AFOSR-71-2157TR) Avail: NTIS CSCL 08/2

The report is a Ph.D. dissertation devoted to a study of stability and control in legged locomotion systems. All of the results obtained apply to a twelfth-order nonlinear differential equation model for the dynamical behavior of an animal or legged vehicle in three-dimensional space, these differential equations are linearized, and necessary and sufficient conditions for stable postural control system operation are derived for bipeds and for quadrupeds. The applicability of the results obtained to the nonlinear model is verified by a vibrational mode study of the nonlinear system by means of a computer simulation. The vibrational mode analysis and synthesis techniques are then used to obtain stable feedback control laws for four different quadruped gaits and for one type of biped walk. The results presented should be useful in the design of autopilots for legged vehicles for improved offroad locomotion and in obtaining a deeper understanding of locomotion in animals and man.

Author (GRA)

N72-10114# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div. **OPERATIONAL MECHANISM OF A PARALLEL TYPE RECOGNITION DEVICE**

S. Vosilyus and R. Yasinevichus 10 Feb. 1971 13 p refs
Transl. into ENGLISH from the book "Avtomatika i Vychislitel'naya Tekhnika" Vilnyus, Izd-vo Mintis, 1968 p 69-73
(FTD PROJ. 6050205)

(AD-727170; FTD-MT-24-318-70) Avail: NTIS CSCL 09/2

An image is described by the addition sum of plane

distribution of standard and noise brightness. If the noise is not correlated to the object and has a zero average value, the aggregate of the signals forming the description vector of the given object is a system of random values in a normal distribution. The operational device determines values proportional to the affiliation of the given object to one of the classes. The rule of processing the description vector is based on a determination of the maximum of the correlation between the unknown image and standard. Furthermore, the resolving power of the operational device, which is shown to increase considerably in the processing of the centered components of the description vectors, is of considerable importance. A description is given of an operational device using standard automatic computer amplifier. Author (GRA)

N72-10115# Illinois Univ., Urbana. Biological Computer Lab. **ACCOMPLISHMENT SUMMARY, 1970 - 1971** 15 Jul. 1971 247 p refs (Grant AF-AFOSR-70-1865; AF Proj. 9768) (AD-727795; BCL-71.2; AFOSR-TR-71-2150) Avail: NTIS CSCL 06/4

Contents: Cognitive memory; Computing in the semantic domain; Life as poly-contextuality; Conditions for composition; Algebraic models of computer programs; Linguistic networks and their investigation using an interactive computer system; A computational technique for uncertainty analysis; Sensory-motor interactions the 'Criter': a model; An end of search, a means of understanding; a preface to the anti-document; Speech research of the past as a guide for the future; A measure of complexity (entropy) of distribution functions; Statistical dynamics of complex systems; Computer-lexicon; Computers and graphics; Experiencing the fourth spatial dimension; Pulse techniques in speech processing; Digital signal processing; The impulse as a measure of loudspeaker nonlinearity. GRA

N72-10116# Qei, Inc., Burlington, Mass. **BIOLOGIC DATA ANALYSIS** Final Report 1971 85 p (Contract N00014-69-C-0390) (AD-727098; NR-105-501) Avail: NTIS CSCL 06/13

The project involves acquisition and analysis of micro-spectrophotometric data in the presence of noise. Bacteria at cryogenic temperatures submitted to ultraviolet radiation emit both phosphorescent and fluorescent radiation. Certain characteristics of this radiation appear to be unique to a given species of bacteria and thus may be a basis for identification of bacteria. The object of this study is to obtain a working system for extracting parameters of micro-spectrophotometric data in the presence of noise. Two main areas are covered. They are data acquisition, equipment interface and noise reduction, and mathematical analysis. GRA

N72-10117# Michigan Univ., Ann Arbor. Highway Safety Research Inst. **STUDIES OF INFLATING RESTRAINT SYSTEMS** Final Report D. Hurley Robbins, Verne L. Roberts, and A. W. Henke Mar. 1971 158 p refs (Contract DOT-FH-11-6982) (PB-201264; DOT-HS-800-497) Avail: NTIS CSCL 13F

A total of 128 impact sled tests using dummy test subjects were conducted to study the protective potential of right front passenger inflating restraint systems. The experimental program consisted of: (1) selection and fabrication of a restraint system configuration; and, (2) testing relative to parameters, such as crash velocity, use or non-use of lap belts, occupant size, impact direction, crash deceleration pulse, and occupant position. Test results were correlated with predictions of a purely mathematical model. The level of protection offered by the system is summarized as a series of proposed velocity threshold curves beyond which performance is expected to be marginal. Author (GRA)

N72-10118# Cornell Aeronautical Lab., Inc., Buffalo, N.Y.

PRELIMINARY VEHICLE TESTS: INFLATABLE OCCUPANT RESTRAINT SYSTEMS. VOLUME 1: EXECUTIVE SUMMARY Final Report, 30 Jun. 1970 - 31 Mar. 1971 James F. Martin and David J. Romeo Mar. 1971 40 p refs (Contract DOT-FH-11-7621) (PB-200875; CAL-YB-2990-K-1; DOT-HS-800-477) Avail: NTIS CSCL 13F

A test program was conducted in which 12 fullscale automobiles were crashed under controlled conditions to provide detailed performance data on inflatable occupant restraint systems (IORS). Both domestic and imported vehicles were used covering the range of size from sub-compact to standard. Flat faced barrier, pole, and car-to-car crash modes were included. Various arrangements of anthropometric dummies ranging in size from a 3-year old child to a 95th percentile male were used in the vehicles. Both the vehicles and the simulated occupants were highly instrumented and extensive high-speed movies were taken. Crash test procedures were developed and an evaluation of currently available IORS was made. Author (GRA)

N72-10119# Michigan Univ., Ann Arbor. Highway Safety Research Inst. **ANALYSIS OF DAISY TRACK HUMAN TOLERANCE TESTS** Final Report James H. McElhaney, Verne L. Roberts, and D. Hurley Robbins Feb. 1971 170 p refs (Contract FH-11-6962) (PB-201265; Bio-M-71-1; DOT-HS-800498) Avail: NTIS CSCL 06S

The results of an analysis of film and transducer records from a series of impact tests on human volunteers are reported. The purpose of the test program was to compare lap belt versus lap belt plus air cushion restraint systems. The analyses indicated that the lap belt plus a rapidly inflated air cushion performed significantly better than the lap belt alone by reducing heat motion, linear head acceleration, shoulder motion, and resultant neck and head injury. Author (GRA)

N72-10120# Life Sciences, Inc., Fort Worth, Tex. **AN INVESTIGATION OF VISUAL, AURAL MOTION AND CONTROL MOVEMENT CUES** Technical Report, 27 Jun. 1969 - 27 Jun. 1970 W. G. Matheny, A. L. Lowes, G. Baker, and J. A. Bynun Apr. 1971 109 p refs (Contract N61339-69-C-0304) (AD-726430; NAVTRADEVCE-89-C-0304-1) Avail: NTIS CSCL 05/10

The report is devoted to the determination of how multi-sensory cues can be simulated and effectively used in the training of pilots. An analytical basis and cue taxonomy is developed and cues are postulated on the basis of information gained from the outside visual world, from sounds generated by the aircraft, and from cues resulting from aircraft motion and control movements. Description and measurement of the physical characteristics of the postulated cues are emphasized. Hypotheses are developed based upon the effects of postulated cues as they both function independently and interact with cues in other modalities. Experimentation is recommended which will lead to verification or modification of cue postulations. Author (GRA)

N72-10121# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div. **TWELVE-MONTH EXPERIMENT IN A GROUND COMPLEX OF LIFE SUPPORT SYSTEMS** 19 Mar. 1971 10 p ref Transl. into ENGLISH from the publ. "Pamphlet for the 1970 Exhibition of Achievements of the National Economy" USSR, 1970 p 2-4 (FTD Proj. 80101) (AD-727264; FTD-HT-23-90-71; UR/0000-70-000-000) Avail: NTIS CSCL 06/11

The pamphlet presents a brief description of the units used in a test of twelve months duration with three subjects working in a closed-cycle life support system. Recycling and regeneration were used to meet all water and oxygen requirements. Author (GRA)

N72-10122# Army Aeromedical Research Lab., Fort Rucker, Ala. Aviation Center Team Study Group.

ENVIRONMENTAL EFFECTS ON ATTACK HELICOPTER CREW TASK PERFORMANCE IN THE NATO THEATER

Stanley C. Knapp, ed. May 1971 43 p ref
(AD-726949; USAARL-71-21) Avail: NTIS CSCL 08/19

The unique tasks, requirements and demands upon attack helicopter crews, and the effects of the environment upon the performance of these tasks are analyzed. Night operations under low ceilings, reduced visibility, high or low speeds, nap-of-the-earth flight profiles and a threat of sophisticated anti-aircraft weaponry is defined as the 'worst-credible-environment' for the NATO theater. In this environment, the attack helicopter and its crew will be expected to fly a large percentage of its missions and deliver its ordnance with a high degree of accuracy. Task performance is outlined in a detailed matrix. Collective tasks are grouped into functional task clusters. The effects of climatic conditions, the hostile threat, social and civil factors upon performance of these task clusters are discussed. The effects of the machine/mission created environment are presented and include hypoxia, toxic products, temperature extremes, visual and optical problems, acoustics, vibration, and human factors.

Author (GRA)

N72-10123# Texas Technological Univ., Lubbock.
THE EFFECT OF DIFFERENTIAL PAYOFF MATRICES UPON VIGILANCE PERFORMANCE Ph.D. Thesis

Peggy Janice Blackwell Aug. 1970 149 p refs
(Contract DAAD05-69-C-0102; Grant MH-3786-03; Proj. Themis)
(AD-727984) Avail: NTIS CSCL 05/10

The purpose of the research was to induce motivation in signal detection by manipulation of costs and payoffs. Expressed in terms of Smith's theory (1966), a subject's willingness to observe and report signals was manipulated.

Author (GRA)

N72-10124# Smithsonian Institution, Washington, D.C. Interdisciplinary Communications Program.

TECHNOLOGICAL AUGMENTATION OF HUMAN COGNITION: AN INTERDISCIPLINARY REVIEW

15 Jun. 1971 45 p
(Contract N00014-67-A-0399-0004; NR PROJ. 154-288)
(AD-726755) Avail: NTIS CSCL 05/9

Five interdisciplinary interaction-discussion conferences were held and two independent task forces were created to explore new teaching and training concepts and methodologies, particularly as new technologies provide potentially powerful, symbiotic means of augmenting human cognition. These conferences sought to determine two factors: research programs upon which to establish bases for innovation and improvement, and critical analyses of current and projected concepts and techniques.

Author (GRA)

N72-10125# Air Force Human Resources Lab., Williams AFB, Ariz. Flying Training Div.

EFFECTS OF REAL WORLD RADIO CHATTER ON MID-PHASE INSTRUMENT GROUND TRAINER PROFICIENCY: A PILOT STUDY

Ronald A. Goebel, Roger L. Williamson, and David R. Baum Nov. 1970 17 p refs
(Proj. AF-1123)
(AD-727054; AFHRL-TR-70-38; Task-112302) Avail: NTIS CSCL 05/9

Under a background condition of either recorded radio chatter or no radio chatter, the individual performances of two flights of mid-phase instrument student pilots were measured during a simulated instrument cross-country mission in the T-38 ground trainer. Operational constraints prevented the exercise of optimal experimental controls, thereby precluding definitive conclusions concerning the effects of radio chatter on performance. Nevertheless, the study established certain methodological guidelines for future research. Additionally, analysis of the comments of those students receiving radio chatter revealed that

the vast majority reacted favorably and enthusiastically to the chatter because it afforded the mission a high degree of realism.

Author (GRA)

N72-10126# American Inst. for Research, Pittsburgh, Pa.
THE DEVELOPMENT, TEST, AND EVALUATION OF THREE PILOT PERFORMANCE REFERENCE SCALES

Walter R. Horner, Thomas L. Radinsky, and Robert Fitzpatrick Brooks AFB, Texas Air Force Human Resources Lab. Aug. 1970 73 p refs

(Contract F33615-69-C-1366; AF PROJ. 1710)
(AD-727024; AFHRL-TR-70-22) Avail: NTIS CSCL 08/9

The report describes the results of a study to develop pilot performance reference scales based upon audio-video recordings of in-flight performances of students undergoing T-37 undergraduate pilot training. The study included scale development as well as the test and evaluation of each scale. All the maneuvers contained on the in-flight recordings were analyzed, and constituent performance elements observable on the video replay were identified. Three maneuvers, Final Turn to Landing, Vertical S 'A', and Lazy Eight, were selected for the final scaling effort. Ten performance elements each were identified for the Lazy Eight and Vertical S 'A' maneuvers, and twelve elements for the Final Turn to Landing. A performance reference scale was developed for each maneuver. Each scale consisted of a series of subscales for rating performance on each of the elements of the maneuver and an additional subscale for rating the overall performance of the maneuver. Although some elements were common to more than one maneuver, the rating scales for these elements were tailored in each case to the maneuver involved. Each subscale consisted of a ten-point rating line (a row of ten boxes) representing the full range of performance from unsatisfactory to excellent and, beneath, four graded verbalizations describing different levels of performance. No verbalizations were presented, however, with the subscale used for rating overall performance. Final versions of the scales were subjected to a test and evaluation through their utilization by experienced instructor pilots. These pilots assigned levels of performance based upon what they observed on video replays of selected maneuver examples.

Author (GRA)

N72-10127# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

CREW COMPARTMENT VIBRATION ENVIRONMENT IN THE B-52 AIRCRAFT DURING LOW-ALTITUDE, HIGH-SPEED FLIGHT Final Report, Aug. 1968 - Dec. 1970

Jerry D. Speakman and Justis F. Rose, Jr. Mar. 1971 206 p refs

(AF PROJ. 7231)
(AD-727023; AMRL-TR-71-12) Avail: NTIS CSCL 08/19

Measurements were made of the pilot station vibration environment experienced in the B-52 aircraft during low-altitude, high-speed flight. Data were obtained of the longitudinal, lateral and vertical linear accelerations and the roll axis angular velocities and accelerations. The terrain contour following flights at 500-900 feet above the flat to semi-mountainous regions of Louisiana and Arkansas were made at 350 knots true airspeed. Data analyses included probability density and distribution and the auto-power spectral density functions in addition to tests for stationarity, randomness and normality. The individual degree-of-freedom results are presented in graphical and tabular form and in general indicate that the pilot station vibration environment produced by the combination of gust response and maneuvering: (1) is stationary for up to 590 seconds; (2) is a random phenomena that does not satisfy the chi-square goodness-of-fit test for Gaussian distribution; (3) cannot be adequately simulated in the laboratory for human biomedical tolerance and/or psycho-physiological performance studies using only vertical axis motion; (4) is remarkably in agreement with those PSD's calculated for the lateral and vertical axes using an aircraft transfer function experimentally derived on another program and the Dryden gust input spectrum.

Author (GRA)

N72-10128# General Electric Co., Schenectady, N.Y. Specialty Materials Handling Products Operation.

RESEARCH AND DEVELOPMENT PROTOTYPE FOR MACHINE AUGMENTATION OF HUMAN STRENGTH AND ENDURANCE: HARDIMAN 1 PROJECT Summary Progress Report, Jan. 1970 - Apr. 1971

B. John Makinson 1 May 1971 33 p Sponsored in part by Army

(Contract N00014-66-C-0051; Prj. IM-62410105072) (AD-724797; S-71-1056) Avail: NTIS CSCL 06/2

The implementation of the Hardiman powered exoskeleton concept was carried to the point where a prototype unit, consisting of 30 hydraulically powered, servo-controlled joints were fabricated and mechanically assembled. One of the arm assemblies was previously operated and has met basic design objectives under test. The Leg and Girdle System was also completed and has gone through partial testing of its twelve servo-controlled joints. Author (GRA)

N72-10129# Royal Aircraft Establishment, Farnborough (England).

THE DEVELOPMENT OF ELECTRO-PNEUMATIC VALVES FOR ARTIFICIAL LIMBS

A. J. Barter Nov. 1970 51 p refs

(AD-726492; RAE-TR-70206; trc-br-22435; Space-347) Avail: NTIS CSCL 06/12

The development of electro-pneumatic flow control valves for artificial limbs is described. Initially a flexible membrane type of valve was chosen for evaluation. At the small sizes necessary for prosthetic systems, the major problem highlighted was gas leakage. It is concluded that the Flexible Membrane Valve did not realize its full potential in these small sizes. An alternative of using a Flat Faced Armature Valve and producing proportional control by variation of the mark to space ratio is described, in order to present as comprehensive a range of options as possible to the designer of artificial limb systems. Author (GRA)

N72-10130*# Massachusetts Inst. of Tech., Cambridge. Dept. of Aeronautics and Astronautics.

UNIVERSITY ROLE IN ASTRONAUT LIFE SUPPORT SYSTEMS: PORTABLE THERMAL CONTROL SYSTEMS

Arye R. Ephrath Washington NASA Nov. 1971 65 p refs (Grant NGR-22-009-312)

(NASA-CR-1852) Avail: NTIS CSCL 06K

One of the most vital life support systems is that used to provide the astronaut with an adequate thermal environment. State-of-the-art techniques are reviewed for collecting and rejecting excess heat loads from the suited astronaut. Emphasis is placed on problem areas which exist and which may be suitable topics for university research. Areas covered include thermal control requirements and restrictions, methods of heat absorption and rejection or storage, and comparison between existing methods and possible future techniques. Author

N72-10131# Forschungsinstitut fuer Anthropotechnik, Meckenheim (West Germany).

INVESTIGATIONS ON THE QUANTIFICATION OF MENTAL STRESS IN SIMULATED VEHICLE CONTROL TASKS [UNTERSUCHUNGEN ZUR QUANTIFIZIERUNG DER PSYCHISCHEN BEANSPRUCHUNG BEI SIMULIERTEN FAHRZEUGFUEHRUNGSAUFGABEN]

Gerald W. Radl Dec. 1969 30 p refs In GERMAN; ENGLISH summary *Its* Anthropotech. Mitt. Nr. 8/69

Avail: NTIS

In each of two experimental series ten individuals were involved in simulated flight control tasks of varying difficulties. Of each subject control performance data, such as heart rate, respiration rate, electromyogram data, and blinking rate were recorded. Ratings of the subjective mental stress were investigated. The value of blinking frequency and of electromyograms for measuring important components of mental stress were verified as well as the applied rating scales. Heart rate frequency, heart rate changing, and respiration data brought no

significant results. The experiments led to the conclusion, that the recorded reaction times of parallel tasks yield useful information on mental stress. Author (ESRO)

N72-10132# Forschungsinstitut fuer Anthropotechnik, Meckenheim (West Germany).

POSSIBILITIES OF MOTIVATION MEASUREMENT IN ANTHROPOTECHNICAL TESTS [MOEGELICHKEITEN ZUR MESSUNG DER LEISTUNGSMOTIVATION BEI ANTHROPOTECHNISCHEN VERSUCHEN]

Brigitte Felden and Gerald W. Radl Jan. 1970 59 p refs In GERMAN; ENGLISH summary *Its* Anthropotech. Mitt. Nr. 1/70 Avail: NTIS

Motivation is treated as an important variable in psychological experiments, and its criteria of measuring techniques are defined. Different methods of testing are presented: self judgment by questionnaires, rating by specially trained experts, use of verbal and graphical stimuli, and test like the Thematic Apperception Test. The test of Heckenhausen is pointed out in detail. All methods are discussed critically with respect to their experimental application under laboratory conditions. Since no method is applicable without restrictions, it is proposed to control motivation as an independent variable in engineering-psychological experiments. ESRO

N72-10133 National Lending Library for Science and Technology, Boston Spa (England).

METHODS OF MEASURING VISUAL FATIGUE [SPOSOBY IZMERENIYA ZRITELNOGO UTOMLENIYA]

M. A. Faermark 19 Aug. 1971 7 p refs Transl. into ENGLISH from Svatotekhnika (Moscow)

(NLL-Lib-Comm-1598-(5196)) Avail: Natl. Lending Library, Boston Spa, Engl: 1 NLL photocopy coupon

Methods are explored for measuring visual fatigue of workers engaged in tasks involving visual checks. The parameters of the object being observed, complexity of the visual task, and conditions of the operators vision are proposed as basics. The change in the individual functions of vision is established as a preferred method, to a first approximation, inasmuch as measurement of changes in productivity and quality of finished work is laborious and difficult to determine. E.M.C.

N72-11068 National Lending Library for Science and Technology, Boston Spa (England).

SOLAR NAVIGATION OF BIRDS [SOLNECHNAYA NAVIGATSIYA PTITS]

G. K. Nazarchuk, A. B. Kistyskovskii, L. A. Smogorzhevskii, and L. M. Shulman Oct. 1971 19 p refs Transl. into ENGLISH from Vestn. zool. (Moscow), v. 6, 1969 p 3-15

(NLL-RTS-6632) Avail: Natl. Lending Library, Boston Spa, Engl.: 6 NLL photocopy coupon

Tests to determine the ability of birds to navigate based on observation of solar elevation and azimuth are discussed. A numerical analysis of the process by which birds maintain orientation in flight during solar position changes is presented. It is concluded that birds do not rely solely on visual perception of the sun for navigation, but the exact manner in which navigation is performed is still not certain. Author

N72-11069*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

ELECTRON TUNNELING AS A BASIS FOR SEMICONDUCTION IN PROTEINS

Lawrence Flax and Dennis Flood Washington Nov. 1971 21 p refs

(NASA-TN-D-6559; E-6483) Avail: NTIS CSCL 06B

Electron tunneling is investigated as a possible mechanism for the conduction of electrical current in solids composed of protein molecules. An intermolecular potential barrier is assumed which takes into account the applied electric field and the

possibility of image charge effects. The WKB approximation is used to calculate the net tunneling current density and resulting conductivity. The results suggest that electron tunneling per se is not a suitable mechanism for explaining the observed conductivities in such materials. Author

N72-11070*# Scientific Translation Service, Santa Barbara, Calif.

ON THE INHERITANCE OF THE ENZYMATIC ACTIVITIES OF LACTATE DEHYDROGENASE AND MALATE DEHYDROGENASE IN HUMAN ERYTHROCYTES [ZUR VERERBUNG DER ENZYMAKTIVITAETEN DER LACTAT-DEHYDROGENASE UND MALAT-DEHYDROGENASE IN MENSCHLICHEN ERYTHROZYTEN]

H. Haug and A. Gathof Washington NASA Nov. 1971 9 p refs Transl. into ENGLISH from Blut (Munich), v. 14, 1966 p 10-15

(Contract NASw-2035)

(NASA-TT-F-14018) Avail: NTIS CSCL 08P

Activities of the enzymes lactate dehydrogenase and malate dehydrogenase were determined in erythrocyte hemolysates from 20 families with 40 adults and 35 children. Agreement of the enzyme activities for the genetically different parents was found in 30% of the cases for lactate dehydrogenase and in 45% of the cases for malate dehydrogenase. Of the 35 children, the relations did not vary by more than 10% in 63% for lactate dehydrogenase and in 68% for malate dehydrogenase. The question of genetic or metabolic dependence of the variability of enzyme activities was discussed. Author

N72-11071*# National Aeronautics and Space Administration, Washington, D.C.

MEASUREMENT OF VISUAL REACTION TIME IN BOTH POSITIVE AND TRANSVERSE G [UNTERSUCHUNGEN UEBER AENDERUNGEN DER OPTISCHEN REAKTIONS-ZEIT DES MENSCHEN BEIM EINWIRKEN HOHER FLIEHKRAEFTE]

H. Burmeister Oct. 1971 12 p refs Transl. into ENGLISH from Luftfahrtmedizin, v. 3, 1939 p 277-284

(NASA-TT-F-14000) Avail: NTIS CSCL 08S

Different subjects were tested for their visual reaction time while under centrifugal force. When this force was in a chest back direction then at 4G there was a slight increase in reaction time and scatter. At 8G the reaction time was definitely prolonged and the scatter noticeably increased. When the centrifugal force was in a head to buttocks direction then an increased reaction time and scatter took place at 3G, while at 4.5G it led to omitting reactions. Author

N72-11072# Joint Publications Research Service, Washington, D.C.

IMMUNOLOGICAL PROBLEMS OF CLOSED ENVIRONMENTS AND GNOTOBIOLOGY

K. A. Lebedev and R. V. Petrov 27 Oct. 1971 26 p refs Transl. into ENGLISH from Usp. Sovrem. Biol. (Moscow), v. 71, no. 2, 1971 p 235-252

(JPRS-54331; UDC-577.391:612.017.1) Avail: NTIS

Ways of preventing reduction of the organism's immune system under conditions of prolonged space flight are discussed. The conclusion is drawn that the most efficient method is enteral immunization of astronauts with sets of antigenic drugs in the form of dietary supplements (antigenic supplements). It is expedient to regulate the astronauts' indigenous microflora before takeoff by applying the principles for creating specific pathogen free (SPF) animals. Upon the astronauts' return to earth after flight gradual restoration of their microflora must be ensured by means of microbial sluicing in isolation chambers. Author

N72-11073# International Academy of Aviation and Space Medicine, Brussels (Belgium).
NINETEENTH INTERNATIONAL CONGRESS OF AVIATION

AND SPACE MEDICINE: ABSTRACTS

Oct. 1971 97 p refs Conf. held in Tel-Aviv, Israel, 24-29 Oct. 1971

Avail: NTIS

A series of abstracts on space, civil aviation, and clinical medicine are given. Data also cover aerospace aspects of environment pollution, neuropsychological and medical criteria for selecting space crews, medical aspects of escape, recovery, and evacuation, and heart stress and fatigue. E.H.W.

N72-11074*# National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.

BACTERIAL ADENOSINE TRIPHOSPHATE AS A MEASURE OF URINARY TRACT INFECTION Patent Application

Emmett Chappelle and Grace L. Picciolo, inventors (to NASA)

Filed 30 Apr. 1971 35 p

(NASA-Case-GSC-11092-2; US-Patent-Appl-SN-139250) Avail:

NTIS CSCL 08E

A method is provided for determining bacterial levels in urine samples, which method depends on the quantitative determination of bacterial adenosine triphosphate (ATP) in the presence of non-bacterial ATP. After the removal of non-bacterial ATP, the bacterial ATP is released by cell rupture and is measured by an enzymatic bioluminescent assay using an enzyme obtained from the firefly. Author

N72-11075*# Minnesota Univ., Minneapolis. Space Science Center.

ENVIRONMENTAL MICROBIOLOGY AS RELATED TO PLANETARY QUARANTINE Semiannual Progress Report

Irving J. Pflug Jun. 1971 74 p refs

(Grant NGL-24-005-180)

(NASA-CR-123328; SAPP-8) Avail: NTIS CSCL 08M

The experiments carried out to determine the effects of temperature and relative humidity on the survival rate of *Bacillus subtilis* var. *niger* spores are reported. The experiments were conducted in environmental chambers at temperatures of 75 and 90 C. Data are also included on the survival characteristics of the spores suspended in sucrose solutions at 90 C with water activities of 0.99, 0.9, and 0.85. Author

N72-11076# Cincinnati Univ., Ohio. Dept. of Environmental Health.

STUDIES ON THE MECHANISM OF THE EFFECT OF IONIZING RADIATIONS ON THE OLFACTORY SYSTEM

Final Report, 1 Jan. 1967 - 31 Dec. 1970

Gary P. Cooper 24 May 1971 7 p refs

(Contract AT(11-1)-1669)

(COO-1669-7) Avail: NTIS

Experiments on the effects of radiation on single olfactory bulb neurons in the rabbit showed that beta irradiation of the olfactory epithelium evoked responses of olfactory bulb neurons whereas beta irradiation of the olfactory bulb itself did not. Studies on quantitative relationships between X-ray parameters and the response of olfactory bulb neurons showed that the response to X-rays may be described by functions similar to those characteristic of other sensory responses. It was found that X-rays do not evoke responses in nasal branches of the trigeminal nerve of rats. The respiratory rate of anesthetized and unanesthetized rats was increased following olfactory stimulation by X-rays. Results of studies on effects of high dose X-irradiation on olfaction in rabbits showed that the peripheral olfactory system appears to be considerably more radioresistant than the central nervous system. The response of olfactory bulb neurons to X-rays as a function of nasal oxygen concentration was studied; it was found the response to X-rays was unaffected until the oxygen concentration decreased to about 2%. Author

N72-11077# Sandia Labs., Albuquerque, N.Mex.

SANDIA LABORATORIES PLANETARY QUARANTINE PROGRAM Quarterly Progress Report, period ending 31 Mar. 1971

R. S. Gillespie Mar. 1971 75 p refs
(TID-25725; QPR-20) Avail: NTIS

The effectiveness of a combination of heat (at temperatures less than 100 C) with gamma or X-radiation delivered at dose rates of approximately 10 krad/hr was investigated for the sterilization of space vehicles. The effects of humidity on the sensitivity of *Bacillus subtilis* spores, heat and radiation sensitivities of heat-resistant bacterial spores found occurring naturally in soil at Cape Kennedy, and a comparison of the effects of gamma and X-radiation dose rates on the inactivation of spores of *B. subtilis* were studied. The combined application of heat and ionizing radiation provides a greater degree of inactivation in a given time period than either heat or irradiation separately during the same period of time. The mechanisms involved in the synergistic effect of heat and ionizing radiation for the inactivation of biological materials were investigated. NSA

N72-11078# Oak Ridge National Lab., Tenn.
MOLECULAR ANATOMY (MAN) PROGRAM, PART 1
Semiannual Progress Report, 1 Sep. 1970 - 28 Feb. 1971
Jul. 1971 229 p refs Sponsored in part by Natl. Cancer Inst., Natl. Inst. of Gen. Med. Sci., and Natl. Inst. of Allergy and Infectious Diseases
(Contract W-7405-eng-26)
(ORNL-4683-Pt-1; sapt-2) Avail: NTIS

Progress of clinical investigations into cancer prevention, infectious diseases, body fluids, and electrophoresis is described. A.L.

N72-11079# Los Alamos Scientific Lab., N.Mex.
SURVEY OF TECHNIQUES EMPLOYED TO DEFINE AEROSOL RESPIRABLE DUST CONCENTRATION AND PARTICLE-SIZE CHARACTERISTICS, VOLUME 2
Harry J. Ettinger Jun. 1971 14 p ref
(Contract W-7405-eng-36)
(LA-4249-Vol-2) Avail: NTIS

A questionnaire survey was conducted to evaluate air sampling procedures employed by AEC licenses and governmental radiological health agencies. Air sampling is generally performed, but relatively little sampling data define respirable concentration, or aerosol particle-size characteristics. However, the importance of these parameters in defining potential health hazards is acknowledged. The need for standardization of air sampling procedures and respirable dust definitions is indicated. Author

N72-11080# Federation of American Societies for Experimental Biology, Bethesda, Md.
ADAPTATION OF VESSELS OF THE TELENCEPHALON TO GRAVITATIONAL OVERLOADS IN THE HEAD-PELVIS DIRECTION
N. I. Zotova 1971 14 p refs Transl. into ENGLISH from Arkh. Anat., Gistol. i Embriol. (Moscow), v. 59, no. 7, 1970 p 59
(PB-200183T; NS-402) Avail: NTIS CSCL 08S

Exposure of an untrained animal to intolerable gravitational overloads leads to considerable morphological changes in the blood vessels of the telencephalon. Prolonged, systematic overloads of a training character lead to adaptation of animals to the overloads, and the vessels of the telencephalon of the trained animal show only negligible changes after exposure to overloads which are not tolerated by untrained animals. Important factors for adaptation of vessels of the telencephalon to hypergravitation are the duration of action of the overloads in the training program and the interval of time after training before the gravitational stress is imposed. Author (GRA)

N72-11081# Air Force Systems Command, Wright-Patterson AFB, Ohio, Foreign Technology Div.
MEDICAL AND BIOLOGICAL RESEARCH ON SOVIET SPACESHIP-SATELLITES
12 Mar. 1971 9 p Transl. into ENGLISH from Pam. for the 1970 Exhibit of Achievements of the Natl. Economy (Moscow), 1970 p 2-4

(AF Proj. FTD-60101)
(AD-727940; FTD-HT-23-62-71; Task-DIA-T69-01-15) Avail: NTIS CSCL 08/3

The pamphlet discusses the flights of various biological objects, especially dogs, in the period preceding Soviet manned space flight. A table of launches and the animals carried in them is given. There is some general information on the gross response of the animals to spaceflight factors. Author (GRA)

N72-11082# Wisconsin Univ., Madison. Dept. of Veterinary Science.
ECOLOGICAL AND AEROSPACE MEDICAL ASPECTS OF VIRUS DISEASES Technical Report, 1 Jul. 1970 - 30 Apr. 1971

Robert P. Hanson 30 Apr. 1971 102 p refs
(Grant AF-AFOSR-1455-68)
(AD-726645; AFOSR-71-1954TR) Avail: NTIS CSCL 02/5
Although the ultimate goal of the research is to understand the epizootiology of vertebrate pathogens, an understanding of the ecology of these pathogens must be based on an understanding of the ecology of plant and animal communities. The report presents an inventory of the ecology of biting insects, birds and mammals. GRA

N72-11083# Defense Documentation Center, Alexandria, Va.
RADIATION HAZARDS Report Bibliography, Apr. 1952 - Mar. 1971
Jul. 1971 141 p refs
(AD-726900; DDC-TAS-71-32) Avail: NTIS CSCL 08/18

The references in this annotated bibliography pertain to the potential hazards related to electromagnetic radiation, radiological dosages, radioactive fallout, and contamination of both water and air supplies. Corporate author-monitoring agency, subject, and title indexes are provided. Author (GRA)

N72-11084* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
MANUALLY ACTUATED HEAT PUMP Patent
William D. Hutchinson, inventor (to NASA) Issued 17 Aug. 1971 6 p Filed 22 Oct. 1969 Sponsored by NASA
Supersedes N70-34725 (08 - 18, p 3302)
(NASA-Case-NPO-10677; US-Patent-3,599,443;
US-Patent-Appl-SN-868530; US-Patent-Class-62-467;
US-Patent-Class-62-56) Avail: US Patent Office CSCL 13A

A manually actuated heat pump is reported for use as an auxiliary device in selectively warming and cooling an ambient medium. The device is characterized by a pair of independently mounted rotatable hubs, interconnected through elastomeric bands which alternately elongate and contract to experience a continuously reversing heat transfer process, in accordance with the principles of the so-called Joule effect in rubber. The pump employs a fluid bath which receives the bands in selected states of elongation for effecting a heat transfer between the fluid of the bath and the bands. Selective preheating and precooling of the bands are achieved in a medium divorced from the ambient atmosphere and thus the reversibility of the transfer of energy within the atmosphere is controlled.

Official Gazette of the U.S. Patent Office

N72-11085* Weber Aircraft Corp., Burbank, Calif.
COLLAPSIBLE APOLLO COUCH Patent
David L. Johansen, Walter E. Cooper, and Liborio J. Ferrara, inventors (to NASA) Issued 13 Jul. 1971 10 p Filed 4 Feb. 1969 Sponsored by NASA
(NASA-Case-MS-C-13140; US-Patent-3,592,505;
US-Patent-Appl-SN-796358; US-Patent-Class-297-68;
US-Patent-Class-297-232; US-Patent-Class-5-89;
US-Patent-Class-285-410) Avail: US Patent Office CSCL 08K

A couch system for manned space vehicles is described. The system comprises a separable main frame structure and three individually foldable couches which are detachable. Each couch is supported by highly articulated frames which may be manipulated by individual occupants. The main frame and the couches may be dismantled, either completely or partially, and

compacted for storage to provide more room for the occupants of the vehicle. One couch is additionally adjustable to a more upright position to facilitate operation of various controls and improve the occupant's view through a window.

Official Gazette of the U.S. Patent Office

N72-11088* Louisiana State Univ., Baton Rouge. Bioengineering Research Facility.

[MECHANISMS AND KINETICS OF CELLULOSE FERMENTATION FOR PROTEIN PRODUCTION] Progress Report, 1970-1971

C. A. Dunlap 1971 48 p refs

(Grant NGL-19-001-024)

(NASA-CR-123368) Avail: NTIS CSCL 06B

The development of a process (and ancillary processing and analytical techniques) to produce bacterial single-cell protein of good nutritional quality from waste cellulose is discussed. A fermentation pilot plant and laboratory were developed and have been in operation for about two years. Single-cell protein (SCP) can be produced from sugarcane bagasse--a typical agricultural cellulosic waste. The optimization and understanding of this process and its controlling variables are examined. Both batch and continuous fermentation runs have been made under controlled conditions in the 535 liter pilot plant vessel and in the laboratory 14-liter fermenters. Author

N72-11087* National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.

ERGOMETER Patent Application

Gerald W. Crum and Richard J. Sauter, inventors (to NASA)

Filed 26 May 1971 13 p

(NASA-Case-MS-C-11561-1; US-Patent-Appl-SN-146490) Avail: NTIS CSCL 05E

A foot pedal operated exercising device containing a dynamometer formed of a linked pair of cylinders each containing a piston, as described. The upper portions of the two cylinders are joined together to provide a common fluid reservoir and each piston is provided with a one way check valve to maintain an adequate working fluid level. Fluid from the driven cylinder is transmitted to the other cylinder through a spring biased valve which takes the predominant portion of the pressure drop, thereby providing a constant force hydraulic dynamometer. Means are also provided to count the amount of piston travel. Author

N72-11088* General Electric Co., Philadelphia, Pa. Space Div.

MULTIPARAMETER VISION TESTER APPARATUS Patent Application

Stacey R. Hunt, Robert J. Homkes, Wilmer B. Poteate, and Andrew C. Sturges, inventors (to NASA) Filed 7 Jul. 1971 70 p

(Contract NASw-1630)

(NASA-Case-MS-C-13601-1; US-Patent-Appl-SN-160371) Avail: NTIS CSCL 05E

A compact vision testing apparatus is provided for testing a relatively large number of physiological characteristics of the eyes and visual system of a human subject. The head of the subject is inserted into a viewing port at one end of a light-tight housing containing various optical assemblies. Visual acuity and other refractive characteristics and ocular muscle balance characteristics of the eyes of the subject are tested by means of a retractable phoropter assembly carried near the viewing port and a film cassette unit carried in the rearward portion of the housing, the latter selectively providing a variety of different visual targets which are viewed through the optical system of the phoropter assembly. The visual dark adaptation characteristics and absolute brightness threshold of the subject are tested by a projector assembly. A Dolman rod unit present in a box assembly tests the visual depth perception of the subject. A mechanism is also provided for testing the visual critical fusion frequency. Author

N72-11089# Vanderbilt Univ., Nashville, Tenn.

DIGITAL SYSTEMS FOR DATA ACQUISITION AND STORAGE

A. Bertrand Brill, Jon J. Erickson, and Charles E. Lindahl Apr. 1970 47 p refs

(Contract AT(40-1)-2401)

(ORO-2401-37; Conf-700516-4) Avail: NTIS

Digital systems for data acquisition and storage for medical imaging instruments including fixed probe systems, rectilinear scanners, stationary camera systems, and moving camera systems are discussed. Also, experience at Vanderbilt University with rectilinear scanners and Anger cameras is described. NSA

N72-11090# California Univ., Livermore. Lawrence Radiation Lab.

RESPIRATORY CARTRIDGE EFFICIENCY STUDIES. 1: EXPERIMENTAL DESIGN

Walter E. Ruch, Gary O. Nelson, Carl L. Lindeken, Robert G. Johnsen, and David J. Hodgkins 29 Apr. 1971 16 p refs

Submitted for publication Supported by AEC

(UCRL-73166; Conf-710505-3) Avail: NTIS

A testing facility to produce test atmospheres of known composition was built. The cartridges are placed in a specially designed and constructed holder; and breakthrough times are determined by measuring the upstream and downstream concentrations, using dual flame ionization detectors. The breakthrough characteristics can be ascertained by using either a steady state condition or a cycling flow produced by a breath simulator. A standard cartridge was designed to evaluate system performance and to periodically check the system for reproducibility. Parameters to be studied include the effects of organic compounds, concentration, work rate, temperature, and relative humidity on cartridge efficiency. Author

N72-11091# Human Resources Research Organization, Alexandria, Va.

MAN IN CONTROL OF HIGHLY AUTOMATED SYSTEMS

Harry L. Ammerman and William H. Melching May 1971 15 p

Presented at 16th Ann. Army Human Factors Res. and Develop. Conf., Fort Bliss, Tex., Oct. 1970

(Contract DAHC19-70-C-0012)

(AD-727658; HUMRRO-PR-7-71) Avail: NTIS CSCL 05/8

The identification of what man should do as a decision maker and controller in the newly evolving man-machine systems is considered. Among the topics discussed are man's underlying basic functions in a complex system, task activities for individual jobs and their analyses, and training and the design of operational job positions. Author (GRA)

N72-11092# Cornell Aeronautical Lab., Inc., Buffalo, N.Y.

PRELIMINARY VEHICLE TESTS; INFLATABLE OCCUPANT RESTRAINT SYSTEMS. VOLUME 2: FINAL PROGRAM REPORT Final Report, 30 Jun. 1970 - 31 Mar. 1971

James F. Martin and David J. Romeo Mar. 1971 168 p refs

(Contract DOT-FH-11-7621)

(PB-200876; CAL-YB-2990-K-2; DOT-HS-800-478) Avail: NTIS CSCL 13F

Sections concerning the test program, inflatable occupant restraint systems, test equipment, test procedures, test data processing and results, and discussion of results are presented. GRA

N72-11093# Cornell Aeronautical Lab., Inc., Buffalo, N.Y.

PRELIMINARY VEHICLE TESTS; INFLATABLE OCCUPANT RESTRAINT SYSTEMS. VOLUME 2: FINAL PROGRAM REPORT: APPENDIX A Final Report, 30 Jun. 1970 - 31 Mar. 1971

Mar. 1971 163 p 3 Vol.

(Contract DOT-FH-11-7621)

(PB-200877; CAL-YB-2990-K-2A) Avail: NTIS CSCL 13F

Approximately 155 illustrations are presented that are grouped according to the type of information (e.g. dummy accelerations) and subgrouped according to test number and

filter frequency. All filters are single order with corner frequencies as indicated. Author (GRA)

N72-11094# Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
PRELIMINARY VEHICLE TESTS: INFLATABLE OCCUPANT RESTRAINT SYSTEMS. VOLUME 2: FINAL PROGRAM REPORT: APPENDIX B Final Report, 30 Jun. 1970 - 31 Mar. 1971

Mar. 1971 144 p 3 Vol.
(Contract DOT-FH-11-7621)

(PB-200878; CAL-YB-2990-K-2B) Avail: NTIS CSCL 13F

Photographs are presented of all of the test vehicles used in the program; both pre-crash and post-crash. Author (GRA)

N72-11095# Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
PRELIMINARY VEHICLE TESTS: INFLATABLE OCCUPANT RESTRAINT SYSTEMS. VOLUME 3: TEST PROCEDURES AND INSTRUMENTATION Final Report, 30 Jun. 1970 - 31 Mar. 1971

James F. Martin and David J. Romeo Mar. 1971 143 p 3 Vol.

(Contract FH-11-7831)

(PB-200779; CAL-YB-2990-K-3) Avail: NTIS CSCL 13F

Descriptions are given of the test procedures, data acquisition techniques, and instrumentation used to carry out the objectives of the program. A brief procedural guide to IORS testing is presented which is aimed at providing a set of guidelines for similar types of test work. Author (GRA)

N72-11096# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EFFECT OF REPRODUCTION SCALE ON PROBABILITY OF IMAGE RECOGNITION

V. K. Pototskii 22 Mar. 1971 6 p Transl. into ENGLISH from Tekhn. Kino Televideniya (USSR), v. 14, no. 2, 1970 p 69

(AD-727457; FTD-HC-23-54-71) Avail: NTIS CSCL 08/16

For the range of spatial frequencies where the transmission function of the visual analyzer - the eye - is unlimited, the study of the dependence of the recognition probability of images transmitted on a noisy communication channel upon the scale of reproduction is not only of unquestioned practical interest, but also allows the following question to be answered: is the visual system an ideal averaging device, i.e., does the signal-to-noise ratio (and therefore, the probability of recognition remain constant) with a change of the angular dimensions of the specific distorted image. Author (GRA)

N72-11097# Naval Aerospace Medical Inst., Pensacola, Fla.
STATE AND TRAIT ANXIETY IN THE STUDENT NAVAL AVIATOR WHO VOLUNTARILY WITHDRAWS FROM FLIGHT TRAINING

Steven F. Bucky and Charles D. Spielberger 12 Apr. 1971 10 p refs

(MF Proj. 12.524.002)

(AD-727614; NAMRL-1132) Avail: NTIS CSCL 05/9

The purpose of the present study was to determine whether student aviators who voluntarily drop out of the naval aviation training program (DOR's) respond differently to measures of state and trait anxiety from the way in which a group of entering aviation officer candidates (AOC's) and a group of male college students respond. The results indicate that DOR's are: (1) lower in A-State and similar in A-Trait when compared to entering AOC's; and (2) similar in A-State and lower in A-Trait when compared to the male college students. Although significant differences between entering AOC's and DOR's were observed, the ultimate usefulness of the STAI in predicting DOR's must await further investigation. Author (GRA)

N72-11098# Air Force Human Resources Lab., Williams AFB, Ariz. Flying Training Div.

WHAT'S NEW ON THE TRAINING HORIZON

David O. Andersen and William V. Hagin Mar. 1971 28 p refs

(AF Proj. 1123)

(AD-727009; AFHRL-TR-71-36) Avail: NTIS CSCL 05/9

The paper describes new training technologies. It documents the potential of these technologies and simple and complex ground trainers for improving both the quality and efficiency of pilot training. Author (GRA)

N72-11099# Human Resources Research Organization, Alexandria, Va.

HARDWARE PARAMETERS RELATED TO OPERATOR TRAINING CAPABILITIES

Harold P. Bishop Jun. 1971 10 p Presented at the 16th Ann. Army Human Factors Res. and Develop. Conf., Fort Bliss, Tex., Oct. 1970

(Contract DAHC19-70-c-0012)

(AD-727657; HUMRRO-PP-9-71) Avail: NTIS CSCL 05/9

The research reported is part of an effort to identify critical human factors problems in the use of new night observation devices, and to develop effective techniques of training men in the use of these devices. Two techniques for training operators of the AN/TSS-7 long range night observation device are described and compared. Pictorial training aids were developed and evaluated; traditional platform instruction was compared with a videotaped instructional sequence. Author (GRA)

N72-11100# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

ALGORITHM FOR RECOGNIZING 40 WORDS ON A BESM-3M DIGITAL COMPUTER

G. Ya. Vysotskii, B. N. Rudnyy, V. N. Trunin-Donskoy, and G. I. Tsemel 12 Feb. 1971 40 p refs Transl. into ENGLISH from Raboty po Tekhn. Kibernetike (USSR), no. 2, 1968 p 3-33

(FTD Proj. 6050205)

(AD-725013; FTD-MT-24-321-70; UR/3502-68-000-002; T68-05-02) Avail: NTIS CSCL 09/2

A study was made of an algorithm for recognizing 40 words on a BESM-3M computer to establish direct communication between man and machine. Of the 40 words pronounced by 20 speakers, 93 percent were recognized correctly. The average recognition time after a word was pronounced was 0.5 sec. The correctness of pronunciation was not controlled. Deviations from normal pronunciation were detected in the print-outs of the segmental sequences. Author (GRA)

N72-11101# Defense Documentation Center, Alexandria, Va.

MEMORY: LONG AND SHORT TERM Report Bibliography, Jul. 1960 - Jan. 1971

Jul. 1971 308 p refs

(AD-727300; DDC-TAS-71-34) Avail: NTIS HC \$6.00/MF \$0.95 CSCL 05/10

The annotated bibliography contains 226 references to reports and reprints from periodicals that analyze variables which affect the information processes of short and long term human memory. Empirical and theoretical techniques which study certain measurable characteristics about human performance and its limitations are also included, as well as studies concerned with the relationship between short term memory, long term memory and learning. Corporate Author-Monitoring Agency, Subject, and AD Number indexes are included. Author (GRA)

N72-11102# Stanford Univ., Calif. Dept. of Computer Science.
[ARTIFICIAL INTELLIGENCE AND HEURISTIC PROGRAMMING RESEARCH]

John McCarthy, Arthur Samuel, Edward Feigenbaum, and Joshua Lederberg Mar. 1971 84 p refs

(ARPA Order 457 Contract ARPA SD-183; Grant MH-06645-08)

(AD-724867; SU-CS-209; AIM-143) Avail: NTIS CSCL 06/4

An overview is presented of current research at Stanford in artificial intelligence and heuristic programming. This report is largely the text of a proposal to the Advanced Research Projects Agency for fiscal year 1972-3. Author (GRA)

N72-11103# Defense Documentation Center, Alexandria, Va.
**WATER: PURIFICATION AND DECONTAMINATION, A
 DDC BIBLIOGRAPHY, JULY 1962 - AUGUST 1969**
 Jun. 1971 102 p refs

(AD-725610; DDC-TAS-71-30) Avail: NTIS CSCL 13/2

The bibliography consists of 76 annotated references to reports which were selected from the Defense Documentation Center's data bank covering the period from January 1953 through December 1970. The reports analyze the purification, distillation and decontamination of water. It includes the recycling of closed ecological systems for the potability of water by the use of ion exchange, filtration, disinfecting agents, and coagulation. The indexes are corporate author-monitoring agency, and subject. Author (GRA)

loss was matched to heat production over a full 24-hour metabolic cycle. The new suit was coupled with a previously developed metabolic rate monitor in a series of human experiments. It was shown that during 30-35 continuous hours of monitoring body heat content is not constant, even at rest, and there is constant swing of heat storage of some magnitude storage is generally ten percent of metabolic rate. Secondly, it was found that there are sinusoidal rhythms in heat production and heat loss, which are matched but out of phase, and the phase shift can explain the established circadian rhythm in rectal temperature. These data are of considerable interest to USAF laboratories studying physiological adjustments following flights over several time zones, changes in biological rhythms during prolonged flights, and in designing new protective equipment. Author (GRA)

N72-11104# Army Test and Evaluation Command, Aberdeen Proving Ground, Md.

OXYGEN AND PROTECTIVE MASKS (AVIATION) Final Report

17 May 1971 33 p

(Proj. AMCR-310-6; AMCR Proj. 310-6)

(AD-725540; MTP-7-2-086) Avail: NTIS CSCL 06/11

The procedure describes test methodology and testing techniques necessary to determine the technical performance and safety characteristics of aviation oxygen and protective masks and associated accessories to determine their suitability for service tests. Author (GRA)

N72-11105# Beta Industries, Inc., Dayton, Ohio.
**IMPACT AND VIBRATION TEST EQUIPMENT DESIGN
 AND EXPERIMENTATION Final Report, Mar. 1970 - Jun.
 1971**

Norman S. Phillips, Richard S. Scranton, and Richard W. Carr
 Jul. 1971 40 p

(Contract F33615-70-C-1445; AF Proj. 7231)

(AD-726119; BII-210-15; AMRL-TR-71-62) Avail: NTIS CSCL 05/5

Test hardware was designed and fabricated which would permit biodynamic research to be conducted on both the AMRL IMPMODE and AMRL MONOMODE at their excitation limits. The existing Body Retraction Apparatus was modified to permit qualification and human testing. An instrumentation system including transducers, signal conditioners, and recorders was assembled to support the testing associated with the foregoing. Qualification testing was accomplished on all three devices with human testing conducted on the Body Retraction Apparatus. The program produced rugged test hardware for use in biodynamic experiments to investigate vibration exposure limits for human subjects and the inertial response of individual body segments during impact and vibration. In addition, a device and technique for investigating human tolerance to forcible retraction was developed and preliminary data collected. Author (GRA)

N72-11106# Army Test and Evaluation Command, Aberdeen Proving Ground, Md.

**RESCUE EQUIPMENT, PERSONNEL AIRCRAFT CRASH
 Final Report**

10 May 1971 42 p

(AMCR Proj. 310-6)

(AD-725541; MTP-7-2-090) Avail: NTIS CSCL 06/7

The procedure defines methods for evaluating equipment utilized for rescue operations of an aircraft crash, including clothing and tools. Author

N72-11107# Webb Associates, Yellow Springs, Ohio.
**PROTECTION OF AIRCREWS FROM HIGH TEMPERA-
 TURES: USE OF A WATER COOLED GARMENT FOR
 HEAT BALANCE STUDIES IN MAN Final Report**

Paul Webb Jul. 1971 11 p refs

(Contract F44820-70-C-0045)

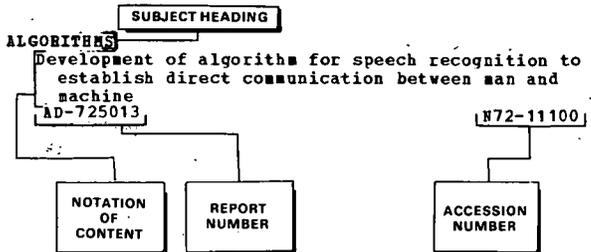
(AD-727222; AFOSR-71-1982TR) Avail: NTIS CSCL 06/17

A water-cooled suit was developed for use as a direct calorimeter with error of approximately one percent when heat

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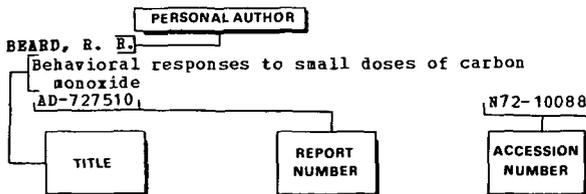
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