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# AEROSPACE MEDICINE AND BIOLOGY

**A CONTINUING BIBLIOGRAPHY**

**WITH INDEXES**

**(Supplement 112)**

**FEBRUARY 1973**

**NATIONAL AERONAUTICS AND SPACE ADMINISTRATION**

## ACCESSION NUMBER RANGES

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IAA (A-10000 Series)      A73-10001—A73-12868

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# AEROSPACE MEDICINE AND BIOLOGY

## A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 112)

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 1973 in

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



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# INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* (NASA SP-7011) lists 323 reports, articles and other documents announced during January 1973 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*. The first issue of the bibliography was published in July 1964; since that time, monthly supplements have been issued.

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

Each entry in the bibliography consists of a bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged in two major sections: *IAA Entries* and *STAR Entries*, in that order. The citations, and abstracts when available, are reproduced exactly as they appeared originally in *IAA* or *STAR*, including the original accession numbers from the respective announcement journals. This procedure, which saves time and money, accounts for the slight variation in citation appearances.

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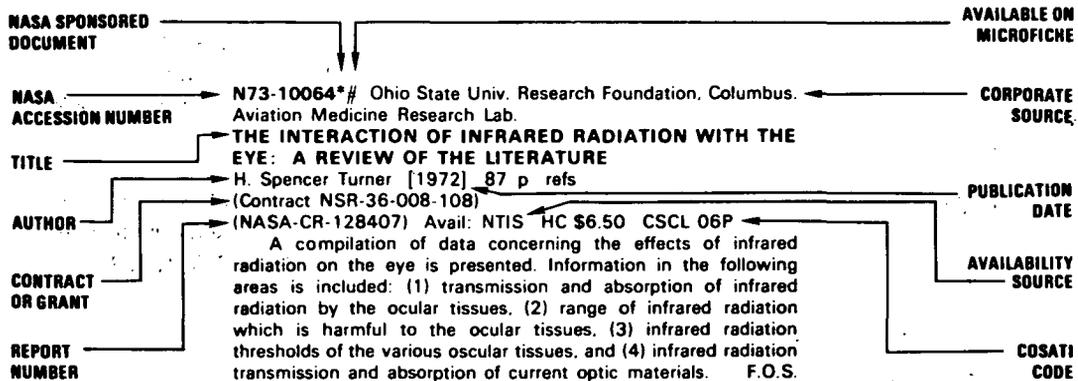
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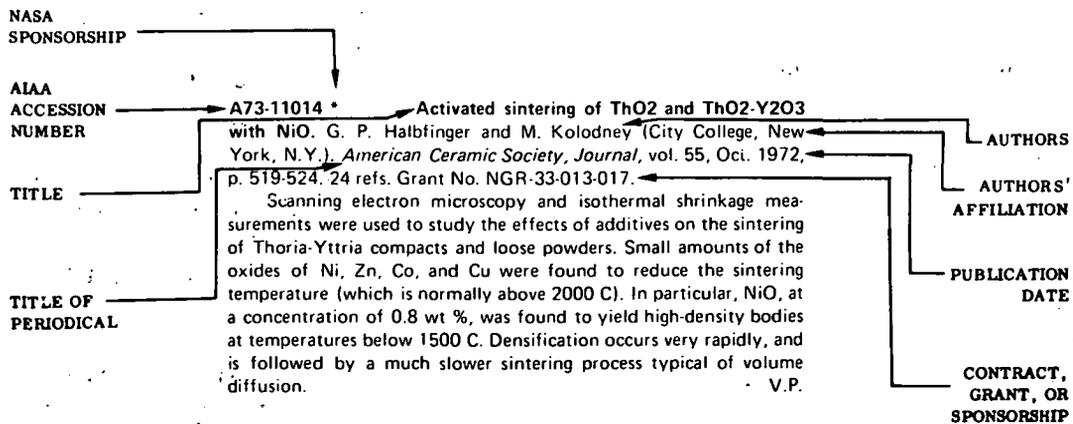
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## TYPICAL CITATION AND ABSTRACT FROM STAR



## TYPICAL CITATION AND ABSTRACT FROM IAA



# AEROSPACE MEDICINE AND BIOLOGY



A Continuing Bibliography (Suppl. 112) FEBRUARY 1973

## IAA ENTRIES

**A73-10107 #** Noise effects on the critical tracking performance of the human operator. G. M. Swisher, M. L. Ritchie, and F. Maher (Wright State University, Dayton, Ohio). *Journal of Spacecraft and Rockets*, vol. 9, Oct. 1972, p. 778, 779. 5 refs. USAF-sponsored research.

Measurement of the closed-loop compensatory tracking performance of the human operator in terms of the environmental stress of a 95-db white noise, using the critical tracking task of Jex et al. (1966). Following a description of the equipment and subject methodology, the results obtained are shown to indicate that the zero-order Jex task performance measures of total time and critical divergence frequency are sensitive to noise stress, whereas the switching time is not. These results suggest that control and human factors engineering researchers in environmental stress must be extremely careful in their selection of performance measures. M.V.E.

**A73-10134** Insensitivity of the alveolar septum to local hypoxia. A. B. Fisher, R. W. Hyde, and J. S. Reif (Pennsylvania University; U.S. Veterans Administration Hospital, Philadelphia, Pa.). *American Journal of Physiology*, vol. 223, Oct. 1972, p. 770-776. 23 refs. Research supported by the Southeastern Pennsylvania Heart Association.

The effect of severe local hypoxia upon lung single-breath diffusing capacity ( $D_{sub L}$ ) and static pressure-volume (P-V) relationships was studied in eight anesthetized dogs. After insertion of a tracheal divider, the left pulmonary artery was occluded with a balloon catheter and the left lung was ventilated for 3 to 7 hr with a gas containing 95% N<sub>2</sub>-5% CO<sub>2</sub>. Compared to control values, left lung mean  $D_{sub L}$  and P-V relationships after hypoxia were not significantly altered. Light and electron microscopic examination failed to show changes that could be attributed to hypoxic exposure. The right lungs had 19% decrease in  $D_{sub L}$  (P less than 0.005), shift of P-V curves to the right, and evidence of edema on histologic examination, possibly due to increased right lung blood flow and prolonged anesthesia. The data indicate that tissues comprising the alveolar septum are resistant to local hypoxia in the absence of pulmonary artery blood flow and suggest that essential metabolism of these cells does not depend on an alveolar oxygen partial pressure exceeding 1 to 6 mm Hg. (Author)

**A73-10135** Effects of exercise on activity of heart and muscle mitochondria. G. L. Dohm, R. L. Huston, E. W. Askew, and P. C. Weiser (U.S. Army, Medical Research and Nutrition Laboratory, Denver, Colo.). *American Journal of Physiology*, vol. 223, Oct. 1972, p. 783-787. 26 refs.

Trained and untrained rats were made to run on a treadmill to a

state of physical exhaustion to assess the effects of physical exercise on the activity of several mitochondrial enzyme systems. The results indicate that endurance training increases the capacity of skeletal muscle to oxidize a number of metabolic substrates. The observed increased rate of oxidation of palmitate, pyruvate-malate, and succinate is attributed to the increase in mitochondrial protein found in trained animals, whereas the increased oxidation of glucose with training is seen to reflect the training effect on hexokinase activity. The oxidative capacity of the heart was unchanged by training. V.P.

**A73-10151 #** Comparative physiological characteristics of functional relations among the hypothalamus and the olfactory and limbic systems of the brain (O sravnitel'no-fiziologicheskikh osobennosti funktsional'nykh vzaimootnoshenii gipotalamusa, oboniatel'noi i limbicheskoi sistem mozga). A. I. Karamian and T. N. Sollertinskaya (Akademiia Nauk SSSR, Institut Evoliutsionnoi Fiziologii i Biokhimii, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 58, July 1972, p. 974-987. 71 refs. In Russian.

**A73-10152 #** Stability criteria in manifestations of the activity of the central nervous system in humans (O kriteriakh ustoiichivosti v proiavleniakh deiatel'nosti tsentral'noi nervnoi sistemy cheloveka). A. M. Zimkina (Leningradskii Nauchno-Issledovatel'skii Institut Ekspertizy Trudospobnosti i Organizatsii Truda Invalidov, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 58, July 1972, p. 1011-1018. 35 refs. In Russian.

Study of the degree of stability of nervous processes in healthy subjects serving as controls and in subjects with damaged brains or spinal cords. The stability indices used were the coefficients of constancy of alpha-wave periods in spontaneous EEG and the absolute coefficient of bioelectric activity shifts under the action of rhythmic and trigger photostimulation. The stability of nervous processes with respect to both of these indices is reduced when either the brain or the spinal cord is damaged, but certain structures of the central nervous system seem to be more closely related to the maintenance of a steady functional state than others. In the case of a pathological alteration of the quantity and volume of sensory input stability is reduced to a greater extent in the presence of irritation phenomena than in the presence of deficiency phenomena. A.B.K.

**A73-10153 #** Evolutionary significance of carbohydrate metabolism alterations in animal brains during adaptation to hypoxia (Evolutsionnoe znachenie izmenenii uglevodnogo obmena v mozge zhivotnykh v protsesse adaptatsii k gipoksii). Z. I. Barbashova (Akademiia Nauk SSSR, Institut Evoliutsionnoi Fiziologii i Biokhimii, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 58, July 1972, p. 1019-1025. 25 refs. In Russian.

**A73-10154 #** Coordination relations in the activity of certain internal organs (Koordinationnyye otnosheniia v deiatel'nosti nekotorykh vnutrennikh organov). V. N. Chernigovskii (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 58, July 1972, p. 1077-1086. 14 refs. In Russian.

Review of the literature on the effect of excitation of receptors of internal organs on skeletal muscles. Arguments are presented in favor of the view that stimulation of receptors of internal organs (the so-called vegetative sphere) can have an effect on skeletal muscles (the so-called animal sphere). It is shown that this effect does not

develop chaotically, but obeys certain laws, where each individual part of a complex act, retaining its specific regulatory function, merges into a chain of successive events, the final result of which is the coordination of processes occurring in a single organ with processes involving the skeletal muscles and the circulatory system.

A.B.K.

**A73-10155 #** Interrelation between hardness, viscosity, strength, and bioelectric activity of human muscles (O vzaimosvizi mezhdu tverdst'iu viazkost'iu, siloi i bioelektricheskoi aktivnost'iu myshts cheloveka). N. V. Zimkin (Leningradskii Nauchno-Issledovatel'skii Institut Fizicheskoi Kul'tury, Leningrad, USSR) and T. G. Pakhomova (Khabarovskii Institut Fizicheskoi Kul'tury, Khabarovsk, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 58, July 1972, p. 1099-1108. 20 refs. In Russian.

Study of the interrelation between various changes in muscle hardness and viscosity, on the one hand, and muscle strength, on the other, both under the action of sleep, hypoxia, and temperature changes while at rest and in connection with static exertions and dynamic work. Peculiarities in these indices are noted in the phasic, postural, and mixed muscles of athletes and untrained individuals. These indices are found to be affected by sleep, ischemia upon application of a tourniquet, a reduction of blood oxygenation, temperature changes, static exertions, and dynamic muscle work with various loads. The changes noted are found to differ not only quantitatively but also in direction. It is suggested that hardness, viscosity, and maximum strength of muscles are determined by changes in the state of the muscle itself and in the impulses arriving at the muscles through motor and, possibly, sympathetic nerves.

A.B.K.

**A73-10156 #** Effect of increased atmospheric pressure on the dynamics of free oxygen content in animal muscle tissues (Vlianie povyshennogo atmosfernogo davleniia na dinamiku soderezhaniia svobodnogo kisloroda v myshechnoi tkani u zhivotnykh). A. G. Zhironkin, L. A. Isaakian, and G. V. Troshikhin (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 58, July 1972, p. 1109-1114. 26 refs. In Russian.

**A73-10157 #** Role of the sympathico-adrenal system during a period of rest and in adaptation to muscular activity (Znachenie simpato-adrenalovoi sistemy v period otdykha i pri adaptatsii k myshechnoi deiatel'nosti). N. N. Iakovlev, N. R. Chagovets, and A. L. Gorokhov (Leningradskii Nauchno-Issledovatel'skii Institut Fizicheskoi Kul'tury, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 58, July 1972, p. 1132-1137. 29 refs. In Russian.

**A73-10158** Isovolumic contraction dynamics in man according to two different muscle models. H. C. Mehmel, H. P. Krayenbuehl, and P. Wirz (Zürich, Universität, Zurich, Switzerland). *Journal of Applied Physiology*, vol. 33, Oct. 1972, p. 409-414. 25 refs. Research supported by the Swiss National Fund.

Two muscle models, a two-component model using total pressure (I) and a three-component model using developed pressure (II), are compared on the basis of the respective results of their application to isovolumic contraction data obtained from high-fidelity left ventricular pressure measurements in conscious man. The results are evaluated within the framework of papillary muscle mechanics. Of particular interest is the analysis of the time course of contractile element velocity throughout the isovolumic part of the left ventricular systole and of the extent of isovolumic shortening. Both differed sizably according to the underlying model. The analysis favors the use of model I.

M.V.E.

**A73-10159** Effect of controlled elevation of body temperature on human tolerance to +Gz acceleration. J. R. Allan and R. J. Crossley (RAF, Institute of Aviation Medicine, Farnborough, Hants., England). *Journal of Applied Physiology*, vol. 33, Oct. 1972, p. 418-420. 8 refs.

A technique for controlled elevation of body temperature was

used in a centrifuge study to determine the effects of raised body temperature on human tolerance to +Gz accelerations. Under control conditions with normal body temperatures, the mean grayout threshold was 3.2 G. The results demonstrated a mean reduction in grayout threshold of 0.9 G when body temperature was 38.5 C, 0.5 G when body temperature was 37.8 C, and 0.3 G when body temperature was normal but the skin vasodilated.

(Author)

**A73-10160** Diet, exercise, and glycogen changes in human muscle fibers. P. D. Gollnick, K. Piehl, B. Saltin (Gymnastik- och Idrottshogskolan, Stockholm, Sweden; Washington State University, Pullman, Wash.), C. W. Saubert, IV, and R. B. Armstrong. *Journal of Applied Physiology*, vol. 33, Oct. 1972, p. 421-425. 21 refs. Research supported by the Statens Medicinska Forskningsrad.

Investigation of the glycogen storage in the different fiber types of human skeletal muscle, and study of the glycogen depletion pattern during exercise under conditions of normal, elevated, and reduced glycogen content produced by alterations in the diet. Four healthy subjects were studied before, during, and after 30 min of exercise at 74% of their maximal oxygen uptake, after each had consumed an uncontrolled mixed (M), high fat and protein (F-P), or carbohydrate-enriched (CHO) diet for three days. Total glycogen was determined in samples from the vastus lateralis muscle. Muscle fibers were identified histochemically from myosin ATPase activity. More glycogen appeared to be stored in fast as compared to slow twitch fibers only after the F-P diet. Glycogen breakdown in the vastus lateralis during exercise was clearly related to the total carbohydrate combusted. Less glycogen was broken down during exercise after the F-P diet. Glycogen depletion during exercise was less in fast than slow twitch fibers after the M and CHO diets but higher after the F-P diet.

M.V.E.

**A73-10161 \*** Cardiorespiratory responses to exercise in air and underwater. D. M. Denison, P. D. Wagner, G. L. Kingaby, and J. B. West (California, University, La Jolla, Calif.). *Journal of Applied Physiology*, vol. 33, Oct. 1972, p. 426-430. 19 refs. Grants No. NGL-05-009-109; No. PHS-HE-13687-01.

Respiratory gas exchange, end-tidal gas tensions, alveolar ventilation, respiratory frequency, cardiac output, and pulse rate were measured in four healthy adult males at rest and during mild and moderate exercise in air at 18-22 C and underwater at 35.0-35.5 C. Immersion was associated with a 10% increase in pulse rate and cardiac output at all levels of exercise. There were no changes in end-tidal CO<sub>2</sub> tension or alveolar ventilation. It is concluded that horizontal subjects breathing at eupneic pressures and working against mild and moderate loads in warm water show the same responses to exercise as in air.

(Author)

**A73-10162** Changes in ventilatory patterns after ablation of various respiratory feedback mechanisms. A. J. Krieger (Pittsburgh, University, Pittsburgh, Pa.), H. D. Christensen, H. N. Sapru, and S. C. Wang (Columbia University, New York, N.Y.). *Journal of Applied Physiology*, vol. 33, Oct. 1972, p. 431-435. 24 refs. Grants No. NIH-NS-00031; No. NIH-NS-05173; No. NIH-NS-05511.

**A73-10163 #** Utility of heat stress indices and effect of humidity and temperature on single physiologic strains. F. K. Klemm and J. F. Hall, Jr. (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, Ohio). *Journal of Applied Physiology*, vol. 33, Oct. 1972, p. 436-440. 12 refs.

**A73-10164** Arterial oxygen increase by high-carbohydrate diet at altitude. J. E. Hansen, L. H. Hartley, and R. P. Hogan, III (U.S. Army, Research Institute of Environmental Medicine, Natick, Mass.). *Journal of Applied Physiology*, vol. 33, Oct. 1972, p. 441-445. 26 refs.

Several respiratory and blood variables in four healthy male volunteers, fed a high- or low-carbohydrate diet, were measured at rest and exercise during short-term exposure to hypoxia for the

purpose of assessing the practical and theoretical value of high-carbohydrate feeding. The obtained results indicate that feeding of a high-carbohydrate diet is a feasible way of increasing ventilation and improving oxygenation when ambient oxygen is decreased. High-carbohydrate feeding is likely to be of greatest benefit early in acclimatization and at the highest elevations. It is recommended that military casualties, while being evacuated by air, be maintained on a high-carbohydrate diet. M.V.E.

**A73-10165** Cardiovascular and temperature regulatory changes during progressive dehydration and euhydration. D. H. Horstman and S. M. Horvath (California, University, Santa Barbara, Calif.). *Journal of Applied Physiology*, vol. 33, Oct. 1972, p. 446-450. 19 refs. Grant No. AF-AFOSR-69-1653.

**A73-10166** Critical temperature of unacclimatized male Caucasians. J. E. Wilkerson, P. B. Raven, and S. M. Horvath (California, University, Santa Barbara, Calif.). *Journal of Applied Physiology*, vol. 33, Oct. 1972, p. 451-455. 27 refs. Grant No. AF-AFOSR-69-1653.

Five unacclimatized male Caucasians were each exposed to ambient temperatures of 28, 25, 20, and 8 deg C. A significant increase in the steady-state resting metabolic rate above that measured at 28 deg C was observed at each successively lower ambient temperature. The steady-state resting mean skin temperature decreased significantly, and the mean steady-state resting rectal temperature increased with decreasing ambient temperature. These and some other results obtained suggest that differences in the lower critical temperatures of various ethnic groups are not likely to be found. M.V.E.

**A73-10167** Effect of interstitial edema on distribution of ventilation and perfusion in isolated lung. L. D. Iliff, R. E. Greene, and J. M. B. Hughes (London, Royal Postgraduate Medical School, London, England). *Journal of Applied Physiology*, vol. 33, Oct. 1972, p. 462-467. 24 refs.

**A73-10168** A continuum analysis of a two-dimensional mechanical model of the lung parenchyma. T. A. Wilson (Minnesota, University, Minneapolis, Minn.). *Journal of Applied Physiology*, vol. 33, Oct. 1972, p. 472-478. Research supported by the Norges Teknisk-Naturvitenskapelige Forskningsrad and PHS.

The possibility of developing a continuum model for lung tissue and the advantages of doing so are demonstrated. A continuum description of a network of springs is derived in order to show that a continuum analysis can be used even though the conceptual or physical model consists of a network of discrete elements. One the material description has been obtained, the methods of continuum mechanics can be used to solve boundary condition problems. Some particular problems are described in order to show that this analysis produces solutions in which the results of the complicated interactions within the material are summarized simply, and the dependence of the solution on the parameters of the network and loading geometry is given explicitly. The results are representative of the behavior of the lung in the same way that the spring network on which the analysis is based is representative of the lung parenchyma. F.R.L.

**A73-10169** A physical model of expiration. J. Pardaens, K. P. van de Woestijne, and J. Clément (Akademisch Ziekenhuis St. Rafaël, Louvain, Belgium). *Journal of Applied Physiology*, vol. 33, Oct. 1972, p. 479-490. 36 refs. Research supported by the Fonds voor Wetenschappelijk Geneeskundig Onderzoek.

A model is presented, simulating the pressure-flow-volume relationships during expiration. Using data available in the literature for the physics of the gases and for the anatomy and physiology of the lungs and bronchial tree, we were able to reproduce satisfactorily

the shape of the isovolume pressure-flow and maximum expiratory flow-volume curves, the airways resistance-volume relationship, the location and movements of the equal pressure point, the partitioning of upstream resistance, and the influence of changes in gas density and viscosity. (Author)

**A73-10170** What mediates the renal vascular response to a salt load in normal man. N. K. Hollenberg, D. F. Adams, H. S. Solomon, H. L. Abrams, and J. P. Merrill (Peter Bent Brigham Hospital; Harvard University, Boston, Mass.). *Journal of Applied Physiology*, vol. 33, Oct. 1972, p. 491-495. 32 refs. Research supported by the John A. Hartford Foundation; Contract No. DA-49-193-MD-2497; Grants No. NIH-HE-11668; No. NIH-S01-FL-05489-01; No. NIH-7-R01-HE-05832; No. NIH-SM-01-FR-31-09.

Exploration of the time course of renal vascular responses to a saline infusion in normal man after balance is achieved on a low-salt diet. The results obtained are not consistent with current concepts concerning the character of renal vascular responses to salt restriction. Neither direct changes in the cardiovascular state, in the sympathetic nervous system activity, in the renin-angiotensin system, in the tubular sodium load, nor in blood viscosity can account for the response. Additional factors must be postulated. It is also clear that changes in renal hemodynamics are not responsible for the early natriuresis which follows a saline load. M.V.E.

**A73-10171** Oxygen uptake during swimming in man. I. Holmer (Gymnastik- och Idrottshögskolan, Stockholm, Sweden). *Journal of Applied Physiology*, vol. 33, Oct. 1972, p. 502-509. 24 refs. Research supported by the Swedish National Association against Heart and Chest Diseases and Swedish Sports Federation.

A swimming flume, a kind of swimming treadmill, was used to determine oxygen uptake during swimming at different speeds and different styles. Oxygen uptake during swimming was analyzed with regard to body composition and the degree of swimming training, and oxygen uptake, heart rate, and pulmonary ventilation in swimming were compared with similar data obtained in running and cycling. At a given swimming speed the trained swimmers were able to swim with a much lower oxygen uptake than subjects who were not trained swimmers. The front crawl proved to be the most economical style. Maximal oxygen uptake, maximal pulmonary ventilation, and maximal heart rate were significantly lower in swimming than in running or cycling, respectively. F.R.L.

**A73-10172** A system for continuous measurement of gas exchange and respiratory functions. J. L. Spencer, B. A. Zikria, J. M. Kinney, J. R. Broell, T. M. Michailoff, and A. B. Lee (Columbia University, New York, N.Y.). *Journal of Applied Physiology*, vol. 33, Oct. 1972, p. 523-528. 8 refs. Research supported by the John A. Hartford Foundation; Grant No. NIH-GM-14546; Contract No. DA-49-193-MD-2552.

An experimental system is described for the study of normal subjects and acutely ill patients which makes possible long runs, the collection of data free from artifacts, physiological or psychological, due to the use of a mask or mouthpiece, the determination of the time of occurrence, tidal volume, and duration of each breath, and the measurement of the rates of oxygen intake and carbon dioxide excretion with a short response time. The system is based on a rigid head canopy and neck seal, the canopy being ventilated by an airstream which passes to continuous carbon dioxide and oxygen analyzers. A spirometer connected to the canopy provides a breath-by-breath record of lung volume changes. F.R.L.

**A73-10173** A linear motion generator for physiological research. W. M. Caldwell and J. B. Hatcher (West Virginia University, Morgantown, W. Va.). *Journal of Applied Physiology*, vol. 33, Oct. 1972, p. 532-535. 5 refs. Research supported by the West Virginia Heart Association; Grant No. NIH-5-S01-FR-05433.

A positioning servomechanism employing a large loudspeaker actuator to generate 5 kg of force over a 3-cm range is described. The electronic control and power amplifier system is constructed from inexpensive operational amplifiers. Unity feedback of the output shaft position is provided by either capacitive or resistive linear transducers of simple design. The mechanical output is proportional to an external input driving signal which may be a periodic waveform or fixed dc level. Maximum frequency response reaches 80 Hz at 0.5 cm. The system is useful in many areas of physiological research for stretching muscles, generating airflows or pressure, and testing transducers. (Author)

**A73-10249 \*** Evolution from amino acids - Lunar occurrence of their precursors. S. W. Fox (Miami University, Coral Gables, Fla.). *New York Academy of Sciences, Annals*, vol. 194, May 3, 1972, p. 71-85. 21 refs. Grant No. NGR-10-007-008; Contract No. NAS9-8101.

Review of the present state of experimentally based concepts of organic evolution from amino acids. Earlier studies of the synthesis of amino acid precursors from meteoritic material, lunar dust, and terrestrial lava are briefly summarized, and laboratory experiments in which polymers of amino acids were obtained either by direct heating of dry amino acids or by heating aqueous solutions of mixtures of amino acids are described. In particular, a process is described by which alpha-amino acids were made to react to form linear chains of proteinoids. It is concluded that a proteinoid microsystem was a common ancestor of all life on earth. A.B.K.

**A73-10323** A method for aiding human operator performance in a noncompensatory tracking task. V. Gourishankar (Alberta University, Edmonton, Alberta, Canada) and L. E. Peppard (Queen's University, Kingston, Ontario, Canada). *IEEE Transactions on Systems, Man, and Cybernetics*, vol. SMC-2, Nov. 1972, p. 670-674. 10 refs. Research supported by the National Research Council of Canada.

A method is proposed for aiding the human operator performing a noncompensatory tracking task. The method involves the display of information to the operator about his performance as compared with an automatic optimal controller performing the same task. Only a computer simulation of the automatic system is required. The method is applied to a simulated vehicle-following experiment and the results show that the method enables the human operator to perform effectively by providing him with an optimal reference. (Author)

**A73-10324** Serial segments method for measuring remnant. R. E. Magdaleno (Systems Technology, Inc., Hawthorne, Calif.). *IEEE Transactions on Systems, Man, and Cybernetics*, vol. SMC-2, Nov. 1972, p. 674-678. 8 refs.

The serial segment method is described for measuring remnant power spectral density in a frequency band centered on each sine wave for the case where each sine wave has at least four times an integer number of cycles per run length. This method can be implemented on digital, hybrid, or analog Fourier coefficient analyzers. M.V.E.

**A73-10350** Observers detecting a signal in two multiple observation tasks. J. Gaussin. *Acta Psychologica*, vol. 36, Sept. 1972, p. 253-274. 22 refs.

Performance improvement in sensory detection tasks is investigated when the number of observations increases, and the validity of the predictions of the signal detection theory (SDT) is tested against a high threshold and a low threshold for two kinds of unusual tasks. In the first, the detection of the signal uses the central level of information processing. In the second, the lack of information originates in the stimulus itself rather than in the limitations of the sensory organs. The observation is repeated a fixed number of times for the two tasks, and the observed integration of successive

information is compared with predictions derived from the SDT and from threshold theories. All results strongly support the SDT. F.R.L.

**A73-10408 \*** Brain serotonin content - Physiological regulation by plasma neutral amino acids. J. D. Fernstrom and R. J. Wurtman (MIT, Cambridge, Mass.). *Science*, vol. 178, Oct. 27, 1972, p. 414-416. 15 refs. Research supported by the John A. Hartford Foundation; Grant No. NGR-22-009-627.

**A73-10409 #** Contribution of polysynaptic pathways to the tonic vibration reflex. K. Kanda (Chiba University, Chiba, Japan). *Japanese Journal of Physiology*, vol. 22, Aug. 1972, p. 367-377. 30 refs.

The tonic vibration reflex (TVR) and the monosynaptic reflex (MSR), due to muscle vibration or muscle nerve electric stimulation, were recorded on the ventral root filament in spinal and decerebrate preparations of 20 cats immobilized in part with gallamine triethiodide. The effect of tetanization of synergist and contralateral sural nerves on the reflexes was studied, and the TVR was compared with the MSR under thiopental anesthesia. Tetanization of the synergist nerve resulted in a brief TVR potentiation in both decerebrated and spinal preparations, while tetanization of the contralateral sural nerve potentiated the TVR only in decerebrate preparations. Small doses of thiopental sodium strongly suppressed the TVR and stimulated the MSR. An important role of the polysynaptic pathway through G1a activation in the generation of the TVR is inferred from these results. V.Z.

**A73-10410 #** Preferred spike intervals in the vibration reflex. S. Homma, K. Kanda, and S. Watanabe (Chiba University, Chiba, Japan). *Japanese Journal of Physiology*, vol. 22, Aug. 1972, p. 421-432. 25 refs. Research supported by the Ministry of Education of Japan.

Investigation of the tonic activation of the soleus motoneuron by vibration in decerebrated cats, showing the occurrence of both peripheral EMG spikes and ventral root unit discharges at intervals corresponding to some cyclic time multiples of vibrations. A formula for the ratio of vibration input-to-ventral root spike output frequencies is derived on the basis of the results. The properties of the interval histograms of the soleus EMG and motoneuron spikes are discussed. Proprioceptive, supraspinal, and contralateral facilitation shortened the intervals between motoneuronal discharges during vibrations as the value of this ratio decreased. V.Z.

**A73-10435** Some differences among figural aftereffects, apparent motion, and paracontrast. R. B. Howard (Columbia University, Hamilton, N.Y.). *Perception and Psychophysics*, vol. 12, no. 4, Oct. 1972, p. 327-332. 27 refs. Research supported by the Colgate Research Council and Sloan Foundation.

It has been suggested that figural aftereffects, apparent motion, and paracontrast may be produced by very similar or equivalent processes. The empirical functions relating figural aftereffect to the duration of the inspection figure and the interfigural distance are significantly different from the corresponding apparent motion and paracontrast functions. The functions relating paracontrast to the interstimulus interval are significantly different from the corresponding figural-aftereffect and apparent-motion functions. Thus, it is unlikely that the processes underlying the three phenomena are the same. Researchers who attempt to study feature analyzers in the human visual system should consider using more than one dependent variable, since none of the three phenomena contains all of the available information. Within-Ss designs should be avoided because a strong response bias exists between figural-aftereffect and apparent-motion tasks. (Author)

**A73-10436** Effects of signal duration and masker duration on detectability under diotic and dichotic listening conditions. D. E. Robinson (Indiana University, Bloomington, Ind.) and C. Trahiotis

(Illinois, University, Champaign, Ill.). *Perception and Psychophysics*, vol. 12, no. 4, Oct. 1972, p. 333, 334. 7 refs.

**A73-10437**      **Extraretinal feedback and visual localization.**  
J. S. Monahan (Duke University, Durham, N.C.). *Perception and Psychophysics*, vol. 12, no. 4, Oct. 1972, p. 349-353. 16 refs. Grant No. PHS-5-S05-RR-07070.

The effect of saccades on visual localization was tested before, during, and after the eye movements. After saccades, localization errors were much less than the distance that the eyes had moved. It is argued that these results demonstrate that extraretinal feedback affects visual localization. The results also suggest that the feedback is related to acceleration rather than to position. Implications for inflow and outflow theories are discussed. (Author)

**A73-10449 \***      **A nonlinear analysis of pulsatile flow in arteries.** S. C. Ling and H. B. Atabek (Catholic University of America, Washington, D.C.). *Journal of Fluid Mechanics*, vol. 55, Oct. 10, 1972, p. 493-511. 12 refs. Grants No. PHS-HE-12083-04; No. NGL-09-005-067.

An approximate numerical method for calculating flow profiles in arteries is developed. The theory takes into account the nonlinear terms of the Navier-Stokes equations as well as the nonlinear behaviour and large deformations of the arterial wall. Through the locally measured values of the pressure, pressure gradient, and pressure-radius function, the velocity distribution and wall shear at a given location along the artery can be determined. The computed results agree well with the corresponding experimental data. (Author)

**A73-10549 #**      **Left ventricular receptors activated by severe asphyxia and by coronary artery occlusion.** P. Thoren (Goteborg, University, Goteborg, Sweden). *Acta Physiologica Scandinavica*, vol. 85, Aug. 1972, p. 455-463. 29 refs. Research supported by the University of Goteborg; Swedish Medical Research Council Grant No. B70-14X-644.

The activity in unmyelinated afferents from left ventricular receptors was examined in cats during brief general asphyxia and during transient occlusion of one coronary artery. After 40 to 70 sec of asphyxia the receptors increased their activity. The firing initially displayed a cardiac rhythm, but became continuous when the asphyxia was prolonged and intensified. This increased activity was closely related to a mechanical distension of the left ventricle when the nutritional supply was compromised, suggesting a mechano-receptor rather than a chemoreceptor function of the receptors.

F.R.L.

**A73-10625 \***      **Studies of the electron transport chain of extremely halophilic bacteria. VIII - Respiration-dependent detergent dissolution of cell envelopes.** J. K. Lanyi (NASA, Ames Research Center, Biological Adaptation Branch, Moffett Field, Calif.). *Biochimica et Biophysica Acta*, vol. 282, 1972, p. 439-446. 17 refs.

**A73-10651 #**      **Models of brain activity (O modeliakh deiatel'nosti mozga).** K. A. Ivanov-Muromskii. *Kibernetika i Vychislitel'naia Tekhnika*, no. 14, 1972, p. 4-8. 22 refs. In Russian.

General conclusions gained from theoretical and experimental research conducted in recent years on the simulation of brain functions are systematically surveyed to provide an overview of requirements and difficulties associated with the development of adequate models of the brain. Initial concepts regarding linear transfer of pulses from receptors to higher cortical centers have been greatly complicated by subsequent discoveries of nonspecific systems, forward-loop and feedback paths, hierarchical control structures, self-organizing systems, and other aspects of real brain

functions. A model satisfactorily reflecting the mechanisms of the brain should account for relations between diffuse and discrete components in structural organization, interaction among specific and nonspecific old and young systems, and the principles of hierarchy and reciprocity. T.M.

**A73-10652 #**      **Certain problems in modeling nerve networks (Nekotorye voprosy modelirovaniia nervnykh setei).** Iu. V. Paramonov. *Kibernetika i Vychislitel'naia Tekhnika*, no. 14, 1972, p. 11-16. 14 refs. In Russian.

The nervous system is schematically described from the viewpoint of mechanisms participating in intracellular regulation and in interaction between the cell and the medium. It is stressed that the cellular activity should not be treated as a specific code; the coding properties have to be viewed in the light of the fact that a given activity represents the transient response of a self-adjusting automatic control system having a specified structure. The analysis of participating mechanisms is used to demonstrate the nonsingular nature of the process by which neurons convert input signals. T.M.

**A73-10653 #**      **Informational significance of neuron pulse activity (Informatsionnoe znachenie impul'snoi aktivnosti neuronov).** I. D. Ponomareva. *Kibernetika i Vychislitel'naia Tekhnika*, no. 14, 1972, p. 20-29. 27 refs. In Russian.

Survey of methods used to analyze the impulse activity of individual neuron units and the simultaneous impulse activity of several structural units (neurons). It is shown that the efficiency of corresponding methods of analysis can be substantially improved by employing large-scale automatic computer systems capable of direct on-line processing of the experimental data. Attention is given to histograms of temporal intervals, correlation analysis of temporal relationships, observation of the stationary characteristics of pulse sequences, and entropy concepts. T.M.

**A73-10654 #**      **Investigation of the edge vision contrast phenomenon using the null method (Issledovanie iavleniia kraevogo kontrasta zreniia s primeneniem nul'-metoda).** E. P. Putiatin and V. Ia. Serdiuchenko. *Kibernetika i Vychislitel'naia Tekhnika*, no. 14, 1972, p. 35-40. 5 refs. In Russian.

Experimental studies show that the parameter  $k$  which characterizes contour definition in human sight changes as a function of the brightness gradient at the boundary between the two fields of illumination. Higher brightness gradients correspond to lower values of  $k$  and to weaker contour definition. Conversely, the contour-definition mechanisms are most active at the low-contrast and 'noisy' portions of the image. The difference in the degree of contour definition at the dark and light portions of the brightness gradient increases with higher values of this gradient. T.M.

**A73-10655 #**      **Axiomatic formulation of a mathematical model for visual adaptation (Aksiomaticeskoe postroenie matematicheskoi modeli adaptatsii zreniia).** M. F. Bondarenko, E. P. Putiatin, and Iu. P. Shabanov-Kushnarenko. *Kibernetika i Vychislitel'naia Tekhnika*, no. 14, 1972, p. 40-49. 7 refs. In Russian.

Previous studies of visual-sensitivity responses evoked by sharp changes in the brightness of incident light proposed heuristic models of adaptation which qualitatively described different aspects of the visual adaptation process. The present study develops a mathematical model of visual adaptation based on five different axioms whose validity was confirmed experimentally in psychophysiological experiments employing the null method of measurement. The axioms describe additive, dimensional, and continuity properties of adaptation. T.M.

**A73-10656 #**      **Investigation of the recovery dynamics of the mimic muscle function and choice of an optimal bioelectric stimulation program with the aid of an electronic digital computer (Izuchenie dinamiki vosstanovleniia funktsii mimicheskikh myshts i**

vybor optimal'noi programmy bioelektricheskoi stimulatsii pri pomoshchi ETsVM). L. S. Aleev, S. A. Maiboroda, N. A. Maksimenko, and V. I. Nemish. *Kibernetika i Vychislitel'naia Tekhnika*, no. 14, 1972, p. 52-56. 9 refs. In Russian.

**A73-10657 #** Formalization of certain functional aspects of the external respiration system (Formalizatsiia nekotorykh aspektov funktsionirovaniia sistema vneshnego dykhaniia). V. I. Gaevskii. *Kibernetika i Vychislitel'naia Tekhnika*, no. 14, 1972, p. 56-64. 12 refs. In Russian.

Further development of existing closed-loop models of the external respiration system requires more detailed description of the characteristics of processes within the human organism. The present study employs heuristic modeling procedures to derive a formalized description of the operation of the external respiration system under conditions of thermal and physical stress, emotional disturbance, and restricted breathing. An attempt is made to provide a mathematical description and to construct an algorithm of the operation of a model system under the above conditions. T.M.

**A73-10658 #** Certain aspects of the bionic analysis and control of dynamic systems (Nekotorye aspekty bionicheskogo analiza i kontrolya dinamicheskikh sistem). A. D. Riabinin, A. M. Shkvar, A. I. Shevchenko, and L. I. Vainerman. *Kibernetika i Vychislitel'naia Tekhnika*, no. 14, 1972, p. 66-70. 5 refs. In Russian.

A proposed method of identifying dynamic system parameters is based on the bionics principle of determining coefficients of polynomials approximating the system input and output functions. The method may be employed for (1) identification of the transfer-function parameters of a dynamic system, (2) real-time indirect control of the functional state of the system, and (3) diagnostic purposes. T.M.

**A73-10659 #** Mathematical description of certain properties of human sensitivity to vibration (Matematicheskoe opisaniie nekotorykh svoistv vibratsionnoi chuvstvitel'nosti cheloveka). Iu. P. Shabanov-Kushnarenko, M. F. Bondarenko, and V. V. Tishchenko. *Kibernetika i Vychislitel'naia Tekhnika*, no. 14, 1972, p. 70-74. In Russian.

**A73-10660 #** Automated system of storing and processing vectorcardiograms (Avtomatizirovannaia sistema khraneniia i pererabotki vektorkardiogramm). A. A. Popov, V. P. Starchik, M. A. Chekailo, V. A. Shul'ga, V. N. Shchitko, and V. M. Ianenko. *Kibernetika i Vychislitel'naia Tekhnika*, no. 14, 1972, p. 82-86. 11 refs. In Russian.

Description of addressing, storage, retrieval, and sorting routines used in a computerized system of processing vectorcardiogram data for analysis and diagnosis of cardiovascular activity. Vectorcardiogram parameters are entered on addressed punch cards containing additional information on the medical case history of the patient. Continuing experiments provide relevant conclusions on the significance of particular parameters for diagnostic purposes. T.M.

**A73-10661 #** Nonlinear method of analyzing electroencephalograms (Nelineinyi metod analiza elektroentsefalogramm). S. N. Zharovskii, L. S. Aleev, and I. N. Tauber. *Kibernetika i Vychislitel'naia Tekhnika*, no. 14, 1972, p. 101-105. 12 refs. In Russian.

The proposed method of deriving useful information from the complex EEG curve accounts not only for the amplitude and spectral characteristics of individual structural components of the curve but also for the nonlinear interaction (modulation effects) among these components. A computer algorithm is described which provides the extremal points and the averaged characteristics of component waveforms in the overall EEG pattern. T.M.

**A73-10662 #** Complex processing of discrete biological information (Kompleksnaia obrabotka diskretnoi bioinformatsii). Iu. G. Pilipenko. *Kibernetika i Vychislitel'naia Tekhnika*, no. 14, 1972,

p. 108-111. 5 refs. In Russian.

Description of a program for processing biomedical data recorded in digital form on a medium suitable for direct input to a digital computer. In experiments involving neuron unit activity, the initial data were recorded in two monitor channels, and the processing included construction of autocorrelation functions and histograms for intervals between pulses in each individual channel and in both channels simultaneously. The autocorrelation function of pulse intervals is useful in detecting cyclic relationships governing neuron impulsion, while histograms can yield conclusions relative to the informative significance of the pulse interval (e.g. difference between the histogram and the Poisson distribution). T.M.

**A73-10663 #** Recorder of a prescribed number of pulses (Otmetchik zadannogo chisla impulsov). G. V. Tsepkov. *Kibernetika i Vychislitel'naia Tekhnika*, no. 14, 1972, p. 112-115. 5 refs. In Russian.

Description of a recorder which performs automatic counts of needed numbers of pulses from 1 through 100,000. A pulse mark appears at the recorder output when the assigned number of pulses is reached. A block diagram and the principal circuit of the recorder are given. The operation of its subunits is discussed. Possible laboratory and clinical applications of the recorder are indicated. V.Z.

**A73-10771** Influence of observing strategies and stimulus variables on watchkeeping performances. G. D. Coates, M. Loeb, and E. A. Alluisi (Louisville, University, Louisville, Ky.). *Ergonomics*, vol. 15, July 1972, p. 379-386. 14 refs. Grant No. DAHC19-69-C-0009; Contract No. DA-49-193-MD-2567. Project THEMIS.

Experiments were performed to determine whether an observing strategy of gazing straight ahead or scanning the visual field is superior when subject's task involved reacting rapidly to readily observed onsets or offsets of a coloured light. A subsidiary goal of the experiments was to resolve conflicting results of past experiments as to the effects of colour, position, and onset or offset of signal light. The experiments clearly indicated that a strategy of gazing ahead is superior for this kind of signal, but results were still equivocal regarding the other effects. (Author)

**A73-10772** Changes in the vibratory sensation threshold after exposure to powerful vibration. N. Bjerker, B. Kylin, and I.-M. Lidstrom (Arbetsmedicinska Institutet, Stockholm, Sweden). *Ergonomics*, vol. 15, July 1972, p. 399-406. 8 refs.

A reliable method for determining the threshold of vibratory sensation is described. In a preliminary study of temporary shifts of the threshold after stimulation with intense sinusoidal vibration the recovery from this shift was found to vary linearly with the logarithm of time. In this respect the shift of the threshold of vibratory sensation resembles that of hearing obtained on exposure to noise. (Author)

**A73-10773** Angular measurements of foot motion for application to the design of foot-pedals. E. Nowak (Instytut Wzornictwa Przemyslowego, Warsaw, Poland). *Ergonomics*, vol. 15, July 1972, p. 407-415.

Description of a mechanical system for measuring foot motions in the development of foot pedal designs satisfying the requirements of anthropology and anatomy. The system consists of an upholstered chair, an arm for leg position stabilization, and a circular device with a lever for foot bending and straightening. The performance characteristics of this system are discussed. V.Z.

**A73-10774** Effect of eccentric and concentric muscle conditioning on tension and electrical activity of human muscle. P. V. Komi and E. R. Buskirk (Pennsylvania State University, University Park, Pa.). *Ergonomics*, vol. 15, July 1972, p. 417-434. 25 refs.

The effects of seven weeks of eccentric or concentric muscle conditioning on muscle tension and integrated electrical activity

(IEMG) were investigated on human subjects by using a special electrical dynamometer as a testing and training apparatus. The eccentric conditioning caused, on the average, a greater improvement in muscle tension than did the concentric conditioning. In early conditioning those in the eccentric group experienced soreness in their exercised muscles. This caused a concomitant drop in maximum strength. After the disappearance of pain symptoms, ability to develop tension increased in a linear fashion. Neither method was able to cause statistically significant changes in the maximum IEMG associated with any type of muscle contraction. (Author)

**A73-10827 \* # Loudness enhancement following contralateral stimulation.** R. Galambos, J. Bauer, T. Picton, K. Squires, and N. Squires (California, University, La Jolla, Calif.). *Acoustical Society of America, Journal*, vol. 52, Oct. 1972, pt. 2, p. 1127-1130. 13 refs. Grants No. NGR-05-009-083; No. NIH-NS-07454.

The apparent loudness of a tone pip can be increased by 15 dB or more if it is preceded by a tone burst to the contralateral ear. The experiment is done by delaying the pip, S1, by a variable time, Delta-T, after the offset of a contralateral tone; the listener assesses the loudness of S1 by adjusting the intensity of a second tone pip, S2, that follows S1 by 1500 msec. Some parametric explorations of the phenomenon are reported here. (Author)

**A73-10828 # Study of the acoustic reflex in human beings. I - Dynamic characteristics.** I. J. Hung and P. Dallos (Northwestern University, Evanston, Ill.). *Acoustical Society of America, Journal*, vol. 52, Oct. 1972, pt. 2, p. 1168-1180. 18 refs. Grant No. NIH-5-T01-GM-0087.

**A73-10829 \* # An earphone coupling system for acute physiological studies.** A. Barnebey, D. C. Nagel (California, University, Los Angeles; NASA, Ames Research Center, Machine Integration Branch, Moffett Field, Calif.), and E. C. Carterette (California, University, Los Angeles, Calif.). *Acoustical Society of America, Journal*, vol. 52, Oct. 1972, pt. 2, p. 1256-1262. 15 refs. Grant No. PHS-MH-07809.

**A73-10973 A study of basilar membrane vibrations. I - Fuzziness-detection: A new method for the analysis of microvibrations with laser light.** L. U. E. Kohlloffel (Birmingham, University, Birmingham, England). *Acustica*, vol. 27, Aug. 1972, p. 49-65. 15 refs. Research supported by the Science Research Council.

**A73-11008 # On the causes of the changes of the second heart sound in left bundle branch block.** A. A. Luisada (University of Health Sciences, Chicago, Ill.), S. Kumar (West Side Veterans Administration Hospital, Chicago, Ill.), and M. J. Pouget (Illinois, University, Chicago, Ill.). *Japanese Heart Journal*, vol. 13, July 1972, p. 281-294. 12 refs.

Right and left cardiac catheterization and phonocardiography were performed on 10 subjects with normal hearts and on 11 patients with complete left bundle branch block (LBBB). The onset of ventricular contraction was delayed in all cases of LBBB. The isovolumic period of the LV was prolonged for either ventricle or only for the left one. Individual cases showed either delayed LV contraction or delayed biventricular prolongation. The timing of the aortic and pulmonary incisuras and that of healthy components were found to be affected by peripheral factors. V.Z.

**A73-11010 Microvascular responses to alterations in oxygen tension.** B. R. Duling (Virginia, University, Charlottesville, Va.). *Circulation Research*, vol. 31, Oct. 1972, p. 481-489. 23 refs. Grant No. PHS-HE-12792.

Attempt to clarify the relation between oxygen partial pressure and vascular smooth muscle contraction in the microcirculation during alterations in the diffusion gradient for oxygen. The data obtained indicate that the microvascular responses to changes in

suffusion solution oxygen partial pressure cannot be entirely attributed to a direct action of oxygen on vascular smooth muscle.

A.B.K.

**A73-11012 Operating a head-up display.** M. F. von Wieser (Douglas Aircraft Co., Long Beach, Calif.). *Shell Aviation News*, no. 411, 1972, p. 14-19. 6 refs.

Data accumulated by a qualified pilot during actual operation of a Nabisco Executive Jet Falcon, using a head-up display are discussed. The functional aspects of the system are demonstrated by motion pictures taken during a low-visibility runway approach. The objective of the test program was to adapt the system to all applicable modes of commercial flight operations by the pilot and the scientist, working as a team. V.P.

**A73-11023 # Current views on the mechanism of the quantum-induced liberation of a mediator from the motor nerve endings of a skeletal muscle (Sovremennye predstavleniia o mekhanizme kvantovogo osvobozhdeniia mediatora iz motornykh nervnykh okonchaniia skeletnoi myshtsy).** M. A. Kamenskaia (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR). *Uspekhi Fiziologicheskikh Nauk*, vol. 3, July-Sept. 1972, p. 22-63. 231 refs. In Russian.

**A73-11024 # Structural organization and electrophysiological properties of the intercentral functional systems of the hypothalamic region of the brain (Strukturalnaia organizatsiia i elektrofiziologicheskie svoistva mezhtsentral'nykh funktsional'nykh sistem gipotalamicheskoi oblasti mozga).** G. P. Krachun (Akademiia Nauk Moldavskoi SSR, Kishinev, Moldavian SSR). *Uspekhi Fiziologicheskikh Nauk*, vol. 3, July-Sept. 1972, p. 87-111. 212 refs. In Russian.

**A73-11025 # Some aspects of the participation of the neostriatum in behavior regulation (Nekotorye aspekty uchastia neostriatuma v regulatsii povedeniia).** E. B. Arushanian (Chitinskii Meditsinskii Institut, Chita, USSR). *Uspekhi Fiziologicheskikh Nauk*, vol. 3, July-Sept. 1972, p. 112-130. 191 refs. In Russian.

Review of studies dealing with the role of the nucleus caudatus and its shell in the organization of certain forms of behavior. It is pointed out that control of behavior by the striatum is realized through well developed inhibitive mechanisms. The characteristic features of the activity of these mechanisms are suppressive reactions, evoked sleep and a specific type of inhibition. The neostriatum is also found to participate in the development of classical conditioned and instrumental reflexes. Other possible neurophysiological mechanisms through which the neostriatum could control behavior are considered. V.Z.

**A73-11052 # Contribution to the study of anthropomorphic systems.** M. Vukobratovic (Institut Mihailo Pupin za Automatizaciju i Telekomunikaciju, Belgrade, Yugoslavia). *Kybernetika*, vol. 8, no. 5, 1972, p. 404-418. 9 refs.

The dynamics and stability of anthropomorphic systems are discussed with particular attention to the minimization of the degrees of freedom by reducing the dimensionality of skeletal activity models used in the synthesis of such systems. The topics also include synergy, generation, synthetic gait algorithms, mechanical biped models, and gait trajectories of such models with fixed upper extremities. A mathematical basis is given for stabilization of artificial anthropomorphic systems. V.Z.

**A73-11080 # Some dactyloscopic indications of congenital vitium cordis (Nekotorye daktiloskopicheskie pokazateli pri vrozhdennykh porokakh serdtsa).** V. I. Fufin and A. I. Khirseli (Mini-

sterstvo Zdravookhraneniia Gruzinskoi SSR, Institut Eksperimental'noi i Klinicheskoi Khirurgii, Georgian SSR). *Akademiia Nauk Gruzinskoi SSR, Soobshcheniia*, vol. 67, Sept. 1972, p. 673-676. 12 refs. In Russian.

A dactyloscopic study was conducted on 69 patients with various types of congenital vitium cordis, and the results were compared with those for 32 healthy persons. A relation between the incidence of certain fingerprint patterns and certain specific types of vitium cordis is shown to exist in the patients. The Henry system was used for fingerprint classification. V.Z.

**A73-11081 #** Structural change in the paradoxical phase of sleep due to the stimulation of the reticular formation and hypothalamus on a background of deep slow sleep (Izmenenie struktury paradoksal'noi fazy sna pod vlianiem razdrasheniia retikulirnoi formatsii i gipotalamusa na fone glubokogo medlennogo sna). T. N. Oniani and M. G. Kavkasidze (Akademiia Nauk Gruzinskoi SSR, Institut Fiziologii, Tiflis, Georgian SSR). *Akademiia Nauk Gruzinskoi SSR, Soobshcheniia*, vol. 67, Sept. 1972, p. 685-688. 6 refs. In Russian.

**A73-11082 #** Changes of the free radical concentration in the cerebral cortex depending on the functional state of the cerebrum (Izmenenie kontsentratsii svobodnykh radikalov v kore bol'shikh polusharii v zavisimosti ot funktsional'nogo sostoiianiia mozga). R. A. Kopaladze, A. F. Semiokhina, O. R. Kol's, and Iu. P. Kozlov (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR). *Akademiia Nauk Gruzinskoi SSR, Soobshcheniia*, vol. 67, Sept. 1972, p. 693-696. 10 refs. In Russian.

**A73-11100 \*** Effects of endotoxin on monoamine metabolism in the rat. L. A. Pohorecky, R. J. Wurtman, D. Taam, and J. Fine (MIT, Cambridge; Boston City Hospital, Boston, Mass.). *Society for Experimental Biology and Medicine, Proceedings*, vol. 140, July 1972, p. 739-746. 23 refs. Army-supported research; Grants No. PHS-AM-11237; No. PHS-HE-02014; No. NGR-22-009-627.

Examination of effects of administered endotoxin on catecholamine metabolism in the rat brain, sympathetic neurons, and adrenal medulla. It is found that endotoxin, administered intraperitoneally, lowers the norepinephrine content in peripheral sympathetic neurons and the brain, and the catecholamine content in the adrenal medulla. It also accelerates the disappearance of H<sub>3</sub>-norepinephrine from all these tissues. It is therefore suggested that the effects of endotoxin on body temperature may be mediated in part by central non-adrenergic neurons. A.B.K.

**A73-11209 \*** Gravity selection by animals in fields of centrifugal acceleration superimposed on weightlessness during sounding rocket flights. K. O. Lange (Kentucky University, Lexington, Ky.) and R. E. Belleville (NASA, Office of Life Sciences, Washington, D.C.). In: *International Symposium on Space Technology and Science*, 9th, Tokyo, Japan, May 17-22, 1971; Proceedings. AGNE Publishing, Inc., 1971, p. 1109-1122. 9 refs. Grant No. NGL-18-001-003.

**A73-11210** Studies of blood gas analysis at abnormal environment. T. Kuyama (Kyoto University, Kyoto, Japan). In: *International Symposium on Space Technology and Science*, 9th, Tokyo, Japan, May 17-22, 1971, Proceedings. Tokyo, AGNE Publishing, Inc., 1971, p. 1123-1134.

The relationship between oxygen constriction of vessels and the sympathetic nervous system is examined on the basis of results of hyperoxic exposure of both human subjects and experimental animals. It was observed that any procedure of sympathetic block reduces the degree of oxygen vasoconstriction. It is assumed that the pH of blood influences cerebral vasoconstriction related with the determination of the partial oxygen pressure of cerebrospinal fluid. Alkalosis of venous blood is always observed when breathing of oxygen continues for a prolonged period. Partial nitrogen pressure and ambient pressure are independent of the vasoconstriction or diameter of vessels in legs. (Author)

**A73-11211** Electromyographic study on human standing posture in experimental hypogavic state. G. Mitarai, T. Mano, S. Mori, and H. Jijiwa (Nagoya University, Nagoya, Japan). In: *International Symposium on Space Technology and Science*, 9th, Tokyo, Japan, May 17-22, 1971; Proceedings. Tokyo, AGNE Publishing, Inc., 1971, p. 1135-1142. 17 refs.

**A73-11238** Pilot incapacitation. G. Bennett (Civil Aviation Authority, London, England). *Flight International*, vol. 102, Oct. 26, 1972, p. 569-571.

Discussion of the incidence, causes, consequences, and prevention of pilot incapacitation. Though rather uncommon as a cause of accidents, incapacitation is nevertheless important because small reductions in accident risks are increasingly important as aircraft size increases. The leading cause of loss of license among UK professional pilots is shown to be cardiovascular disease. This is attributed to the relatively high number of pilots in the 40-55 age group when they are most susceptible to high blood pressure and coronary disease. Advances in pilot examination techniques are reviewed. M.V.E.

**A73-11444 #** Y-chromosome localization in the interphase nuclei of cerebral neurons in man (Lokalizatsiia Y-khromosom v interfaznykh iadrakh neironov golovnogo mozga cheloveka). L. I. Gol'dgefter, N. Ia. Gakhov, and A. N. Mosolov (Novosibirskii Gosudarstvennyi Meditsinskii Institut, Novosibirsk, USSR). *Akademiia Nauk SSSR, Doklady*, vol. 206, Sept. 11, 1972, p. 470, 471. 5 refs. In Russian.

The location of Y-chromosomes is determined by luminescent microscopy in tissue samples from the brain and hypothalamus of two women and four men who died 6 to 24 hr before sample excision. Association of the luminescent portions of Y chromosomes with interphase nuclei is established with quinacrine dihydrochloride used for dyeing. V.Z.

**A73-11445 #** Stable frequency and synchronicity alterations in the discharges of cortical neuron populations in feedback experiments (Ustoichivye izmeneniia chastoty i sinkhronnosti razriadov korkovykh neironnykh populiatsii v eksperimentakh s obratnoi sviaz'iu). N. N. Vasilevskii, N. B. Suvorov, and V. V. Trubachev (Akademiia Meditsinskikh Nauk SSSR, Leningrad, USSR). *Akademiia Nauk SSSR, Doklady*, vol. 206, Sept. 11, 1972, p. 510-512. In Russian.

**A73-11464** Digital filters applicable to electroencephalographic pattern recognition. W. P. Wilson (Duke University, Durham, N.C.) and A. O. Bishop, Jr. (Tennessee University, Knoxville, Tenn.). In: *Information processing 71; Proceedings of the Congress, Ljubljana, Yugoslavia, August 23-28, 1971, Volume 2*. Amsterdam, North-Holland Publishing Co., 1972, p. 1543-1546.

Research currently in progress in the analysis of the electroencephalogram (EEG) is being directed toward a more efficient technique of extracting pertinent information from the waveform in real time. The use of a certain class of digital filters and sampling each filter for discrete overlapping intervals indicate that on-line EEG analysis may be practical on the small minicomputer. This communication describes the set of orthogonal functions which are implemented in the Generalized Fourier Technique to construct a series of frequency and energy sensitive digital filters. The numerical technique for programming the filters is outlined as is the pattern classification technique. Application of this type of filter to EEG signal waveforms is discussed. (Author)

**A73-11465** Computation of solutions to the inverse problem of electrocardiography. H. S. Schloss (Southern California University, Los Angeles, Calif.). In: *Information processing 71; Proceedings of the Congress, Ljubljana, Yugoslavia, August 23-28, 1971, Volume 2*. Amsterdam, North-Holland Publishing Co., 1972, p. 1547-1551.

Studies dealing with this inverse problem are reviewed, including the author's recent stochastic identification approach to the solution of it. The difficulties inherent in this and other approaches are noted, in particular those encountered when attempting to relate ECG's to physiological condition of the myocardium by Fourier analysis. The computational algorithms used in computer programming when the stochastic method is applied to a physiological model are discussed.

V.Z.

**A73-11501** The role of the vagus nerves in the respiratory response to CO<sub>2</sub> under hyperoxic conditions. W. Wiemer and P. Kiwull (Ruhr-Universität, Bochum, West Germany). *Pflügers Archiv*, vol. 336, no. 2, 1972, p. 147-170. 60 refs. Deutsche Forschungsgemeinschaft Grant No. Wi-165.

The respiratory and circulatory responses to increased partial pressure of CO<sub>2</sub> in the inhaled air were investigated in anesthetized rabbits before and after inactivation of the vagus nerve, with intact or sectioned carotid sinus nerves. Vagal inactivation had only a slight effect on responses of blood pressure and heart rate to increased CO<sub>2</sub> pressure. It is concluded that vagal reflexes originated by pulmonary stretch receptors may have a modifying effect on the ventilatory efficacy of the chemosensitive mechanism of respiration in rabbits.

V.Z.

**A73-11502** The role of the carotid chemoreceptors in the CO<sub>2</sub>-hyperpnea under hyperoxia. P. Kiwull, W. Wiemer, and H. Schöne (Ruhr-Universität, Bochum, West Germany). *Pflügers Archiv*, vol. 336, no. 2, 1972, p. 171-186. 45 refs. Deutsche Forschungsgemeinschaft Grant No. Wi-165.

Investigation of the effect of inactivation of the carotid sinus nerves on the respiratory response to increased CO<sub>2</sub> partial pressure in the inhaled air in anesthetized rabbits with intact or cut vagi. It is concluded that the carotid chemoreceptors of rabbits do not contribute essentially to the steady state hyperpnea caused by hypercapnia under hyperoxic conditions.

V.Z.

**A73-11503** Responses of midbrain cells to blur. J. M. Lee and R. M. Hill (Ohio State University, Columbus, Ohio). *Pflügers Archiv*, vol. 336, no. 3, 1972, p. 213-216. 8 refs. PHS-supported research.

The effects of induced blur were studied on the response efficiencies of cells of the midbrain. Although a small minority of cells exhibited little change in response pattern with either hyperopic or myopic blur, the response efficiencies of most (some 86%) of the cells studied were markedly reduced, but often selectively - i.e., one trigger feature was more vulnerable than the others. (Author)

**A73-11504** The effect of O<sub>2</sub> breathing on maximal aerobic power. R. Margaria, E. Camporesi, P. Aghemo, and G. Sassi (Milano, Università, Milan, Italy). *Pflügers Archiv*, vol. 336, no. 3, 1972, p. 225-235. 17 refs. Research supported by the Consiglio Nazionale delle Ricerche.

Performance time, lactic acid concentration in blood, heart rate, and maximum oxygen consumption were measured in 11 subjects who inhaled air or oxygen while performing supramaximal exercises with O<sub>2</sub> requirements of 70 to 80 ml/kg to exhaustion. An indirect method was also used in maximum aerobic power tests on the subjects. Measured by direct and indirect methods, the maximum oxygen consumption was about 8 per cent higher during pure oxygen inhalation than during air inhalation, with correspondingly decreased lactic acid production rates in the blood. The heart rates in contrast were lower, and varied as a linear function of the work load, when pure oxygen was inhaled.

V.Z.

**A73-11505** Non-invasive technique for diagnosing atrial septal defect and assessing shunt volume using directional Doppler ultrasound - Correlations with phasic flow velocity patterns of the shunt. D. Kalmanson, C. Veyrat, C. Derai, C.-H. Savier, M. Berkman,

and P. Chiche (Fondation Ophtalmologique A. de Rothschild; Hôpital Tenon, Paris, France). *British Heart Journal*, vol. 34, Oct. 1972, p. 981-991. 24 refs. Translation.

**A73-11506** Atrioventricular block response to exercise and intraventricular conduction at rest. S. D. Mouloupoulos, J. Darsinos, and D. A. Sideris (Athens, National and Capodistrian University, Athens, Greece). *British Heart Journal*, vol. 34, Oct. 1972, p. 998-1004. 17 refs.

Sixty patients with atrioventricular block were exercised and monitored by a radioelectrocardiograph. Cases with a bundle-branch block QRS pattern at rest presented an improvement of atrioventricular conduction on exercise in 12.5%, no change in 43.8%, and an impairment in 43.8% of cases. Corresponding figures in cases with no intraventricular conduction defect were 61.4, 24.0, and 13.6% (P less than 0.001). Heart rate, neural tone, and myocardial ischemia in relation to the refractory period length and the localization of the lesion are considered as factors possibly accounting for the difference in response to exercise between the two groups. (Author)

**A73-11507** Q waves and coronary arteriography in cardiomyopathy. G. T. Gau, J. F. Goodwin, C. M. Oakley, E. G. J. Olsen, S. H. Rahimtoola, M. J. Raphael, and R. E. Steiner (Royal Postgraduate Medical School; Hammersmith Hospital, London, England). *British Heart Journal*, vol. 34, Oct. 1972, p. 1034-1041. 16 refs.

This study shows that the Q wave pattern on the electrocardiogram provides insufficient evidence for the diagnosis of ischemic heart disease. Apparent evidence of ischemic heart disease on the electrocardiogram was misleading in 6 out of 10 patients with congestive cardiomyopathy and in 3 of 8 patients with hypertrophic cardiomyopathy. With the increasing application of surgical techniques to patients with atheromatous coronary artery disease, coronary arteriography will undoubtedly assume an increasing role in the more precise delineation of these cases. (Author)

**A73-11508** Left ventricular end-diastolic pressures following selective coronary arteriography. D. Kavanagh-Gray (St. Paul's Hospital, Vancouver, British Columbia, Canada). *American Heart Journal*, vol. 84, Nov. 1972, p. 629-633. 20 refs.

Study of the changes in left ventricular end-diastolic pressures following angiography as performed on a group of 40 consecutive patients. Seven patients showed no rise in left ventricular end-diastolic pressure after angiography. Two patients with cardiomyopathy and 27 of 31 patients with coronary artery disease showed significant rises in end-diastolic pressure, proportional to the extent of the disease. (Author)

**A73-11509** The value of the ultrasonic Doppler method and apexcardiography as reference tracings in phonocardiography. J. B. Kostis (Philadelphia General Hospital, Philadelphia, Pa.), S. Gotzoyannis, E. Mavrogeorgis, G. Lee, and S. Bellet. *American Heart Journal*, vol. 84, Nov. 1972, p. 634-642. 21 refs. Research supported by the Foundation for Cardiovascular Research and Philadelphia General Hospital.

**A73-11586 #** Observations concerning the combined radiation-protective effect of pantothenic acid and aminoethylisothiuronium (Beobachtungen über die gemeinsame Strahlenschutzwirkung von Pantothensäure und Aminoäthylisothiuronium). T. Szegszardy, I. Gazdag (Szegedi Orvostudományi Egyetem, Szeged, Hungary), and I. Szorady (Städtisches Krankenhaus, Oroshaza; Städtisches Kinderkrankenhaus, Szeged, Hungary). *Radiobiologia - Radiotherapia*, vol. 13, no. 3, 1972, p. 375-378. 8 refs. In German.

An investigation with 180 mice was conducted to explore the possibility of an enhancement of the radiation-protective effects of aminoethylisothiuronium (AAeT) with the aid of a pantothenic acid (Ps) treatment. It was found that in the case of a radiation dose of

500 r the protective effect of AAeT and Ps+AAeT was the same. However, a previous treatment with Ps produced a pronounced increase in the protective effects of the AAeT in the case of an exposure to radiation of 800 r. G.R.

**A73-11659 # Operation of spacecraft in orbit with the aid of remote-controlled manipulators - A joint project of ERNA, KYBERTRONIC, KLERA (Wartung von Raumfahrzeugen im Orbit mit Hilfe von ferngesteuerten Manipulatoren - Ein Gemeinschaftsprojekt der ERNO, KYBERTRONIC, KLERA).** H. Kleinwächter and W. Wiens. *Deutsche Gesellschaft für Luft- und Raumfahrt, Jahrestagung, 5th, Berlin, West Germany, Oct. 4-6, 1972, Paper 72-098.9* p. 6 refs. In German.

Review of various versions of a synchronous telemanipulator system under development that consists of a slave and master. The slave is an antropomorphic machine, and the master is its remote human operator. Operation control is implemented by an exoskeleton, i.e., a light-weight coupling-link system strapped to the master's limbs in such a manner that it accurately duplicates every movement of the master's bone structure. These exoskeleton movements are converted into electric currents whose transmission to the slave actuates the latter's electromotive and/or pneumatic muscles in a way that makes the limbs of the antropomorphic slave precisely and synchronously duplicate the human master's limb movements. Visual and other sensory feedback provisions complement this system, whose application fields include atomic energy, space travel, and deep sea exploration. M.V.E.

**A73-11666 # Effectiveness studies regarding cockpit displays (Wirksamkeitsuntersuchungen von Anzeigen für die Flugführung).** R. Beyer (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Flugführung, Braunschweig, West Germany). *Deutsche Gesellschaft für Luft- und Raumfahrt, Jahrestagung, 5th, Berlin, West Germany, Oct. 4-6, 1972, Paper 72-097.27* p. 15 refs. In German.

A comparative evaluation of two forms of cockpit displays should take into account the control accuracy obtainable and the workload to which the pilot is subjected in following the indications of the displays in both cases. Factors to be considered for an assessment of cockpit displays include data for aircraft control, experimental-psychological data, physiological measurements, and subjective evaluations. The examples discussed show the complexity of the evaluation process for a given cockpit display. G.R.

**A73-11857 Aircraft fault isolation based on pattern of cockpit indications - A human factors approach.** A. A. Burrows and W. L. Miles (Douglas Aircraft Co., Long Beach, Calif.). *Aeronautical Journal*, vol. 76, Sept. 1972, p. 545-550.

**A73-11921 Human adaptability (Adaptatsiia cheloveka).** Edited by Z. I. Barbashova and I. I. Likhniiskaia. Leningrad, Izdatel'stvo Nauka, 1972. 268 p. In Russian.

Studies concerning the physiological adaptation of humans to high altitudes are given. The adaptation of high mountain aborigenes, the function of the hemocoagulation system at high altitudes, and the effect of high altitude on blood pH under strains are covered.

Individual items are announced in this issue. V.Z.

**A73-11922 # Physiological examination of man at the altitudes of Tian Shan and Pamir /a review/ (Fiziologicheskie issledovaniia cheloveka na vysoyakh Tian'-Shania i Pamira /obzor/).** M. M. Mirrakhimov (Kirgizskii Gosudarstvennyi Meditsinskii Institut, Frunze, Kirgiz SSR). In: Human adaptability. Leningrad, Izdatel'stvo Nauka, 1972, p. 94-111. 75 refs. In Russian.

The adaptation of man to high altitudes is discussed in a review of studies concerning the adaptation developed by mountain aborigenes in Tian Shan and Pamir. The topics include the influences of brief and prolonged stays at high altitudes on hemodynamic and pulmonary functions and tribal adaptation to high altitudes as the result of natural selection due to the severity of primitive life. V.Z.

**A73-11923 # High mountain areas and hemocoagulation (Vysokogor'e i gemokoaguliatsiia).** V. A. Isabaeva (Kirgizskii Gosudarstvennyi Meditsinskii Institut, Frunze, Kirgiz SSR). In: Human adaptability. Leningrad, Izdatel'stvo Nauka, 1972, p. 132-138. 7 refs. In Russian.

Investigation of the function of the hemocoagulation system in humans with residences at 760, 2020, 3600 and 4500 m above sea level. The effects of different altitudes on this function are discussed. Changes in hemocoagulation characteristics during adaptation to brief and lasting stays in high mountain areas are described, with particular attention to those in the tonus of the parasymphathetic nervous system. V.Z.

**A73-11924 # Hydrogen ion concentration in the blood of man under high mountain conditions with physical loads (Kontsentratsiia vodorodnykh ionov v krovi u liudei v usloviyakh vysokogor'ia pri fizicheskoi nagruzke).** V. V. Matsynin (Akademiia Nauk Ukrainskoi SSR, Institut Fiziologii, Kiev, Ukrainian SSR). In: Human adaptability. Leningrad, Izdatel'stvo Nauka, 1972, p. 152-155. 13 refs. In Russian.

Blood pH was determined in 12 male members of an expedition on Mount Elbrus before and after prolonged even-rate exercises on a pedaling training stand, during a step-wise adaptation process at altitudes from 3000 to 5621 m above sea level. Lower blood pH levels were established after exercises. V.Z.

**A73-11925 # Comparative evaluation of the general and specific efficiencies of athletes under normal barometric pressure and in the process of training and acclimatization under highland conditions of Pamir (Sravnitel'naia kharakteristika obshchei i spetsial'noi rabotosposobnosti u sportsmenov pri normal'nom barometricheskom davlenii i v protsesse trenirovki i akklimatizatsii v usloviyakh vysokogor'ia Pamira).** E. B. Gippenreiter, L. K. Romanova, R. I. Tikhvinskaia, and S. B. Tikhvinskii (Vsesoiuznyi Nauchno-Issledovatel'skii Institut Fizicheskoi Kul'tury, Moscow, USSR). In: Human adaptability. Leningrad, Izdatel'stvo Nauka, 1972, p. 241-249. 10 refs. In Russian.

**A73-11991 \* # Design principles for contamination abatement in scientific satellites.** R. J. Naumann (NASA, Marshall Space Flight Center, Space Sciences Laboratory, Huntsville, Ala.). *International Astronautical Federation, International Astronautical Congress, 23rd, Vienna, Austria, Oct. 8-15, 1972, Paper. 25* p. 10 refs.

It is shown that deposition of contamination films on satellite optics can be controlled by the following means: isolating critical optical surfaces from the rest of the spacecraft; avoiding or minimizing the use of nonmetallic material, particularly near or in line of sight of optical surfaces; avoiding materials with high vapor pressures; subjecting materials to vacuum baking prior to use, to drive off the volatile outgassing products; keeping the critical surfaces at temperatures above the ambient; avoiding elevated operational temperatures for nonmetallic materials; paying special attention to optics exposed to intense UV-, X-ray, or particular radiation; avoiding water-vapor sources; and directing RCS plumes away from critical surfaces. Methods of controlling particulate contaminants are also proposed. V.P.

**A73-11993 \* # Progress in the development of the reverse osmosis process for spacecraft wash water recovery.** J. N. Pecoraro (NASA, Washington, D.C.), H. E. Podall (U.S. Department of the Interior, Washington, D.C.), and J. M. Spurlock. *International Astronautical Federation, International Astronautical Congress, 23rd, Vienna, Austria, Oct. 8-15, 1972, Paper. 16* p.

Research work on ambient- and pasteurization-temperature reverse osmosis processes for wash water recovery in a spacecraft environment is reviewed, and the advantages and drawbacks of each are noted. A key requirement in each case is to provide a membrane of appropriate stability and semipermeability. Reverse osmosis systems intended for such use must also take into account the specific limitations and requirements imposed by the small volume of

water to be processed and the high water recovery desired. The incorporation of advanced high-temperature membranes into specially designed modules is discussed. V.P.

**A73-12076** Photopic luminosity measured by the method of critical frequency. M. H. Bornstein and L. E. Marks (Yale University; John B. Pierce Foundation Laboratory, New Haven, Conn.). *Vision Research*, vol. 12, Dec. 1972, p. 2023-2033. 26 refs. Grant No. AF-AFOSR-70-1950.

The study reported was conducted to investigate luminous efficiency determined by the method of critical frequency. Subjects adjusted the radiance of an intermittent light to produce just-detectable flicker for a constant rate of intermittence at each of a number of wavelengths. The relative radiances needed at different wavelengths provide a measure of luminous efficiency. The study had two specific purposes. The first was to determine the degree of similarity between photopic luminosity measured by the method of critical frequency and photopic luminosity defined by CIE. The second was to examine whether and how luminous efficiency measured by critical frequency depends on the frequency of intermittence or overall level of radiance. G.R.

**A73-12077** The colour vision characteristics of an observer with unilateral defective colour vision - Results and analysis. B. G. Bender, K. H. Ruddock, E. C. de Vries-de Mol, and L. N. Went (Imperial College of Science and Technology, London, England; Leiden, Rijksuniversiteit, Leiden, Netherlands). *Vision Research*, vol. 12, Dec. 1972, p. 2035-2057. 32 refs.

**A73-12078** A two-stage model of brightness. H. Schiffman (Duke University, Durham, N.C.) and H. F. Crovitz (U.S. Veterans Administration Hospital, Durham, N.C.). *Vision Research*, vol. 12, Dec. 1972, p. 2121-2131. 30 refs.

A mathematical approach to the long-distance effects of luminance discontinuities is developed, giving attention to the propagation of brightness changes outward from points of large second derivatives of luminance. The hypothesis is advanced that the system responsible for brightness perception operates in two stages, including an analytic stage in which the stimulus distribution is transformed through double differencing, and a synthetic, or reconstructive, stage in which the outcome of this double differencing then undergoes a form of double integration. G.R.

**A73-12079** A combined photoelectric method for detecting eye movements. L. Mitrani, N. Yakimoff, and St. Mateeff (Bulgarian Academy of Sciences, Institute of Physiology, Sofia, Bulgaria). *Vision Research*, vol. 12, Dec. 1972, p. 2145, 2146.

The method considered makes use of a device which has two photosensitive elements for horizontal eye movements and a third element for vertical movements. The device is mounted on a spectacle frame. A rapid adjustment of the device is possible, and recordings may be continued for prolonged periods without affecting any eye function. The photocell output can be fed to any suitable recording device. The angular accuracy of eye position measurement is about 15 min. G.R.

**A73-12080** Scotopic vision - An unexpected threshold elevation produced by dark annuli. H. J. Wyatt (Washington University, St. Louis, Mo.). *Vision Research*, vol. 12, Dec. 1972, p. 2147-2150. 9 refs. Grant No. NIH-EY-00220.

**A73-12081** Influence of border and background on perception of straightness. R. Over (Queensland, University, Brisbane, Australia). *Vision Research*, vol. 12, Dec. 1972, p. 2153-2155. 6 refs.

In the experiment discussed subjects were required to judge the straightness of a line superimposed on adjacent but oppositely tilted line gratings. Orientation contrast occurs when a single line is viewed

against a background of uniformly tilted lines, and the distortion involves a shift in the perceived orientation of the line in the direction opposite to the background. It was found that the extent to which a physically straight line superimposed on oppositely tilted gratings appeared bent was dependent solely on the relationship between the orientation of the local stimulus and its background.

G.R.

**A73-12119** Vertical posture control mechanisms in man. A. I. Litvintsev. (*Avtomatika i Telemekhanika*, Apr. 1972, p. 71-83.) *Automation and Remote Control*, vol. 33, no. 4, Sept. 1972, pt. 1, p. 590-600. Translation.

Stabiligrams, mechanograms and electromyograms were recorded to investigate muscular activity control mechanisms in subjects who maintained a comfortable standing posture, a precise standing posture and a standing posture with closed eyes, with or without receiving jolts in sagittal or frontal directions. It was found that at least four muscular activity control mechanisms were active in the subjects as they tried to maintain their prescribed postures. LF and 10-Hz muscular activity bursts to maintain the posture, and concordant LF activity variations in talocrural and knee joints to maintain body equilibrium were the characteristic features of the control mechanisms. V.Z.

**A73-12151** Favorable effect of flight on pilots exhibiting degenerative arteriopathy of the lower limbs (Action favorable du vol chez des pilotes de chasse présentant une artériopathie dégénérative des membres inférieurs). R. Pannier, J. C. Richard, and G. Leguay (Hôpital d'Instruction des Armées Dominique Larrey, Versailles, France). *Revue de Médecine Aéronautique et Spatiale*, vol. 11, 2nd Quarter, 1972, p. 59-61. 6 refs. In French.

**A73-12152** Importance of the Lohmann reaction in the response of the heart to anoxic aggression (Importance de la réaction de Lohmann dans la réponse du cœur à une agression anoxique). P. Borredon (Centre de Recherches de Médecine Aéronautique, Paris, France). *Revue de Médecine Aéronautique et Spatiale*, vol. 11, 2nd Quarter, 1972, p. 63-69. 28 refs. In French.

Study of the simultaneous evolution of the concentrations of phosphoryl-creatine (PC) and adenosine triphosphate (ATP) of the heart in situ in guinea pigs subjected to anoxic aggression by artificial ventilation with pure nitrogen. It is found that at the start of a sudden anoxic aggression a great decrease in the PC concentration in the myocardium occurs, while an increase occurs in the ATP concentration. It is shown that at the start of anoxic aggression the Lohmann reaction intervenes to ensure not only the maintenance of the ATP concentration but also to reinforce the value of the energy potential represented by the functional fraction of cellular ATP.

A.B.K.

**A73-12153** Fatigue in flight personnel during long flights (Fatigue du personnel navigant au cours de vols de longue durée). R. Auffret (Ministère des Armées, Service de Santé des Armées, Paris, France). *Revue de Médecine Aéronautique et Spatiale*, vol. 11, 2nd Quarter, 1972, p. 71-78. 20 refs. In French.

Results of a physiological evaluation of the effects of long flights on the crews of DC 7 aircraft specially equipped to receive telemetering transmissions from ballistic missiles and to monitor their landing. The results of studies of the changes occurring in the cardiac frequency, the urinary elimination of 17-ketosteroids, the urinary elimination of mucoproteins (the Donaggio reaction), the urinary elimination of catecholamines, and glycemia are presented, with special attention being given to the results for a 24-hour flight. It is found that the subjective impressions of fatigue described by the crew members are confirmed by the recorded biological data. A.B.K.

**A73-12154** Fractures of the spine during flight /concerning two cases encountered during pumping/ (Les fractures du rachis en vol /à propos de deux cas rencontrés au cours de pompages/). J. M. Wattier, R. Auffret, R. P. Delahaye (Ministère des Armées, Service de Santé des Armées, Paris, France), J. Roubinet (Hôpitaux des Armées, Paris, France), and A. Salvagniac. *Revue de Médecine Aéronautique et Spatiale*, vol. 11, 2nd Quarter, 1972, p. 79-81. 12 refs. In French.

Review of two cases of spinal fracture which occurred to a fighter pilot and a test pilot, on Mirage III aircraft during pumping - an aerodynamic phenomenon encountered on high-speed aircraft. It is found that in the two cases the spinal fractures resulted from an extremely rapid repetition of large-amplitude positive and negative accelerations due to oscillations of the aircraft along its pitching axis. These fractures are found to be due to compression on a bent spinal column. The fractures encountered are localized in the upper and middle parts of the spinal column. A.B.K.

**A73-12155** Systematic X-ray photography of flight personnel and lung tuberculosis (Radiophotographie systématique du personnel navigant et tuberculose pulmonaire). G. Gueffier, R. Carre, J. Hocquel, M. Cren (Hôpitaux des Armées, Paris, France), and R. P. Delahaye (Ministère des Armées, Service de Santé des Armées, Paris, France). *Revue de Médecine Aéronautique et Spatiale*, vol. 11, 2nd Quarter, 1972, p. 83-88. 12 refs. In French.

Illustration of the use of the technique of thoracic X-ray photography in the detection of tubercular lesions in flight personnel. After reviewing the basic principle of the method and comparing it with standard radiography and radioscopy, a brief summary is given of the equipment used and of the schedule followed in processing the films. The results of the application of the proposed technique are evaluated, noting the low incidence of tuberculosis detected in the groups examined, corresponding to the reduction in tuberculosis morbidity in the population of France as a whole. Factors favoring this reduction in morbidity are suggested. A.B.K.

**A73-12156** Retinal arterial pressure - Orthostatic hypotension and fatigue /Preliminary study/ (Pression artérielle rétinienne - Hypotension orthostatique et fatigue /Etude préliminaire/). Dr. Boissin, Dr. Fuchez, Dr. Abbas, and Dr. Bellanger (Compagnie Nationale Air France, Paris, France). *Revue de Médecine Aéronautique et Spatiale*, vol. 11, 2nd Quarter, 1972, p. 89-91. 5 refs. In French.

Results of a study attempting to verify the variations in retinal arterial pressure (RAP) and, consequently, brain circulation as a function of the activity of airline flight and ground personnel. It is found that airline work (whether in flight or on the ground) leads to variations in RAP in excess of 5 grams in 44 per cent of the cases studied. These variations are not necessarily accompanied by a subjective sensation of fatigue. It is found that in long-haul flights the RAP has a tendency to decrease, while in medium-haul flights and in ground personnel the variations in RAP seem to reach equilibrium. The subjective sensation of fatigue may be attributable to the appearance of an orthostatic hypotension syndrome manifested by a relative decrease in RAP. A.B.K.

**A73-12157** Does Carpentier's reconstructive valvuloplasty reopen the question of the inaptitude for flight of flight personnel with mitral prostheses (La valvuloplastie reconstructive de Carpentier remet-elle en question l'inaptitude au vol du personnel navigant porteur d'une prothèse mitrale). J. M. Caula, R. Carre, and F. Plas. *Revue de Médecine Aéronautique et Spatiale*, vol. 11, 2nd Quarter, 1972, p. 92-94. In French.

Reconsideration of the traditional bias against allowing pilots who have had artificial mitral valves inserted to correct mitral insufficiency to resume flying, in the light of the new factors introduced by the advent of Carpentier's technique of reconstructive valvuloplasty. It is noted that reconstructive valvuloplasty possesses

two advantages over other techniques of mitral valve insertion - namely, it does not involve any risk of thrombosis or sudden mechanical accident, and it eliminates the need for anticoagulants. The conditions under which Carpentier's valvuloplasty can be undertaken are reviewed, and the actual technique of the operation is described. Finally, the case of a pilot who had successfully undergone reconstructive valvuloplasty is reported, noting approvingly that he was allowed to resume flying with certain limitations.

A.B.K.

**A73-12158** Ocular tonus and aptitude in flight personnel (Tonus oculaire et aptitude au personnel navigant). G. Perdriel and J. P. Chevaleraud. *Revue de Médecine Aéronautique et Spatiale*, vol. 11, 2nd Quarter, 1972, p. 95-99. In French.

Consideration of the role of ocular tonus measurements in the detection and treatment of glaucoma. The method employed in measuring ocular tonus is described, and a procedure to be followed in the case of statistically abnormal or suspicious ocular tonuses is outlined. In such cases it is necessary to draw up a balance, based on an accurate questionnaire and both objective and subjective examinations. In particular, a careful study must be made of the papilla with the aid of an ophthalmoscope and a nyctohemeral curve must be plotted. Also, studies must be made of the visual field, the chromatic color perception, and the night vision of the patient. Finally, so-called provocation tests must be performed. A.B.K.

**A73-12159** Hemodynamic effects of physical maneuvers /Valsalva, effort, respiration/ and of pharmacodynamic tests - Their clinical application (Effets hemodynamiques des manoeuvres physiques /Valsalva, effort, respirations/ et des épreuves pharmacodynamiques - Leur application à la clinique). J. P. Perrot, A. Godefroid, R. Carre, and F. Plas. *Revue de Médecine Aéronautique et Spatiale*, vol. 11, 2nd Quarter, 1972, p. 100-106. 22 refs. In French.

**A73-12160** Numerical analysis of spontaneous electric activity of the brain - Study of the statistical properties of the power density spectra (Analyse numérique de l'activité électrique cérébrale spontanée - Etude des propriétés statistiques et des spectres de densité de puissance). Mr. Laget, Mr. Court, Mr. Dufour, Mr. Bassant, Mr. Cassan, Mr. Fatome, Mr. Basin, Mr. Rouif, Mr. Hillion, and Mr. Lechevallier. *Revue de Médecine Aéronautique et Spatiale*, vol. 11, 2nd Quarter, 1972, p. 107-114. In French.

**A73-12161** Cat optic tract and geniculate unit responses corresponding to human visual masking effects. A. M. L. Coenen and E. G. J. Eijkman (Nijmegen, Katholieke Universiteit, Nijmegen, Netherlands). *Experimental Brain Research*, vol. 15, Oct. 29, 1972, p. 441-451. 14 refs. Research supported by the Nederlandse Organisatie voor Zuiver Wetenschappelijk Onderzoek.

The responses of single units of both optic tract and lateral geniculate nucleus were investigated under typical masking conditions with cats as experimental animals. It was found that these recordings showed effects quite comparable with psychophysically observed masking. Attention is given to electrophysiological results, backward masking, forward masking, and psychophysical methods. Mean single unit activity in the cat is compared with a mean of simultaneous activity of many units in the human visual system. G.R.

**A73-12162** Analysis of the response characteristics of optic tract and geniculate units and their mutual relationship. A. M. L. Coenen, H. J. M. Gerrits, and A. J. H. Vendrik (Nijmegen, Katholieke Universiteit, Nijmegen, Netherlands). *Experimental Brain Research*, vol. 15, Oct. 29, 1972, p. 452-471. 30 refs. Research supported by the Nederlandse Organisatie voor Zuiver Wetenschappelijk Onderzoek.

**A73-12166 #** The role of muscle stiffness in meeting the changing postural and locomotor requirements for force development by the ankle extensors. S. Grillner (Goteborg, Universitet, Goteborg, Sweden). *Acta Physiologica Scandinavica*, vol. 86, Sept. 1972, p. 92-108. 34 refs. Research supported by the Swedish Medical Research Council and Vilhelm och Martina Lundgrens Vetenskapsfond. SMRC Project 14X-3026.

**A73-12187 #** Radiation protective effect of a mixture of ATP, AET, and serotonin on yields of 600-R X-ray-induced chromosome aberrations in the rat. I. Baev and D. Benova (Research Institute on Radiology and Radiation Hygiene, Sofia, Bulgaria). *Bolgarskaia Akademiia Nauk, Doklady*, vol. 25, no. 8, 1972, p. 1129-1131. 12 refs.

**A73-12354 #** Cytochemical-luminescence study of adrenal cortex proteins under the influence of ionizing radiation (Liuminetsentno-tsitokhimicheskoe issledovanie belkov kory nadpocheknikha pri deistvii ioniziruiushchei radiatsii). D. Kh. Khamidov, P. A. Khakimov, and U. Mamataliev (Akademiia Nauk Uzbekskoi SSR, Institut Biokhimii, Tashkent, Uzbek SSR). *Akademiia Nauk Uzbekskoi SSR, Doklady*, vol. 29, no. 7, 1972, p. 58-60. 6 refs. In Russian.

**A73-12417** Hypothalamic norepinephrine - Circadian rhythms and the control of feeding behavior. D. L. Margules, M. J. Lewis, J. A. Dragovich, and A. S. Margules (Temple University, Philadelphia, Pa.). *Science*, vol. 178, Nov. 10, 1972, p. 640-643. 23 refs. Grant No. NIH-MH-19438.

The data reported appear to resolve the controversy between proponents of the noradrenergic-feeding and the noradrenergic-satiety theories. The effects of the addition of exogenous 1-norepinephrine (1-NE) to the hypothalamus seem to be dependent on differences in the internal state of the hypothalamus associated with the environmental cycles of darkness and light. In the dark, this treatment suppressed feeding behavior. In the light, the same dose of 1-NE applied to the same hypothalamic site facilitated feeding behavior. Two circadian rhythms of 1-NE have been identified in the rat hypothalamus. G.R.

**A73-12422** Regulation of testis function in golden hamsters - A circadian clock measures photoperiodic time. J. A. Elliott, M. H. Stetson, and M. Menaker (Texas, University, Austin, Tex.). *Science*, vol. 178, Nov. 17, 1972, p. 771-773. 36 refs. Grants No. NIH-HD-03803; No. NIH-GM-00836.

**A73-12423** Spontaneous middle ear muscle activity in man - A rapid eye movement sleep phenomenon. M. A. Pessah (Montefiore Hospital, Bronx, N.Y.) and H. P. Roffwarg (Montefiore Hospital; Yeshiva University, Bronx, N.Y.). *Science*, vol. 178, Nov. 17, 1972, p. 773-776. 15 refs. Grants No. PHS-K2-MH-18739; No. PHS-MH-13269.

The commencement of rapid eye movement (REM) sleep in mammals is associated with a number of distinct alterations in physiological processes. In search of a physiological indicator of auditory imagery during dreaming, preliminary investigations of tympanic membrane motility in sleep were undertaken. Initial efforts were not successful. However, a spontaneous middle ear muscle activity (MEMA) was observed with the aid of acoustic impedance recordings. Five subjects were audiologically examined for normal hearing as well as for a functioning middle ear response. The subjects were monitored in the laboratory during sleep. It was found that MEMA was present in every subject studied and in every REM period. G.R.

**A73-12429 \*** Analysis of volatile combustion products and a study of their toxicological effects. J. D. Seader, I. N. Einhorn, W. O. Drake, and C. M. Muhlfeith (Utah, University, Salt Lake City, Utah).

(Conference on Flammability Characteristics of Polymeric Materials, Salt Lake City, Utah, June 21-26, 1971.) *Polymer Engineering and Science*, vol. 12, Mar. 1972, p. 125-133. 10 refs. Contract No. NAS2-6063.

An experimental program was conducted to study the thermochemical, flammability and toxicological characteristics of uncoated and coated polyisocyanurate foams. The coatings used were fluorinated copolymer and an intumescent material. Combustion and pyrolysis gases were analyzed by gas chromatography and mass spectrometry. The LD-50 and LD-100 tests were performed on Sprague-Dawley rats housed in an environmental chamber. The isocyanurate foam, fluorinated-copolymer-coated foam, and the intumescent-coated foam were found to have excellent flammability and insulation characteristics, although smoke development was substantial. (Author)

**A73-12443** Nature of the conduction disturbance in selective coronary arteriography and left heart catheterization. M. B. Rosenbaum, R. Shabetai, K. L. Peterson, and R. A. O'Rourke (Kentucky, University, Lexington, Ky.; California, University, San Diego, Calif.). *American Journal of Cardiology*, vol. 30, Sept. 1972, p. 334-337. 28 refs. Grant No. PHS-HE-05598-07.

The electrocardiographic changes associated with coronary arteriography were compared with those occurring during left ventricular catheterization in 16 patients. In 1 patient, a 36 year old man, transient left anterior divisional block was documented when the catheter tip was in the outflow tract of the left ventricle. The AQRS shifted from +90 to -50 deg, the initial 0.02-sec QRS forces shifted inferiorly and to the right, and the QRS interval increased from 0.07 to 0.09 sec, fulfilling previously described criteria for the diagnosis of left anterior divisional block. This was attributed to transient injury of the anterior division of the left bundle branch. In the same patient and in the other 15, selective opacification of the coronary arteries shifted the main QRS forces, without change in the direction of the initial QRS forces. The axis shifts occurring during coronary arteriography are attributed to parietal block. (Author)

**A73-12444** Echocardiographic analysis of mitral valve motion in atrial septal defect. M. Kamigaki (Presbyterian Hospital, San Francisco, Calif.) and N. Goldschlager (Pacific Medical Center, San Francisco, Calif.). *American Journal of Cardiology*, vol. 30, Sept. 1972, p. 343-348. 23 refs. Grants No. NIH-HE-05498-09; No. NIH-FR-00241.

Eleven patients with secundum atrial septal defect underwent echocardiographic study of mitral valve motion. In 100 per cent of cases, there was abnormal motion of the valve leaflets, primarily involving the posterior leaflet. Reduced velocity and excursion of leaflet motion did not correlate with age, left ventricular stroke index, right ventricular chamber dimension or pressure, or amplitude of motion of the abnormally moving interventricular septum. The echocardiographic findings are unique to atrial septal defect. Although the explanation for the findings is not immediately clear, the possible contributory roles of left ventricular disease, the interventricular septum, and the left to right shunt itself are examined. (Author)

**A73-12445** Usefulness of vectorcardiography combined with His bundle recordings and cardiac pacing in evaluation of the preexcitation /Wolff-Parkinson-White/ syndrome. A. Castellanos, Jr., A. S. Agha, B. Portillo, and R. J. Myerburg (Miami, University; U.S. Veterans Administration Hospital, Miami, Fla.; Sanatorio Antituberculoso, Maracaibo, Venezuela). *American Journal of Cardiology*, vol. 30, Nov. 8, 1972, p. 623-628. 28 refs.

**A73-12446** Echocardiographic findings in experimental myocardial infarction of the posterior left ventricular wall. G. Stefan and R. J. Bing (Huntington Memorial Hospital, Pasadena, Calif.). *American Journal of Cardiology*, vol. 30, Nov. 8, 1972, p. 629-639. 22 refs. Research supported by the Margaret W. and Herbert Hoover,

Jr. Foundation and Council for Tobacco Research.

Analysis of motion and configuration of the posterior left ventricular endocardium in posterior left ventricular wall infarction in dogs, and correlation of these changes with the electrocardiogram and left ventricular hemodynamics. The results presented may form the basis for an interpretation of echocardiographic findings in posterior wall infarction in man. M.V.E.

**A73-12467 #** Effect of a 5-day space flight on cardio-dynamics during physical work of moderate intensity (Vliianie 5-sutochnogo kosmicheskogo poleta na kardiodynamiku pri fizicheskoj rabote umerennoj intensivnosti). V. M. Mikhailov, V. S. Georgievskii, V. V. Smyshliaeva, and S. L. Kantor. *Kosmicheskie Issledovaniia*, vol. 10, Sept.-Oct. 1972, p. 778-782. 12 refs. In Russian.

**A73-12510 #** Biochemical processes during the maturation of erythrocytes - Further results with regard to the action site of the respiratory inhibitor F from reticulocytes in the respiratory chain (Biochemische Vorgänge bei der Erythrozytenreifung - Weitere Ergebnisse zum Wirkort des Atmungsstoffs F aus Retikulozyten in der Atmungskette). T. Schewe, Ch. Hiebsch, and S. Rapoport (Berlin, Humboldt-Universität, Berlin, East Germany). *Acta Biologica et Medica Germanica*, vol. 29, no. 2, 1972, p. 189-206. 41 refs. In German.

**A73-12511 #** Possible mechanisms of cardiac hypertrophy. F. Z. Meerson (Akademii Meditsinskikh Nauk SSSR, Moscow, USSR). *Acta Biologica et Medica Germanica*, vol. 29, no. 2, 1972, p. 277-280. 52 refs.

In the paper the hypothesis of the mechanism of cardiac hypertrophy is discussed. The essence of this hypothesis consists in that a cellular genetic apparatus activation is due to a deficit in high energy phosphates, caused by cardiac hyperfunction, or uncoupling action of catecholamines or genetically produced mitochondrial lesion or any other factor. The activation of the nucleic acid and protein synthesis developing as a response on this signal first of all increases the mitochondrial biogenesis and then the heart hypertrophy develops. The hypertrophy causes the decrement in the load per unit of myocardial mass, eliminating by this way a deficit of high energy phosphates and forms the basis for rather steady cardiac hyperfunction. (Author)

**A73-12524** A minor perturbing effect of retinal locus on dot pattern recognition - Rejection of a possible artifact. W. R. Uttal (Michigan, University, Ann Arbor, Mich.). *Psychonomic Science*, vol. 29, Oct. 25, 1972, p. 100-102. 6 refs. NSF Grant No. GB-25431.

**A73-12525** Effects of color differences in a letter matching task. A. D. Well and J. Green (Massachusetts, University, Amherst, Mass.). *Psychonomic Science*, vol. 29, Oct. 25, 1972, p. 109, 110. Research supported by the University of Massachusetts.

Ten subjects in an experiment were required to judge whether or not two simultaneously presented letters had the same name. Letters could be either in upper- or lowercase. Each pair appeared as two colored letters on a dark background. A second experiment was conducted in which the criteria for sameness was changed from name identity to form identity. It was found that color variation had a significant effect in the case of 'same' judgments, while 'different' judgments were not affected by color differences. G.R.

**A73-12545 \*** Conjoint-measurement framework for the study of probabilistic information processing. T. S. Wallsten (North Carolina, University, Chapel Hill, N.C.). *Psychological Review*, vol. 79, no. 3, 1972, p. 245-260. 29 refs. Grants No. NIH-MH-10006; No. NGL-23-005-171.

The theory of conjoint measurement described by Krantz et al. (1971) is shown to indicate how a descriptive model of human processing of probabilistic information built around Bayes' rule is to

be tested and how it is to be used to obtain subjective scale values. Specific relationships concerning these scale values are shown to emerge, and the theoretical prospects resulting from this development are discussed. M.V.E.

**A73-12548 \*** Radioisotopic T-3 and T-4 thyroid function tests in the pig-tailed monkey (*Macaca nemestrina*). A. M. Kodama. (California, University, Berkeley, Calif.). *Laboratory Animal Science*, vol. 22, Feb. 1972, p. 68-71. 13 refs. Contract No. NAS2-4231.

**A73-12549 \*** Cation exchange binding of rubidium and cesium by rat liver cell microsomes. H. Sanui (California, University, Berkeley, Calif.). *Journal of Cellular Physiology*, vol. 78, Dec. 1971, p. 369-375. 16 refs. Grant No. NGL-05-003-024.

**A73-12557 #** Binary regularities in the electrical wave spectrum of the brain (Dvoichnye zakonomernosti v spektre elektricheskikh voln mozga). A. A. Sokolov, P. P. Kondrat'ev, and Ia. A. Sokolov (Moskovskii Energeticheskii Institut, Moscow, USSR). *Akademiia Nauk SSSR, Doklady*, vol. 205, Aug. 21, 1972, p. 1473-1475. In Russian.

Development of a mathematical model of the distribution of multiplets or frequencies of electrical brain waves corresponding to spectral density extrema. It is shown that the law of distribution of these multiplets can be obtained on the basis of an analogy between electrical brain waves and the operation of an electronic oscillator of RC type. The mutual relations between the multiplets and cutoff frequencies are represented by a nonlinear, symmetrically directed graph, in which the path transfers between sources and sinks are represented by sums of paths which constitute binary functions. A.B.K.

**A73-12558 #** Topochemical differences in RNA content in spinal cord motoneurons during hypoxia and hypokinesia (Topokhimicheskie razlichiiia soderzhaniiia RNK v motoneironakh spinogo mozga pri gipoksii i gipokinezii). V. A. Brumberg, O. G. Gzenko, N. N. Demin, V. B. Malkin, and L. Z. Pevzner (Akademii Nauk SSSR, Institut Fiziologii, Leningrad, USSR). *Akademiia Nauk SSSR, Doklady*, vol. 205, Aug. 21, 1972, p. 1490-1493. 15 refs. In Russian.

Comparison of the reactions of the motoneurons of the cervical and lumbar enlargements of the spinal cord in various groups of rats exposed to hypoxia alone, hypokinesia alone, and the combined action of the two. Using the technique of UV cytospectrophotometry, it is found that the concentration of cytoplasmic RNA in the motoneurons of the cervical section of the spinal cord decreased reliably only under conditions of hypokinesia, while in motoneurons of the lumbar enlargement of the spinal cord the RNA concentration was found to be significantly higher than in the control group in all the investigated series. Hypokinesia also led to a distinct increase in the volume of the cytoplasm in motoneurons of both sections of the spinal cord, while a combination of hypoxia and hypokinesia caused a similar increase only in neurons of the cervical enlargement. A.B.K.

**A73-12560 \*** Semicircular canals as a primary etiological factor in motion sickness. E. F. Miller, II and A. Graybiel (U.S. Naval Aerospace Medical Research Laboratory, Pensacola, Fla.). *Aerospace Medicine*, vol. 43, Oct. 1972, p. 1065-1074. 36 refs. NASA-supported research. NASA Order T-81633; NASA Order L-43518.

Data are presented which support the view that the semicircular canals of humans can act as the essential factor for the production of motion sickness and the evocation of symptoms characteristic of this malady in the absence of 'motion.' Quantitative grading of acute symptoms demonstrated that motion sickness can be evoked by stimuli which are adequately provocative and unique for the canals. These results are compared with those of two provocative rotational tests that introduce Coriolis (cross-coupled angular acceleration) forces or generate a rotating linear acceleration vector. Wide

interindividual differences but only slight intraindividual differences among the six provocative test conditions are revealed, indicating that individuals usually possess an overall susceptibility to motion which is relatively independent of its type. The fact that typical symptoms of motion sickness were also produced by bithermal irrigation of several subjects who represented a wide range of susceptibility adds to the evidence that semicircular canals can act as the primary etiological factor in this malady. (Author)

**A73-12561 \*** Effect of sleep-wake reversal and sleep deprivation on the circadian rhythm of oxygen toxicity seizure susceptibility. J. D. Dexter, D. G. Hof, and C. E. Mengel (Missouri University, Columbia, Mo.). *Aerospace Medicine*, vol. 43, Oct. 1972, p. 1075-1078. 11 refs. Contracts No. NAS9-9209; No. N00014-67-0003; Grant No. NIH-CA-11447-04.

Albino Sprague-Dawley rats were exposed in a previously O<sub>2</sub> flushed, CO<sub>2</sub> free chamber. The exposure began with attainment of 60 psi (gauge) and the end point was the first generalized oxygen toxicity seizure. Animals were exposed to reversal diurnal conditions since weanlings until their sleep-wake cycles had completely reversed, and then divided into four groups of 20 based on the time of day exposed. The time of exposure to oxygen at high pressure prior to seizure was now significantly longer in the group exposed from 1900 to 2000 hr and a reversal of the circadian rhythm of oxygen toxicity seizure susceptibility was noted. Animals maintained on normal diurnal conditions were deprived of sleep on the day of exposure for the 12 hours prior to exposure at 1900 hr, while controls were allowed to sleep. There was no significant differences in the time prior to seizure between the deprived animals and the controls with an n = 40. Thus the inherent threshold in susceptibility to high-pressure oxygen seizures seems not to be a function of sleep itself, but of some biochemical/physiologic event which manifests a circadian rhythm. (Author)

**A73-12562** Effect of altitude acclimatization and simultaneous acclimatization to altitude and cold on critical flicker frequency at 11,000 ft. altitude in man. C. S. Nair, M. S. Malhotra, and P. M. Gopinath (Defence Institute of Physiology and Allied Sciences, Delhi, India). *Aerospace Medicine*, vol. 43, Oct. 1972, p. 1097-1100. 11 refs.

Critical flicker frequency (CFF) was determined on 20 healthy subjects at sea level. They were divided into two groups and flown to an altitude of 11,000 ft. One group was exposed to hypoxia alone, while the other group was subjected to hypoxia and cold simultaneously for a period of three weeks, after which the groups were interchanged and studied for a further period of three weeks. CFF was recorded at the end of each week. Results indicated that acclimatization to this altitude did not affect the CFF significantly. Cold stress produced a profound deterioration in CFF. (Author)

**A73-12563** Effects of immersion with the head above water on tissue nitrogen elimination in man. U. I. Balldin and C. E. G. Lundgren (Lund, Universitet, Lund, Sweden). *Aerospace Medicine*, vol. 43, Oct. 1972, p. 1101-1108. 35 refs. Research supported by the Swedish Delegation for Medical Defense Research and Swedish Medical Research Council. SMRC Project B70-40P-2633-02.

**A73-12564** Handling the hijacker. W. J. McArthur, P. J. Dean, J. R. Carroll, T. Holliday, and R. E. Stokes (Defence and Civil Institute of Environmental Medicine, Downsview, Ontario; Air Canada; Clarke Institute of Psychiatry; Toronto, University, Toronto, Canada). *Aerospace Medicine*, vol. 43, Oct. 1972, p. 1118-1121. 14 refs.

Review of information gained from studies of hijackings which have occurred in the United States and Canada. Data collected have been reviewed from the air safety crew training psychological and medical points of view to provide practical advice for individuals faced with handling the hijack situation. A psychological classifica-

tion of hijackers is presented together with guidelines for dealing with them. Stress is laid upon the requirement to calm the hijacker and to avoid anxiety provoking situations. Control by violent action is sometimes inevitable and this problem is also discussed. A short training program for aircrew, cabin crew, and senior supervisors is outlined. This program is designed to enhance the ability of personnel to analyze the situation and cope better with the hijacker. (Author)

**A73-12565 \*** Effects of the space flight environment on man's immune system. II - Lymphocyte counts and reactivity. G. L. Fischer, J. C. Daniels, W. C. Levin, S. L. Kimzey, E. K. Cobb, and S. E. Ritzmann (NASA, Manned Spacecraft Center, Houston, Tex.; Eisenhower Memorial Hospital, Palm Desert, Calif.; Texas, University, Galveston, Tex.). *Aerospace Medicine*, vol. 43, Oct. 1972, p. 1122-1125. 11 refs. Contracts No. NAS9-6811; No. NAS9-8122; No. NAS9-8258; No. NAS9-11088; No. NAS9-11161.

The present studies were undertaken to assess the effects of the environment of space flights on the cellular division of the human immune system. Peripheral blood absolute lymphocyte counts were determined at various preflight and postflight intervals for the 21 crewmen of Apollo Missions 7-13. Mean lymphocyte numbers tended to exhibit a delayed significant but fluctuating increase shortly after recovery, although a variety of responses was seen in individual astronauts. The in vitro reactivity of lymphocytes, reflected by RNA and DNA synthesis rates by unstimulated and PHA-stimulated lymphocytes tissue-cultured preflight and postflight from the same participants, was found to remain within previously established normal ranges. These results indicate that functional integrity of cellular immune potential as reflected by in vitro techniques is maintained during this spaceflight experience. (Author)

**A73-12627 \*** Resistance of soil microorganisms to starvation. M. Chen and M. Alexander (Cornell University, Ithaca, N.Y.). *Soil Biology and Biochemistry*, vol. 4, 1972, p. 283-288. 17 refs. Grant No. NGR-33-010-013.

Most groups of soil microorganisms died when exposed to prolonged starvation in a carbon-free solution, but the relative abundance of Bacillus and actinomycetes increased with time. Certain nonspore-forming bacteria also persisted. The ability of individual soil isolates to endure starvation in solution was not correlated with their glycogen content or rate of endogenous respiration. However, cells of the resistant populations were rich in poly-beta-hydroxybutyrate, whereas the starvation-susceptible bacteria generally contained little of this substance. Poly-beta-hydroxybutyrate was used rapidly in cells deprived of exogenous sources of carbon. (Author)

**A73-12644 \*** Hydroxyindole-O-methyl transferases in rat pineal, retina and Harderian gland. D. P. Cardinali and R. J. Wurtman (MIT, Cambridge, Mass.). *Endocrinology*, vol. 91, July 1972, p. 247-252. 13 refs. Grants No. PHS-AM-11709; No. NGR-22-009-627; No. NIH-ES-00616.

**A73-12648 \*** The study of biological macromolecules using perturbed angular correlations of gamma radiation. C. F. Meares and D. G. Westmoreland (Stanford University, Stanford, Calif.). In: Cold Spring Harbor symposia on quantitative biology. Volume 36. Cold Spring Harbor, N.Y., Cold Spring Harbor Laboratory, 1971, p. 511-516. 22 refs. NSF Grant No. GP-23406; Grants No. NIH-GM-14752; No. NGL-05-020-250.

**A73-12820** Relationship of anginal symptoms to lung mechanics during myocardial ischemia. C. P. Pepine and L. Wiener (Naval Hospital, Philadelphia, Pa.). *Circulation*, vol. 46, Nov. 1972, p. 863-869. 18 refs. Navy-supported research. MR Project 005.20.010133A.

**A73-12821** Maximal treadmill exercise electrocardiography - Correlations with coronary arteriography and cardiac hemodynamics. C. M. Martin and D. R. McConahay (Letterman General Hospital, San Francisco, Calif.). *Circulation*, vol: 46, Nov. 1972, p. 956-962. 31 refs.

**A73-12865 #** Acceleration of the elimination of radioactive isotopes from the organism. (Uskorenie vyvedeniia iz organizma radioaktivnykh izotopov). Iu. F. Koval'. Moscow, Atomizdat, 1972. 200 p. 512 refs. In Russian.

A systematic study is made of various aspects of the pathogenesis and treatment of radiation damage occurring as a result of the incorporation of radioisotopes. The general characteristics of the metabolism of radioactive substances in the organism are described, as well as possible methods for accelerating their elimination. The ways in which radioisotopes arrive in the organism, the absorption and distribution of radioisotopes in the organism, and the excretion of radioisotopes are considered. An analysis is made of the toxicity and biological action of various radioisotopes. The effectiveness of various methods of eliminating some of the most important radioisotopes is evaluated. Of special interest in this connection are the results obtained by the author from the use of various complexons and the author's experience in using diuretics for purposes of deincorporation.

A.B.K.

## STAR ENTRIES

**N73-10019\*** Boeing Co., Philadelphia, Pa. Vertol Div.  
**HELICOPTER CREW/PASSENGER VIBRATION SENSITIVITY**  
 Richard Gabel and Donald A. Reed /in NASA. Langley Res. Center Symp. on Vehicle Ride Quality Oct. 1972 p 143-153 ref.  
 CSCL 06S

**N73-10020\*** Naval Aerospace Medical Research Lab., Pensacola, Fla.  
**SOME OF THE MECHANISMS UNDERLYING MOTION SICKNESS**  
 Ashton Graybiel /in NASA. Langley Res. Center Symp. on Vehicle Ride Quality Oct. 1972 p 155-174 refs.

(NASA Order W-13433)  
 CSCL 06S

**N73-10023\*** Virginia Univ., Charlottesville. Center for Application of Science and Engineering to Public Affairs.  
**INVESTIGATION OF TRAVELER ACCEPTANCE FACTORS IN SHORT HAUL AIR CARRIER OPERATIONS**  
 A. R. Kuhlthau and Ira D. Jacobson /in NASA. Langley Res. Center Symp. on Vehicle Ride Quality Oct. 1972 p 211-228 refs.  
 CSCL 05E

**N73-10024\*** National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.  
**RIDE QUALITY RESEARCH ACTIVITIES AT NASA LANGLEY RESEARCH CENTER**  
 Andrew B. Connor, Hugh P. Bergeron, and W. Elliott Schoonover, Jr. /in its Symp. on Vehicle Ride Quality Oct. 1972 p 229-246 refs.  
 CSCL 05E

**N73-10059\*#** California Univ., Berkeley. Dept. of Soils and Plant Nutrition.  
**ENZYME ACTIVITY IN TERRESTRIAL SOIL IN RELATION TO EXPLORATION OF THE MARTIAN SURFACE** Semiannual Progress Report  
 M. S. Ardakani, A. D. McLaren, and A. H. Pukite 1 Jul. 1972 26 p refs.  
 (Grant NGL-05-003-079)  
 (NASA-CR-128399; SAPR-16; SSL-Ser-13-Issue-76) Avail: NTIS HC \$3.50 CSCL 06M

An exploration was made of enzyme activities in soil, including abundance, persistence and localization of these activities. An attempt was made to develop procedures for the detection and assaying of enzymes in soils suitable for presumptive tests for life in planetary soils. A suitable extraction procedure for soil enzymes was developed and measurements were made of activities in extracts in order to study how urease is complexed in soil organic matter. Mathematical models were developed, based on enzyme action and microbial growth in soil, for rates of oxidation of nitrogen as nitrogen compounds are moved downward in soil by water flow. These biogeochemical models should be applicable to any percolating system, with suitable modification for special features, such as oxygen concentrations, and types of hydrodynamic flow. Author

**N73-10060#** Medical Biological Lab. RVO-TNO, Rijswijk (Netherlands).

**SUMMARIES, BIOLOGICAL EFFECTS OF MICROWAVE RADIATION, PART 5**

P. M. M. VanOsch and H. Heering Apr. 1972 91 p (MBL-1972-5; TDCK-59853) Avail: NTIS HC \$6.75

Summaries of research on the biological effects of microwave exposure are reported. Studies included are: survival rate of panirradiated guinea pigs, indices of fertility for irradiated female mice, and the effect of microwaves on bone, bone marrow, and adjacent tissues. F.O.S.

**N73-10061#** Medical Biological Lab. RVO-TNO, Rijswijk (Netherlands).

**SUMMARIES, BIOLOGICAL EFFECTS OF MICROWAVE RADIATION, PART 6**

H. Heering and P. M. M. VanOsch May 1972 89 p (MBL-1972-6; TDCK-59854) Avail: NTIS HC \$6.50

Abstracts on the biological effects of microwave radiation on humans and animals are presented. Data cover hemodynamic responses, biological rhythm changes, muscular reflexes, eye sight decrement, and various other physical damages, and effects on life expectancy of exposed individuals. E.H.W.

**N73-10062\*#** Naval Aerospace Medical Research Lab., Pensacola, Fla.

**DIRECTION-SPECIFIC ADAPTATION EFFECTS ACQUIRED IN A SLOW ROTATION ROOM**

Ashton Graybiel and James Knepton 11 Jul. 1972 21 p refs (NASA Order W-13433)  
 (NASA-CR-129083; NAMRL-1162) Avail: NTIS HC \$3.25 CSCL 06S

Thirty-eight subjects were required to execute 120 head movements in a slow rotation room at each 1-rpm increase in velocity of the room between 0 and 6 rpm and, after a single-step gradual return to zero velocity, execute 120 head movements either immediately after the return or after delay periods varying from 1 to 24 hours unless, at any time, more than mild symptoms of motion sickness were elicited. A second stress profile differed by the sequential addition of an incremental adaptation schedule in which the direction of rotation was reversed. The experimental findings demonstrated the acquisition of direction-specific adaptation effects that underwent spontaneous decay with a short time constant (hours). Speculations are presented which could account for the simultaneous acquisition of short-term and long-term adaptation effects. The findings support the theory that motion sickness, although a consequence of vestibular stimulation, has its immediate origin in nonvestibular systems, implying a facultative or temporary linkage between the vestibular and nonvestibular systems. Author

**N73-10063\*#** Lunar Science Inst., Houston, Tex.  
**[EFFECTS OF APOLLO 12 LUNAR MATERIAL ON LIPID LEVELS OF TOBACCO TISSUE AND SLASH PINE CULTURES]** Progress Report

John D. Weete 1 Oct. 1972 55 p refs (Contract NAS9-12622)

(NASA-CR-128606) Avail: NTIS HC \$4.75 CSCL 06A

Investigations of the lipid components of pine tissues (*Pinus ellottii*) are discussed, emphasizing fatty acids and steroids. The response by slash pine tissue cultures to growth in contact with Apollo lunar soil, earth basalt, and Iowa soil is studied. Tissue cultures of tobacco grown for 12 weeks in contact with lunar material from Apollo 12 flight contained 21 to 35 percent more total pigment than control tissues. No differences were noted in the fresh or dry weight of the experimental and control samples. J.A.M.

**N73-10064\*#** Ohio State Univ. Research Foundation, Columbus. Aviation Medicine Research Lab.

**THE INTERACTION OF INFRARED RADIATION WITH THE**

**EYE: A REVIEW OF THE LITERATURE**

H. Spencer Turner [1972] 87 p refs  
(Contract NSR-36-008-108)  
(NASA-CR-128407) Avail: NTIS HC \$6.50 CSCL 06P

A compilation of data concerning the effects of infrared radiation on the eye is presented. Information in the following areas is included: (1) transmission and absorption of infrared radiation by the ocular tissues, (2) range of infrared radiation which is harmful to the ocular tissues, (3) infrared radiation thresholds of the various ocular tissues, and (4) infrared radiation transmission and absorption of current optic materials. F.O.S.

**N73-10065\*#** Ohio State Univ. Research Foundation, Columbus. Aviation Medicine Research Lab.

**HUMAN RESPONSES TO ELECTRICITY: A LITERATURE REVIEW**

H. Spencer Turner [1972] 115 p refs  
(Contracts NSR-36-008-108; BCL-RF209-032/103)  
(NASA-CR-128422) Avail: NTIS HC \$7.75 CSCL 06P

An extensive review of literature on research concerning biomedical sensors is presented for establishing standards for current limiting devices. The physiological and pathological responses of the human, when exposed to electricity are reported including the thresholds: for perception of electricity, pain by electric current, induction of muscular contraction by electric shock, and ventricular fibrillation. The passive electrical properties of cells and tissues are also reported. F.O.S.

**N73-10066\*#** Techtran Corp., Glen Burnie, Md.  
**THE QUESTION OF WATER AND ELECTROLYTE LEVELS AT HIGH TEMPERATURES**

L. Schmidt Washington NASA Oct. 1972 19 p Transl into ENGLISH from Arbeitsmed. - Sozialmed. - Arbeitshyg. (West Germany), v. 2, 1966 p 44-50  
(Contract NASw-2037)

(NASA-TT-F-13915) Avail: NTIS HC \$3.00 CSCL 06P

Physiological regulatory mechanisms governing the water and electrolyte levels in the body are studied, together with the various disturbances caused during work at high temperatures. Author

**N73-10067\*#** Techtran Corp., Glen Burnie, Md.  
**UNDERSTANDING THE EFFECT OF CALCIUM-DEFICIENT DIET ON THE COMPOSITION OF GROWING BONE**

Stephan Weiser Washington NASA Oct. 1972 24 p refs Transl. into ENGLISH from Biochem. Z. (West Germany), v. 66, 1914 p 95-114

(Contract NASw-2037)

(NASA-TT-F-13917) Avail: NTIS HC \$3.25 CSCL 06P

Feeding a calcium-deficient diet to pigs and dogs leads to reduced weight gain and changes in bone structure. Detailed tables illustrate results of analysis of bones and bone ash from animals fed calcium-rich and calcium-deficient diets. Author

**N73-10068\*#** Techtran Corp., Glen Burnie, Md.  
**INVESTIGATION OF THE BIOSYNTHESIS OF UNSATURATED FATTY ACIDS IN YEAST**

J. Schultz and F. Lynen Washington NASA Oct. 1972 16 p refs Transl. into ENGLISH from Eur. J. Biochem. (West Germany), v. 21, 1971 p 48-54

(Contract NASw-2037)

(NASA-TT-F-13918) Avail: NTIS HC \$3.00 CSCL 06H

Palmitoyl-CoA and other longchain acyl-CoA derivatives were purified by counter current distribution or by partition chromatography. The particle bound acyl-CoA desaturase from baker's yeast was isolated. This microsomal fraction contained a considerable amount of fatty acid synthetase which was removed from the microsomes by ultrasonic treatment. There is no indication that transfer of an acyl residue from CoA to the enzyme as a first step occurs in the reaction sequence. The enzyme reaction is not inhibited by SH-blocking reagents. It is concluded that an AC-protein-like component does not participate in the enzymatic desaturation of fatty acids in yeast. The Michaelis constants for the substrates stearoyl-, palmitoyl- and myristoyl-CoA for the desaturation reaction were determined. Author

**N73-10069\*#** Techtran Corp., Glen Burnie, Md.  
**STUDIES OF THE SURVIVAL TIME OF BACTERIA ON SURFACES AND THE POSSIBILITIES OF INFLUENCING IT. 3: INFLUENCE OF VARIOUS LIGHTING CONDITIONS AND PREVIOUS DISINFECTION IN THE USE OF PLASTICS**  
K. O. Gundermann and S. Glueck Washington NASA Oct. 1972 13 p refs Transl. into ENGLISH from Arch. Hyg. Bakteriol. (Munich), v. 154, no. 5, 1971 p 480-487  
(Contract NASw-2037)

(NASA-TT-F-13923) Avail: NTIS HC \$3.00 CSCL 06M

The examination of the survival time of bacteria on plastics revealed an unequivocal, inherent bactericidal effect of some materials as well as an at least unfavorable effect on the germs of some others when all test conditions were taken into consideration. The strong influence of the daylight on the lifetime could be confirmed again. The late effect of disinfectants is in part dependent on the surface material. The phenolic agent, for instance, showed a considerable late effect on polyethylene, polystyrene, polypropylene, polycarbonate, phenolic resin, and acrylic glass; the delayed effect of this agent was reduced in the case of PVC and polyacetal. Author

**N73-10070\*#** Translation Consultants, Ltd., Arlington, Va.  
**COMPLETE AND ISOENZYME CONTENT OF LACTATE DEHYDROGENASE IN PLASMA, LEUKOCYTES AND ERYTHROCYTES IN MYELOPROLIFERATIVE DISEASES**

W. A. Helbig, K. Parthum, and H. J. Sommer Washington NASA Nov. 1972 12 p refs Transl. into ENGLISH from Folia Haematol. (Leipzig), v. 95, no. 3, 1971 p 229-237

(Contract NASw-2038)

(NASA-TT-F-14586) Avail: NTIS HC \$3.00 CSCL 06P

Examinations of the complete activity of LDH and its isoenzymes in plasma and in myeloid cells revealed clear differences between healthy persons and patients with myeloproliferative diseases. Even within the latter group there were differences which can be used for a differential diagnosis. However, the long time which is required to isolate the cells, to represent the isoenzymes, and to evaluate them will cause this method to be applied only in special laboratories or for special cases. Author

**N73-10071\*#** Translation Consultants, Ltd., Arlington, Va.

**PRE- AND POSTOPERATIVE FLUID THERAPY**

H. Breivik Washington NASA Nov. 1972 7 p refs Transl. into ENGLISH from Tidsskr. Norske Laegeforen. (Oslo), v. 89, 1969 p 1029-1030

(Contract NASw-2038)

(NASA-TT-F-14600) Avail: NTIS HC \$3.00 CSCL 06E

The administration of Ringers lactate solution in pre- and postoperative fluid therapy is discussed and its advantages described. Author

**N73-10072\*#** Techtran Corp., Glen Burnie, Md.  
**COMPARISON OF THE DEVELOPMENT OF THE VESTIBULAR (LABYRINTH) OF THE FROG RANA TEMPORARIA IN CONDITIONS OF WEIGHTLESSNESS**

Ya. A. Vinnikov, O. G. Gizenko, L. K. Titova, V. I. Govardovskiy, F. G. Gribakin, A. A. Bronshteyn, R. A. Pevzner, M. Z. Aronova, A. L. Mashinskiy, L. R. Palmbakh et al Washington NASA Nov. 1972 15 p refs Transl. into ENGLISH from Zh. Evol. Biokhim. Fiziol. (Leningrad), v. 8, no. 3, May-Jun. 1972 p 343-349

(Contract NASw-2037)

(NASA-TT-F-14624) Avail: NTIS HC \$3.00 CSCL 06P

For a period of four days eggs of the frog Rana temporaria were investigated in both terrestrial conditions and in conditions of weightlessness. The embryos were placed in a special container which was equipped with a small tank containing a fixing fluid. In the terrestrial conditions, as the control, and in the experimental conditions, the embryos were maintained for a period of two days, during which the segmentation occurred with the formation of blastulae and the initial formation of gastrulation. In both terrestrial conditions and in conditions of weightlessness the frog embryos which were fixed at the stage of tail budding were seen to have a normal development of the auditory vesicle.

the future vestibular apparatus - and the beginning of differentiation of the receptor and supporting cells, as well as the bipolar neuroblasts of the eighth ganglion. Author

**N73-10073#** Joint Publications Research Service, Arlington, Va.

**HYGIENIC PROBLEMS OF THE EFFECT OF MICROWAVE ELECTROMAGNETIC FIELDS ON THE BODY**

M. P. Troyanskiy 10 Oct. 1972 9 p refs Transl. into ENGLISH from *Gigiena i Sanit. (Moscow)*, no. 8, 1972 (JPRS-57209) Avail: NTIS HC \$3.00

The harmful effects of microwave fields on the human body, the determination of maximum permissible human exposure levels, and the development of preventive and protective measures are studied. Author

**N73-10074\*#** Translation Consultants, Ltd., Arlington, Va. **INPUT AND OUTPUT IN THE SYSTEM OF THERMOREGULATION DURING REST AND EXERCISE**

M. Scarperi, S. Scarperi, K. Behling, A. Bleichert, and J. Kitzing Washington NASA Nov. 1972 10 p refs Transl. into ENGLISH from *Intern. Z. Angew. Physiol. (Berlin)*, v. 30, 1970 p 186-192 (Contract NASw-2038)

(NASA-TT-F-14582) Avail: NTIS HC \$3.00 CSCL 06P

Sweat rate and heat conductance remain nearly constant despite a steady increase in core temperature during experiments in a hot environment. The water loss during the experiments must be taken in account in input-output correlations. Water loss during the experiments was replaced. The correlation equations described hold without a correction factor. Esophageal temperature during exercise in these experiments was steady in the first 1/2 hour. After 2 hours esophageal temperature in a warm climate is markedly lower than in the control experiments. Author

**N73-10075\*#** California Univ., Davis. Dept. of Animal Physiology.

**THE FOUNDATIONS OF SPACE BIOLOGY AND MEDICINE. VOLUME 2: ECOLOGICAL AND PHYSIOLOGICAL BASES OF SPACE BIOLOGY AND MEDICINE. PART 3: EFFECT ON THE ORGANISM OF DYNAMIC FLIGHT FACTORS. CHAPTER 1: PRINCIPLES OF GRAVITATIONAL BIOLOGY** Arthur H. Smith [1972] 94 p refs Supported by NASA (Grant NGR-05-004-008)

(NASA-CR-128471) Avail: NTIS HC \$6.75 CSCL 06S

The physical principles of gravitation are discussed, such as gravitational and inertial forces, weight and mass, weightlessness, size and scale effects, scale limits of gravitational effects, and gravity, as a biogenic factor. The behavior of the accelerative force gravitation, is described. This law proposes and quantifies the mutual gravitational attraction existing between all bodies of matter, the force being proportional to the product of masses, and inversely related to the square of the distance separating them. Gravity orientation, chronic acceleration, and hematology are examined. Systematic responses, such as circulation and renal functions, are also considered, along with animal response to a decreased acceleration field and physiology of hyper- and hypodynamic fields. J.A.M.

**N73-10076#** Defence Research Information Centre, Orpington (England).

**LESIONS OF THE NERVOUS SYSTEM IN DECOMPRESSION SICKNESS**

M. P. Elinskii May 1972 12 p refs Transl. into ENGLISH from *Vopr. Psichiat. i Neuropatol. (USSR)* v. 13, 1968 p. 615-622 Presented at Symp. on Psichiat. and Neuropatol., Leningrad, 1968

(AD-743330; DRIC-Trans-2790; BR-30161) Avail: NTIS CSCL 06/5

Of all the pathological conditions brought about by the effects of anomalous conditions in the surrounding air media, the most

serious is the disease associated with rapid reduction of the atmospheric pressure. Such diseases are termed decompression sickness. Where there is considerable and rapid reduction of pressure, the gases dissolved in the blood and tissue separate out in the form of bubbles and form vascular embolisms and local affection of the tissue. Such sickness is encountered in ascents to high altitudes (above 8000 m), caisson work, diving operations, deep diving sport, pressure chamber research, etc. Affection of the nervous system is one of the most serious complications, and is important as a symptom of decompression sickness. Several characteristic features of the clinic course of the illness which is accompanied by affection of the nervous system are described. GRA

**N73-10077#** Defence Research Establishment Ottawa (Ontario). **RELATIONSHIPS BETWEEN DOSIMETER RESPONSE AND ABSORBED DOSE FOR 0.66-MeV GAMMA RAYS AND FOR 2.9-MeV NEUTRONS**

Charles E. Clifford and Robert A. Facey Mar. 1972 13 p refs (DRB Proj. 16-01-39)

(AD-743005; DREO-TN-72-12) Avail: NTIS CSCL 06/18

The dose at sites in the interior and on the surface of a human phantom was measured for broad-beam exposure to 0.66-MeV gamma rays and to 2.95-MeV neutrons. Measurements were made for a range of angles of radiation incidence. A comparison is presented between the surface dose at possible dosimeter locations on the chest, abdomen and groin and the corresponding absorbed dose to the bone-marrow system and to the abdomen. Unless the geometry of exposure is accurately known, it is shown that a chest dosimeter is a poor indicator of the absorbed dose. A dosimeter worn on the groin would be significantly better for both neutrons and gamma rays for a wide range of exposure geometries. Author (GRA)

**N73-10078#** School of Aerospace Medicine, Brooks AFB, Tex. **COMPUTER PROGRAM FOR ACTIVITY DETERMINATIONS IN THE USAFSAM WHOLE-BODY COUNTER Final Report, Jan. - May 1970**

Ted D. Rupp and Robert C. Nelson Jun. 1972 43 p refs (AF Proj. 7757)

(AD-745578; SAM-TR-72-10) Avail: NTIS CSCL 06/18

Omega is a very low frequency (VLF) navigation system which will give world-wide coverage with eight stations when fully implemented. Using published skywave correction tables accuracies of 1 to 2 n.mi. are attainable. Through the use of differential Omega, correction information can be disseminated to users in the vicinity of a monitor site. Differential Omega accuracies are directly proportional to distance from the monitor site and are 0.26 - 0.5 n.mi. at 200 n.mi. from the monitor site. A system using U.S. Coast Guard radiobeacons as the differential information transmitter was proposed by Goodman and McKaughan. Their proposals were examined and improvements suggested. Two additional differential Omega systems being proposed by civilian contractors were also examined. Author (GRA)

**N73-10079#** Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

**A METHOD FOR CALCULATING AIRCREW RADIATION DOSE M.S. Thesis**

John A. Bachman Jun. 1972 84 p refs

(AD-745084; GNE/PH/72-1) Avail: NTIS CSCL 06/18

A method was developed to estimate the radiation dose received by an aircrew member in an aircraft in the vicinity of an atmospheric nuclear weapon detonation. The problem is segmented into three parts; determining the radiation field at the aircraft, determining the radiation field within the aircraft, and calculating the radiation dose absorbed by the crew member. The air portion is solved using a computer code with some special treatment of the results, and existing fluence-to-dose conversion factors are used for calculating the crew member dose. The treatment of the aircraft attenuation is developed. The scattered fluence is determined using multigroup diffusion theory. A sample problem is presented using the F-102A interceptor and a hypothetical burst. Author (GRA)

**N73-10080#** Armed Forces Radiobiology Research Inst., Bethesda, Md.

**NEUTRON EFFECTIVENESS FOR CAUSING INCAPACITATION IN MONKEYS**

J. W. Thorp and R. W. Young Apr. 1972 18 p refs  
(AD-742076; AFRR1-SR72-5) Avail: NTIS CSCL 06/18

Fifty-eight male monkeys (*Macaca mulatta*) were trained by shock avoidance conditioning to work a simultaneous visual discrimination problem. Trained subjects were irradiated in either a nuclear reactor-produced neutron field (incident neutron to gamma ray ratio of about 10) or a similarly produced gamma ray field (incident neutron to ratio of about 0.1). In all exposures the midbrain dose rate was about 2000 rads/minute. The midbrain dose most likely to cause early transient incapacitation (ETI) in 50 percent of the irradiated subjects was determined. The signs and symptoms of ETI were the same whether the monkey received gamma or neutron radiations. Author

**N73-10081#** North Carolina Univ., Chapel Hill.  
**INTERRELATION OF SYSTEMIC AND CELLULAR RESPONSES TO ACUTE AND CHRONIC HYPOXIA** Final Report.  
1 Jan. 1963 - 31 Dec. 1970

A. T. Miller, Jr. 4 Nov. 1971 59 p refs  
(Contract DA-49-193-MD-2371)  
(AD-743536) Avail: NTIS CSCL 06/19

A number of separate, though interrelated projects are described in this report. They are grouped into two major categories - (1) the effects of hypoxia on cell metabolism, and (2) the effects of hypoxia on behavior. One of the major objectives was a study of certain features of the process of acclimation to simulated high altitude. This included (a) the effects of altitude acclimation on cellular metabolic and behavioral responses to acute hypoxia, (b) the effects of altitude acclimation on one of the enzymes important to anaerobic metabolism (lactic dehydrogenase) and on the relative vascularity of brain, heart and skeletal muscle, (c) the adaptive value of two of the prominent changes observed at altitude (hyperventilation and polycythemia), and (d) an attempt to determine the stimulus responsible for the increased vascularity of organs in altitude-acclimated animals. Author (GRA)

**N73-10082#** Naval Postgraduate School, Monterey, Calif.  
**A STUDY OF UNDERWATER DIVER TACTILE SENSITIVITY**  
M.S. Thesis

David Lee McKee Mar. 1972 53 p refs  
(AD-743709) Avail: NTIS CSCL 05/10

The thesis examines the effects of underwater submersion and prolonged underwater submersion on a diver's tactile sensitivity. The method of constant stimulus is used to determine size discrimination thresholds. The stimuli used are squares of hard acrylic plastic into which holes of varying diameters have been drilled. Four tests were administered to each subject. One test was administered on dry land in the open air and served as the standard. The other three tests were administered underwater at various time intervals. The conclusion drawn from this research is that a diver's tactile sensitivity as measured by his ability to make size discriminations is not affected by underwater submersion or even prolonged underwater submersion of sixty-six minutes. Furthermore, the thresholds of approximately one millimeter, determined in this thesis, are consistent with the findings of past research in this field. Author (GRA)

**N73-10083#** Naval Aerospace Medical Research Lab., Pensacola, Fla.

**COMPARATIVE EVALUATION OF EXPOSURE DISTRIBUTIONS FOR AIR TRAVELERS AND RADIATION WORKERS**

Hermann J. Schaefer 25 Feb. 1972 14 p refs  
(Contract DOT-FA71SS-10)  
(AD-743482; NAMRL-1159) Avail: NTIS CSCL 06/18

Radiation workers contribute 0.48 millirem/year per capita of the total U.S. population. Air travelers exposed to increased environmental radiation levels at altitude contribute 0.54 millirem/year. However, the two respective distributions differ

greatly in all other parameters; namely, number of individuals involved, magnitude and spread of individual exposure, and skewness. While the distribution for radiation workers centers heavily on near-zero exposures and reaches out to large excursions in rare cases of accidents, the one for air travelers shows a narrow spread, excludes excursions completely, and does not constitute an additional radiation risk. Author (GRA)

**N73-10084#** Naval Postgraduate School, Monterey, Calif.  
**THE EFFECT OF TEMPORAL UNCERTAINTY ON HUMAN ENERGY EXPENDITURE DURING MODERATE EXERCISE**  
M.S. Thesis

Barry Grant Swanbon Mar. 1972 51 p refs  
(AD-743726) Avail: NTIS CSCL 05/10

It is hypothesized that psychological attitudes affect physiological functions in humans. One function that might be affected is energy consumption during work or exercise. An experiment was conducted to examine the effect of temporal uncertainty about the duration of an exercise period on energy cost. A sample of 13 healthy, young male military officers were tested under controlled exercise routines with and without temporal uncertainty. Results indicated that there is a significant difference between similar tasks under temporal uncertainty and certainty. The task under uncertainty required less energy than the other task. Author (GRA)

**N73-10085#** Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

**A SYSTEM FOR VALIDATING HUMAN RELIABILITY DATA**  
M.S. Thesis

Edward Low Dec. 1971 81 p refs  
(AD-744551; GRE/MATH/66-5) Avail: NTIS CSCL 05/10

The human reliability data (Data Store, An Index of Electronic Equipment Operability) derived by the American Institute for Research was used to select, modify, or construct 11 indicators and controls. These indicators and controls were assembled into two panels representing the best and worst reliability figures that could be utilized. To produce realistic operational panels, little reliability difference could be made in the dimensions. The panel equipment, through a tally tape reader, was operated to simulate an aircraft flight profile from take-off to level-off. A checklist was devised varying response control indicator relationships. Trained subjects performed discrete actions in response to indications of airspeed, altitude, and vertical velocity. Their response was recorded and observed. To minimize equipment variability for higher reliability tasks, redundant error recording and interpretation was performed. Author (GRA)

**N73-10086#** Defence Research Information Centre, Orpington (England).

**DISORDERS OF THE NERVOUS SYSTEM IN DECOMPRESSION DISEASE**

G. A. Akimov May 1972 13 p refs Transl. into ENGLISH from Zh. Nevropatol. i Psikhiatr. (Moscow), no. 69, 1969 p 979-984

(AD-744298; DRIC-Trans-2788; BR-30159) Avail: NTIS CSCL 06/5

On the basis of a clinical study of 56 cases with neurological symptoms in decompression sickness (caisson disease), the authors distinguished the following varieties: cerebral forms, spinal, neural and obliterated. In 2 cases which were attributed to the cerebral (with comatose conditions) and spinal forms of decompression sickness, pathomorphological studies were also performed. It was established that the main significance should be connected with circulatory disturbances and the peculiarities of vascularization in the pathogenesis of nervous-system lesions. Author (GRA)

**N73-10087#** Naval Submarine Medical Center, Groton, Conn.  
**PSYCHOLOGICAL EFFECTS OF PROLONGED EXPOSURE TO SONAR SIGNALS AT AN ELEVATED INTENSITY. 1: FIVE DAYS' EXPOSURE TO SIGNALS AT 85 dB** Interim Report

Benjamin B. Weybrew and Ernest M. Noddin 2 Dec. 1971  
18 p refs

(AD-744938; NSMRL-689) Avail: NTIS CSCL 06/19

Twelve enlisted submariner candidates were confined to an Audiology Lab for a period of 10 days. Intervening between 2 pre-experimental and 2 recovery days were 5 days: exposure to a continuous sonar signal at 85 dB. Addition test scores declined, letter cancellation accuracy also declined, and the four adjective checklist measures of affect and mood, viz., hostility, depression, anxiety and maladjustive trends, all increased within the first day of the sound exposure. However, these indicators had all reverted to pre-experimental level by 48-60 hours into the sound-on phase of the experiment. On the third day of the sound exposure one of the 12 subjects developed anxiety symptoms acute enough to warrant tranquilizer medication. The self-control design of the study, however, does not allow for any unequivocal statement regarding the cause of these symptoms. Author (GRA)

**N73-10088#** Naval Submarine Medical Center, Groton, Conn. **THE VISUAL EVOKED CORTICAL RESPONSE AS A MEASURE OF STRESS IN NAVAL ENVIRONMENTS: METHODOLOGY AND ANALYSIS. 2: RAPID FLASH RATES** Jo Ann S. Kinney, Christine L. McKay, A. Mensch, and S. M. Luria 6 Oct. 1971 20 p refs  
(AD-744934; NSMRL-681; PR-2) Avail: NTIS CSCL 06/19

The second of two reports is presented whose goal is to evolve methodology for use in evaluating the visual evoked response (VER). The first presented techniques for obtaining and evaluating the complete evoked response; in this study, the method purposely results in VER's which are incomplete, by presenting the visual stimuli at rates that are too rapid to be responded to singly. Rapid flash rates are shown to produce VER's which are reliable and easy to interpret and assess statistically. Furthermore, they appear to be composed of factors in addition to elements from the complete evoked response. Together the methods evolved in the two papers provide efficient techniques for using the VER as a tool in studying Naval problems. Author (GRA)

**N73-10089#** Naval Aerospace Medical Research Lab., Pensacola, Fla.

**RHESUS MONKEY HEART RATE DURING EXERCISE**

John DeLorge and John S. Thach, Jr. 18 Apr. 1972 19 p refs

(AD-744930; NAMRL-969) Avail: NTIS CSCL 06/16

Three rhesus monkeys were implanted with ECG telemeters and performed a calisthenic exercise requiring complete arm extension above their heads and below their knees. The animals were unrestrained and confined to a large box. The exercise was programmed to produce food pellets on various reinforcement schedules. Heart rate samples were obtained both during sleep and high rates of activity. Two animals provided exercise data and one animal provided data without the exercise task. Highest heart rates were seen in the two exercise animals. No differences in maximum heart rates were related to the different reinforcement schedules. In most instances heart rates were twice those of resting heart rates for 5 minutes or longer. Occasionally, heart rates were three times the resting rates for at least 2 minutes. The resting heart rates from all three animals were generally lower than those reported in previous literature as normal rates in the rhesus. During the fixed-interval reinforcement schedule there was a correlated increase in heart rate along with the increase in response rate. Author (GRA)

**N73-10090#** Minnesota Univ., Minneapolis. **Chronobiology Labs. CIRCADIAN RHYTHMS OF THE CIRCULATORY SYSTEM. LITERATURE REVIEW: COMPUTERIZED CASE STUDY OF TRANSMERIDIAN FLIGHT AND MEDICATION EFFECTS ON A MILDLY HYPERTENSIVE SUBJECT** Technical Report, 1 Jan. 1969 - 15 Aug. 1971

Howard Levine and Franz Halberg Apr. 1972 72 p refs  
(Contract F29600-69-C-0011; AF Proj. 7755)  
(AD-743300; SAM-TR-72-3) Avail: NTIS CSCL 06/16

Rhythmic changes in blood pressure are assessed by flight surgeons and other medical practitioners by considering separately the systolic as compared to the diastolic measurements. Predictably recurring pressure changes other than those associated with the heartbeat also have long been known and await exploitation in practice. This report: (1) reviews the literature in the field of circadian circulatory rhythms; (2) specifies causes delaying clinical progress in application of circadian rhythmometry; (3) indicates with an illustrative example how modern computer techniques have started to overcome some of the difficulties encountered in quantifying and interpreting rhythms; and (4) demonstrates effects stemming from intercontinental transmeridian flights upon several circadian rhythms in a mildly hypertensive subject. Author (GRA)

**N73-10091#** Naval Medical Research Inst., Bethesda, Md. **ACOUSTIC-OPTICAL DETECTION OF DECOMPRESSION SICKNESS IN HAMSTERS** Medical Research Progress Report

Wesley D. Ulrich, Benjamin E. Smith, and Richard M. Fine 1 Mar. 1972 24 p refs

(AD-743475; PR-3) Avail: NTIS CSCL 06/19

Severe decompression sickness was produced by explosive decompression in twenty-three of forty-one anesthetized hamsters. Analysis of the post-decompression respiration pattern and ultrasonic transmission led to two observations: (1) animals without apnea never demonstrated macroscopic bubbles, and (2) animals which gasped always demonstrated macroscopic bubbles. The ultrasound attenuation generally preceded gasping but did not precede apnea unless more than ten minutes had elapsed since decompression. The respiratory signs were considered to be a consequence of pulmonary aero-embolism. Pilot studies with 2-(4-phenyl-piper-aziny)methyl cyclohexanone HCL, showed that it decreased mortality in unanesthetized hamsters but increased mortality in animals anesthetized with chloralose-urethane. Pilot studies with piperhydramine in anesthetized hamsters showed no change in mortality rates. Author (GRA)

**N73-10092#** Naval Postgraduate School, Monterey, Calif. Dept. of Operations Research and Administrative Sciences.

**PARAMETERS AFFECTING UNDERWATER VISION M.S. Thesis**

Edward Aberle Ruckner, Jr. Mar. 1972 26 p refs

(AD-743756) Avail: NTIS CSCL 05/10

The purpose of this study was to determine the effects of illumination color, viewing distance, and turbidity on a visual reading task in a totally dark, flooded environment. The reading task was to read a voltmeter and make a correct oral report of the reading. A total of 180 data points spread over 18 viewing conditions were taken for each subject. Seventeen military officers were used as subjects. Experimental conditions were presented in a random manner to all subjects. A statistical examination of the results showed that white or green illumination is better than red in reducing reading response time. Turbidity levels were significant in affecting both increasing as the Attenuation Coefficient increased. Author (GRA)

**N73-10093#** Naval Weapons Lab., Dahlgren, Va. **BIOLOGICAL HAZARDS FROM EXPOSURE TO ELF ELECTRICAL FIELDS AND POTENTIALS**

Herman P. Schwan Mar. 1972 35 p refs

(AD-743480; NWL-TR-2713) Avail: NTIS CSCL 06/18

The report presents a theoretical study of biological hazards arising from exposure to extra low frequency (ELF) electromagnetic environments. It includes an annotated bibliography, the derivation of appropriate mathematical formulae for hazard determination, and presents several recommendations for further studies. The report especially stresses the need for accurate, experimentally verified, measurements of the electrical impedance of the human body in the frequency range of interest. Author (GRA)

**N73-10094#** Army Medical Research Lab., Fort Knox, Ky.  
**COLOR NAMING LATENCIES WITH BRIEF EXPOSURES OF INDIVIDUAL STROOP AND CONTROL STIMULI**  
 Progress Report

Frederick N. Dyer and Thomas E. Kuehne 13 Mar. 1972 14 p refs

(DA Proj. 3A0-61102-B-71-R)  
 (AD-745106; USAMRL-970) Avail: NTIS CSCL 05/10

Two experiments utilizing brief presentations of Stroop and control stimuli failed to show any increase in interference to color naming as exposures were shortened. The results contradict Klein's hypothesis that the delay of naming in the Stroop task results from the time required for restimulation by the relevant color unless it is assumed this restimulation can occur via the iconic image. Basically similar results when the iconic image was terminated with an erasure stimulus, further suggest the inappropriateness of the Klein explanation or else of the belief that an iconic image can be terminated in this fashion. The failure to reproduce high interference of a previous study using brief presentations indicates that some other difference between that study and the previous and present works must account for those results. Author (GRA)

**N73-10095#** Human Engineering Labs., Aberdeen Proving Ground, Md.

**REACTION TIME: A BIBLIOGRAPHY WITH ABSTRACTS. SUPPLEMENT 2. WITH SUBJECT INDEX**

Lawrence E. Symington Apr. 1972 85 p refs  
 (AD-745416) Avail: NTIS CSCL 05/10

The bibliography is a 1971 supplement to previous annotated reaction time bibliographies published by the Human Engineering Laboratory. It is a compilation of 232 abstracted references dealing with reaction time in selected human information processing tasks. Most of the references are from the 1971 open literature and are arranged in alphabetical order by author. An alphabetic index of pertinent parameters of investigation is also provided. Author (GRA)

**N73-10096#** Oregon State Univ., Corvallis. Dept. of Microbiology.

**MICROBIAL ACTIVITIES IN HYPERBARIC ENVIRONMENTS**  
 Final Report

P. R. Kenis and R. Y. Morita Jun. 1972 6 p  
 (Contract N00014-71-C-0190)

(AD-745334) Avail: NTIS CSCL 06/13

High pressure helium-oxygen effects on microbial processes are of interest from the standpoint of spoilage and toxin production in foods; the fouling and degradation of materials stored in the habitat; possible altered pathogenicity of disease causing microorganisms; and to serve as a model system to gain information on high pressure helium-oxygen effects on biochemical processes which may relate to human cells. The present study was limited to a growth response investigation in a high pressure helium-oxygen atmosphere using representative bacteria and yeasts. This information should prove useful to predict gross microbial activity in undersea habitats compared to growth in air at 1 atm. GRA

**N73-10097#** New Mexico State Univ., University Park. Dept. of Psychology.

**PREDICTING HUMAN PERFORMANCE 3: DETECTION OF A SIMPLE VISUAL SIGNAL AS A FUNCTION OF TIME OF WATCH**

Warren H. Teichner Jun. 1972 36 p refs  
 (Contract N00014-70-A-0147-0002; NR Proj. 197-013)  
 (AD-745317; NMSU-ONR-TR-72-1) Avail: NTIS CSCL 05/10

The percentage of detection of 37 studies of vigilance, using simple signals, were found to depend primarily on the initial or pre-test detection level, the nature of the signal, i.e. whether it is a dynamic signal (requires movement or change of state of the eye) or static, and the duration of the watch. The loss of detection associated with static signals was assumed to be more representative of a loss in a vigilance or attentional process. That loss appears to be rapid in development, essentially complete

in about 35 min., and small in amount. The greater decrements associated with dynamic stimuli were assumed to be due to an additional process of eye fatigue. Author (GRA)

**N73-10098#** Indiana Univ. Medical Center, Indianapolis.

**A STUDY OF THE EFFECTS OF WHOLE-BODY PLUS OR MINUS A(Z) VIBRATION ON POSTURAL SWAY** Final Report

J. R. McKay Apr. 1972 25 p refs

(Contract AF 33(615)-2922; AF Proj. 7222)

(AD-745580; AMRL-TR-71-121) Avail: NTIS CSCL 06/19

An experiment is described, the purpose of which was to determine the effects of whole body, plus or minus a(z) vibration on the amplitude and frequencies of postural sway in human subjects. A platform, supported by two force cells and embodying transducers sensitive to applied vertical load, was used to measure the sway of standing subjects. The standard deviation of lateral sway was found to vary between 1.0 and 3.7 lb prior to vibration. Frequency analysis showed that the power lay mainly in the range from 0.01 to 1.0 Hz. Vibration exposure induced small and inconsistent changes in some spectral components of sway and some of these changes were statistically significant. These effects of vibration on sway amplitude and frequency are discussed. Author (GRA)

**N73-10099#** Twinbrook Research Lab., Rockville, Md.

**TWINBROOK RESEARCH LABORATORY** Annual Report, 1971

Donald M. Hodge May 1972 262 p refs  
 (PB-210613) Avail: NTIS HC \$3.00 CSCL 06R

Human and animal investigations of both ionizing and nonionizing radiations and their implications on health effects are discussed. GRA

**N73-10100#** Naval Aerospace Medical Research Lab., Pensacola, Fla.

**COMPARATIVE MOTION SICKNESS SYMPTOMATOLOGY AND PERFORMANCE DECREMENTS OCCASIONED BY HURRICANE PENETRATIONS IN C-121, C-130, AND F-3 NAVY AIRCRAFT**

Robert S. Kennedy, William F. Moroney, Ronald M. Bale, Harvey G. Gregoire, and David G. Smith 22 Jul. 1971 16 p refs  
 (AD-743928; NAMRL-1139) Avail: NTIS CSCL 06/19

The purpose of this research was to compare complex monitoring performance and motion sickness symptomatology during hurricane penetration in three types of aircraft. Three different Navy aircraft made six flights, each flight penetrating hurricane Inga several times. The controlling aircraft (a C-121) is routinely employed by the Navy for hurricane penetrations. The other two aircraft (C-130 and P-3) followed the C-121 into the storm at short intervals and penetrated the storm at the same altitude, heading, airspeed, etc. Most subjects experienced slight to moderate malaise during the flights with generally higher sickness rates occurring during the more turbulent flights. The subjects: overall flying experience afforded some protection. Airsickness rates in the C-121 were greater than those in the C-130 and P-3. The results on a complex counting task showed that performance decreased as a function of increased turbulence. Author (GRA)

**N73-10101#** San Francisco Univ., Calif. Dept. of Physics.

**HIGH Z PARTICLE COSMIC-RAY EXPOSURE OF APOLLO 8-14 ASTRONAUTS** Technical Report, Nov. 1961 - Dec. 1971

E. V. Benton and R. P. Henke Kirtland AFB, N. Mex. AFWL Jun. 1972 46 p refs

(Contract F29601-70-C-0077; AF Proj. 8803)  
 (AD-745188; AFWL-TR-72-2) Avail: NTIS CSCL 06/18

On Apollo missions that individual astronauts: high Z particle exposure was measured by means of Lexan foils located in the passive dosimetry packs carried on the chest, thigh, and ankle of each astronaut. The report deals with measurements obtained

on Apollo flights 8-14. Data is presented on the high Z track fluences, the stopping particle densities, and the particle integral LET spectra. The LET spectra, in turn, are used to calculate the fractional cell loss, FCL, of the human kidney (TK) cells arising from the high Z particle exposure. The measurements, on subsequent missions, show a consistent and a significant increase in the observed high Z particle exposure. Author (GRA)

**N73-10102#** Flying Personnel Research Committee, London (England).

**THE INCIDENCE OF BACKACHE AMONG AIRCREW AND GROUNDCREW IN THE ROYAL AIR FORCE Technical Report, 1969 - 1970**

J. G. Fitzgerald and Jane Crotty Feb. 1972 45 p ref Revised (AD-745177; FPRC-1313-Rev) Avail: NTIS CSCL 06/5

To determine the incidence of backache in Royal Air Force aircrew a questionnaire-type survey involving two thousand aircrew and groundcrew was carried out in 1969-70. Aircrew showed an incidence significantly higher than that in groundcrew. Among the aircrew group the incidence of backache in pilots was significantly higher than that in navigators and other aircrew combined. Pilots using ejector seats showed a higher incidence than those using static seats; among the latter group helicopter pilots suffer more discomfort than their colleagues using other types of static seats. More than half of the pilots who experience frequent in-flight backache or pain never suffer from backache on the ground. Author (GRA)

**N73-10103#** Naval Submarine Medical Center, Groton, Conn. **BINAURAL IMPROVEMENT IN NORMAL AND DEFECTIVE EARS IN A BACKGROUND OF OTHER VOICES Medical Research Progress Report**

J. Donald Harris and Cecil K. Myers 2 Aug. 1971 17 p refs (AD-746101; NSMRL-677; Rept-3) Avail: NTIS CSCL 17/2

A realistic artificial head with hi-fi microphones in the positions of eardrums was placed in a large echo-free chamber, looking at a loudspeaker ten feet distant. The loudspeaker presented lists of ten colloquial sentences, while two other loudspeakers at plus or minus 45 deg presented a male and a female voice reading interesting materials. Two-channel magnetic tape recordings were created of this multiple voice situation, at various relative strengths of the background voices. These tapes were administered to one ear, and again to both ears, of 22 normal-hearing young men, and to 22 monaural hypacusics. The monaural mode for the hypacusics was always the better ear. The test is also useful for determining the performance of an individual in certain military multiple-voice listening situations.

GRA

**N73-10104\*#** National Aeronautics and Space Administration, Washington, D.C.

**SEVENTH ANNUAL CONFERENCE ON MANUAL CONTROL 1972 354 p refs Conf. held at Los Angeles, 2-4 Jun. 1971 (NASA-SP-281) Avail: NTIS; SOD \$3.25 CSCL 05E**

Manual control theory and systems are applied to man machine environments. Considered are human operator modeling and display systems in automobile driving, air traffic control, and industrial management.

**N73-10105\* Systems Technology, Inc., Inglewood, Calif. PROBLEMS IN MODELING MAN MACHINE CONTROL BEHAVIOR IN BIODYNAMIC ENVIRONMENTS**

Henry R. Jex *In* NASA, Washington 7th Ann. Conf. on Manual Control 1972 p 3-13 refs

CSCL 05E

Reviewed are some current problems in modeling man-machine control behavior in a biodynamic environment. It is given in two parts: (1) a review of the models which are appropriate for manual control behavior and the added elements necessary to deal with biodynamic interfaces; and (2) a review of some

biodynamic interface pilot/vehicle problems which have occurred, been solved, or need to be solved. Author

**N73-10106\*** Forschungsinstitut fuer Anthropotechnik, Meckenheim (West Germany).

**DEVELOPMENT AND OPTIMIZATION OF A NONLINEAR MULTIPARAMETER MODEL FOR THE HUMAN OPERATOR Gunnar Johannsen *In* NASA, Washington 7th Ann. Conf. on Manual Control 1972 p 15-21 refs**

CSCL 05E

A systematic method is proposed for the development, optimization, and comparison of controller-models for the human operator. This is suitable for any designed model, even multiparameter systems. A random search technique is chosen for the parameter optimization. As valuation criteria for the quality of the model development the criterion function - the comparison between the input and output functions of the human operator and those of the model - and the most important characteristic values and functions of the statistical signal theory are used. A nonlinear multiparameter model for the human operator is being designed which considers the complex input information rate per time in a single display. The nonlinear features of the model are effected by a modified threshold element and a decision algorithm. Different display-configurations as well as various transfer functions of the controlled element are explained by different optimized parameter-combinations. Author

**N73-10107\*** Bolt, Beranek, and Newman, Inc., Cambridge, Mass. **A CONTROL THEORY MODEL FOR HUMAN DECISION MAKING**

William H. Levison *In* NASA, Washington 7th Ann. Conf. on Manual Control 1972 p 23-32 refs

(Contract NAS2-5884)

CSCL 05E

The optimal control model for pilot-vehicle systems has been extended to handle certain types of human decision tasks. The model for decision making incorporates the observation noise, optimal estimation, and prediction concepts that form the basis of the model for control behavior. Experiments are described for the following task situations: (1) single decision tasks; (2) two decision tasks; and (3) simultaneous manual control and decision tasks. Using fixed values for model parameters, single-task and two-task decision performance scores to within an accuracy of 10 percent can be predicted. The experiment on simultaneous control and decision indicates the presence of task interference in this situation, but the results are not adequate to allow a conclusive test of the predictive capability of the model.

Author

**N73-10108\*** Naval Ship Research and Development Center, Washington, D.C.

**AN INPUT ADAPTIVE, PURSUIT TRACKING MODEL OF THE HUMAN OPERATOR**

John R. Ware *In* NASA, Washington 7th Ann. Conf. on Manual Control 1972 p 33-45 refs

(Contracts NSR-23-005-906; NSR-23-005-364)

CSCL 05E

Developed and evaluated is a simple model of the input adaptive behavior of the human operator (HO) in a pursuit tracking is assumed that the HO is approximately an optimal predictor using only position and velocity information, then there is a simple method of computing the values of the model parameters in terms of the autocorrelation function of the input signal. Experimental evidence indicates that the ability of the HO to use velocity information decreases with increasing signal velocity indicating that a biased estimator of the velocity weighting should be used. A suitable approximation is derived which has rapid convergence and low variance. The model thus derived is compared to actual subject transfer functions and is found to be in close

agreement. In addition to tracking random processes the model can adapt to and track deterministic signals, such as sine waves, up to approximately the frequency at which human operators begin to track precognitively. Author

**N73-10109\*** Oakland Univ., Rochester, Mich.  
**A HYBRID COMPUTER PROGRAM FOR THE VISUAL DISPLAY OF COMPENSATORY SYSTEM MODEL PARAMETERS**

Glenn A. Jackson and Gerald Brabant *In* NASA, Washington, 7th Ann. Conf. on Manual Control 1972 p 47-51 refs

(Grant NGR-23-054-003)  
 CSCL 05E

A hybrid computer identification program has been developed which determines and displays those parameter values of a model of the compensatory control system that existed over the last fifteen seconds of operation. These values are up-dated every 0.05 sec so that a visual display of the parameters appears to be continuous. Presently, a closed loop crossover model is being used as the compensatory system model with the parameters K and tau displayed, however, any suitable model could be used in its place. Author

**N73-10110\*** Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.

**INPUT NOISE APPROXIMATION IN TRACKER MODELING M.S. Thesis**

Paul F. Torrey and Russell A. Hannen *In* NASA, Washington, 7th Ann. Conf. on Manual Control 1972 p 53-55 refs

CSCL 05E

The validity of approximating random Gaussian distributed inputs used in human response modeling by sums of discrete sine waves is studied. An ideal rectangular power density spectrum is simulated using both filtered Gaussian white noise and sums-of-discrete sine waves with three different input cutoff frequencies in the same compensatory tracking task. Resulting normalized tracking error and quality operator observations are used to investigate apparent discrepancies in human operator characteristics. Results show that discrete and continuous input tracking data compare favorable when the power in the crossover region is taken into account. Author

**N73-10111\*** City Coll. of the City of New York.  
**DIGITAL MODELING OF HUMAN OPERATOR DYNAMICS VIA CLASS OF LIAPUNOV FUNCTIONS**

Ralph Mekel and Patrick Peruo, Jr. *In* NASA, Washington, 7th Ann. Conf. on Manual Control 1972 p 57-58

(Grant NGR-33-013-053)  
 CSCL 05E

A technique is described which is utilized for modeling human operator dynamics. The technique is based upon a model-reference system configuration and a class of Liapunov functions formulated for this purpose which possess variable characteristics. It is shown how such a class of Liapunov functions and their time derivatives is formulated. The crux of the formulation lies in three variable positive definite matrices used for the construction of the class of Liapunov functions. The form and order of these matrices depend upon the form and order of the error differential equation of the human operator model-reference system. These matrices can be modified to include nonlinear functions of the human operator model. Author

**N73-10112\*** Massachusetts Inst. of Tech., Cambridge.  
**CONSIDERATIONS FOR THE DESIGN OF AN ONBOARD**

R. E. Anderson, R. E. Curry, H. G. Weiss, R. W. Simpson, M. E. Connelly, and T. Imrich *In* NASA, Washington, 7th Ann. Conf. on Manual Control 1972 p 61-72 refs

CSCL 05E

The basic concept of remoting information to the cockpit is

used to design and develop a computerized airborne traffic situation display device that automatically selects and presents segments of a controller's scope to the aircraft pilot via a narrow band digital data link. These data are integrated with aircraft heading and navigation information to provide a display useful in congested air space. The display can include alphanumerical symbols, air route maps, and controller instructions. G.G.

**N73-10113\*** Systems Technology, Inc., Inglewood, Calif.  
**MANUAL CONTROL THEORY APPLIED TO AIR TRAFFIC CONTROLLER-PILOT COOPERATION**

Dunstan Graham, Warren F. Clement, and Lee Gregor Hofmann *In* NASA, Washington, 7th Ann. Conf. on Manual Control 1972 p 73-80 refs

CSCL 05E

Reduced runway separation standards are among the means which have been proposed for increasing airport capacity. The probability of a blunder will dominate the calculation of safe separation standards. Then the determinant of safe system performance will be the system reaction time comprised of the air traffic controller's detection, decision and communication delays, and the response times of the pilot and aircraft in executing a collision avoidance maneuver. Estimates of these times, based on existing data, show that the delays ascribable to the human portions of the man-machine system are comparatively unimportant. New developments in radar, computers, and data links will be required to provide any substantial improvement of the existing system, and the goal of 2500 ft of separation may not be achievable. Author

**N73-10114\*** Massachusetts Inst. of Tech., Cambridge.  
**SUPERVISORY SAMPLING AND CONTROL: SOURCES OF SUBOPTIMALITY IN A PREDICTION TASK**

Thomas B. Sheridan and William B. Rouse *In* NASA, Washington, 7th Ann. Conf. on Manual Control 1972 p 81-88 refs

CSCL 05E

A process supervisor is defined as a person who decides when to sample the process input and what values of a control variable to specify in order to maximize (minimize) a given value function of input sampling period, control setting, and process state. Presented experimental data in such a process where the value function is a time-averaged sampling cost plus mean squared difference between input and control variable. The task was unpaced prediction of the output of a second order filter driven by white noise. Experimental results, when compared to the optimal strategy, reveal several consistently suboptimal behaviors. One is a tendency not to choose a long prediction interval even though the optimal strategy dictates that one should. Some results are also interpreted in terms of those input parameters according to which each subjects' behavior would have been nearest optimal. Differences of those parameters from actual input parameters served to quantify how subjects' prediction behavior differed from optimal. Author

**N73-10115\*** California Univ., Los Angeles:  
**MANUAL CONTROL MODELS OF INDUSTRIAL MANAGEMENT**

E. R. F. W. Crossman *In* NASA, Washington, 7th Ann. Conf. on Manual Control 1972 p 89-100 refs

(Contract N00014-69-A-0200-1043)  
 CSCL 05E

The industrial engineer is often required to design and implement control systems and organization for manufacturing and service facilities, to optimize quality, delivery, and yield, and minimize cost. Despite progress in computer science most such systems still employ human operators and managers as real-time control elements. Manual control theory should therefore be applicable to at least some aspects of industrial system design and operations. Formulation of adequate model structures is an essential prerequisite to progress in this area; since real-world production systems invariably include multilevel and multiloop control, and are implemented by timeshared human effort. A

modular structure incorporating certain new types of functional element, has been developed. This forms the basis for analysis of an industrial process operation. In this case it appears that managerial controllers operate in a discrete predictive mode based on fast time modelling, with sampling interval related to plant dynamics. Successive aggregation causes reduced response bandwidth and hence increased sampling interval as a function of level. Author

**N73-10116\*** Oakland Univ., Rochester, Mich.  
**A DYNAMIC MODEL OF THE HUMAN POSTURAL CONTROL SYSTEM**

J. C. Hill *In* NASA, Washington 7th Ann. Conf. on Manual Control 1972 p 103-113 ref

(Grant NGR-23-054-033)

CSSL 05E

A digital simulation of the pitch axis dynamics of a stick man of figures is described. Difficulties encountered in linearizing the equations of motion are discussed; the conclusion reached is that a completely linear simulation is of such restricted validity that only a nonlinear simulation is of any practical use. Typical simulation results obtained from the full nonlinear model are presented. Author

**N73-10117\*** Illinois Univ., Chicago.  
**FURTHER OBSERVATIONS ON THE RELATIONSHIP OF EMG AND MUSCLE FORCE**

Gyan C. Agarwal, Lawrence R. Cecchini, and Gerald L. Gottlieb *In* NASA, Washington 7th Ann. Conf. on Manual Control 1972 p 115-118, refs

(Grant NSF GK-17581)

CSSL 05E

Human skeletal muscle may be regarded as an electro-mechanical transducer. Its physiological input is a neural signal originating at the alpha motoneurons in the spinal cord and its output is force and muscle contraction, these both being dependent on the external load. Some experimental data taken during voluntary efforts around the ankle joint and by direct electrical stimulation of the nerve are described. Some of these experiments are simulated by an analog model, the input of which is recorded physiological soleus muscle EMG. The output is simulated foot torque. Limitations of a linear model and effect of some nonlinearities are discussed. Author

**N73-10118\*** Michigan Univ., Ann Arbor.  
**THE USE OF A BATTERY OF TRACKING TESTS IN THE QUANTITATIVE EVALUATION OF NEUROLOGICAL FUNCTION**

B. S. Repa, J. W. Albers, A. R. Potvin, and W. W. Tourtellotte *In* NASA, Washington 7th Ann. Conf. on Manual Control 1972 p 119-128 refs

(Contract NSR-23-005-364; Grant GM-01289-07)

CSSL 05E

A tracking test battery has been applied in a drug trial designed to compare the efficacy of L-DOPA and amantadine to that of L-DOPA and placebo in the treatment of 28 patients with Parkinson's disease. The drug trial provided an ideal opportunity for objectively evaluating the usefulness of tracking tests in assessing changes in neurologic function. Evaluating changes in patient performance resulting from disease progression and controlled clinical trials is of great importance in establishing effective treatment programs. Author

**N73-10119\*** Massachusetts Inst. of Tech., Cambridge.  
**HUMAN DISORIENTATION IN A ROTATING SPACECRAFT**  
 Laurence R. Young *In* NASA, Washington, 7th Ann. Conf. on Manual Control 1972 p 125-128 refs

(Grants NGR-22-009-025; NGR-22-009-156)

CSSL 05E

The problem of disorientation in a rotating spacecraft is treated as an example of the general case of habituation to an unusual

motion environment using all sensors and active movements. The dynamic response of the sensors is stressed. Several avenues for work on combating disorientation are mentioned. Author

**N73-10120\*** Technische Univ., Berlin (West Germany). Inst. fuer Flugfuehrung und Luftverkehr.

**THE INFLUENCE OF A PREDICTION DISPLAY ON THE QUASI-LINEAR DESCRIBING FUNCTION AND REMNANT MEASURED WITH AN ADAPTIVE ANALOG-PILOT IN A CLOSED LOOP**

D. Dey *In* NASA, Washington 7th Ann. Conf. on Manual Control 1972 p 131-135 refs

CSSL 05E

The effect of a prediction display on the human transfer characteristics is explained with the aid of a quasi-linear model. The prediction display causes an increase of the gain factor and the lead factor, a diminishing of the lag factor and a decrease of the remnant. Altogether, these factors yield a smaller mean square value of the control deviation and a simultaneous decrease of the mean square value of the stick signal. Author

**N73-10121\*** Bolt, Beranek, and Newman, Inc., Cambridge, Mass.  
**ANALYTIC EVALUATION OF DISPLAY REQUIREMENTS FOR APPROACH TO LANDING**

David L. Kleinman and Sheldon Baron *In* NASA, Washington 7th Ann. Conf. on Manual Control 1972 p 137-138 refs  
 Submitted for publication

CSSL 05E

A pilot-vehicle-display model is used to study information and display requirements and the effects on system performance and reliability of pilot-induced randomness, wind gusts, configurational changes, etc. A brief description of a control theoretic systems model is given and its use and validity are demonstrated by applying it in a piloted approach to landing situation. The analysis procedure assumes that the vehicle dynamics are represented by linearized equations of motion. Author

**N73-10122\*** National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.  
**PILOT PERFORMANCE WITH A SIMULATED ILS INDEPENDENCE PICTORIAL DISPLAY**

Everett Palmer and Thomas Wempe *In* its 7th Ann. Conf. on Manual Control 1972 p 139-154 refs

CSSL 05E

As part of a general investigation of the effectiveness of pictorial displays for manual control and monitoring of aircraft approaches and landings, a simulator study was conducted in which pilot performance with three pictorial displays was evaluated. These displays differed in the type of guidance symbology added to the basic perspective runway display. The effect of decreased resolution and update rate of the runway image on pilot performance was also determined. The results indicate that for pictorial displays with added guidance symbology, there was a marked improvement in pilot performance compared to results of a previous study in which the display consisted of only a runway image and aircraft attitude. Author

**N73-10123\*** Systems Technology, Inc., Inglewood, Calif.  
**EFFECTS OF DISPLAY FORMAT ON PILOT DESCRIBING FUNCTION AND REMNANT**

Henry R. Jex, R. Wade Allen, and R. E. Magdaleno *In* NASA, Washington 7th Ann. Conf. on Manual Control 1972 p 155-159 ref

(Contract F33615-69-C-1808)

CSSL 05E

As part of a program to develop a comprehensive theory of manual control displays, six display formats were used by three instrument-rated pilots to regulate against random disturbances with a controlled element under both foveal and 10 deg parafoveal viewing conditions. The six display formats were: CRT line, CRT thermometer bar, 14-bar quantized on a CRT, a rotary

dial and pointer, and two variations of a moving scale tape-drive. All were scaled to equivalent movement and apparent brightness. Measures included overall performance, describing functions, error remnant power spectra, critical instability scores, and subjective display ratings. The results show that the main effect of display format is on the loop closure properties. Less desirable displays induce lower bandwidth closures with consequent effects on the closed-loop remnant and performance. Author

**N73-10124\*** Systems Technology, Inc., Inglewood, Calif.  
**A DYNAMIC RESPONSE AND EYE SCANNING DATA BASE USEFUL IN THE DEVELOPMENT OF THEORIES AND METHODS FOR THE DESCRIPTION OF CONTROL/DISPLAY RELATIONSHIPS**  
 Richard Klein /in NASA, Washington 7th Ann. Conf. on Manual Control 1972 p 161-166 refs

(Contract NAS2-5690)  
 CSCL 05E

A set of specially prepared digital tapes is reported which contain synchronized measurements of pilot scanning behavior, control response, and vehicle response obtained during instrument landing system approaches made in a fixed-base DC-8 transport simulator. The objective of the master tape is to provide a common data base which can be used by the research community to test theories, models, and methods for describing and analyzing control/display relations and interactions. The experimental conditions and tasks used to obtain the data and the detailed format of the tapes are described. Conventional instrument panel and controls were used, with simulated vertical gust and glide slope beam bend forcing functions. Continuous pilot eye fixations and scan traffic on the panel were measured. Both flight director and standard localizer/glide slope types of approaches were made, with both fixed and variable instrument range sensitivities. Author

**N73-10125\*** Douglas Aircraft Co., Inc., Santa Monica, Calif.  
**CONTROL INFORMATION IN VISUAL FLIGHT**  
 J. M. Naish /in NASA, Washington 7th Ann. Conf. on Manual Control 1972 p 167-176 refs

CSCL 05E

The purpose of the inquiry is to determine how precisely a pilot can estimate the movements of his vehicle, and thus exercise control, during an unaided visual approach. The method is to relate changes in the forward view, due to movements along and across the approach path, to human visual thresholds and errors. The scope is restricted to effects of inclination, expansion, size, and rotation in runway features during approaches at small angles of elevation. Quantitative relations are given which provide a basis for ranking the several information mechanisms. Alignment by inclination of a ground line is found to be an accurate lateral mechanism, probably superior to the expansion mechanism. Vertical control mechanisms are complex, of questionable accuracy, and difficult to rank. The results throw some doubt on the usefulness of a runway symbol as a source of displayed information. Author

**N73-10126\*** Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).  
**ON THE DEPENDENCE OF INFORMATION DISPLAY QUALITY REQUIREMENTS UPON HUMAN CHARACTERISTICS AND PILOT/AUTOMATICS RELATIONS**  
 V. Wilckens /in NASA, Washington 7th Ann. Conf. on Manual Control 1972 p 177-183 refs

CSCL 05E

Present information display concepts for pilot landing guidance are outlined considering manual control as well as substitution of man by fully competent automatics. Display improvements are achieved by compressing the distributed indicators into an accumulative display and thus reducing information scanning.

Complete integration of quantitative indications, outer loop information, and real world display in a pictorial information channel geometry constitutes an interface with human ability to differentiate and integrate for optimal manual control of the aircraft. G.G.

**N73-10127\*** Massachusetts Inst. of Tech., Cambridge.  
**A BAYESIAN MODEL FOR VISUAL SPACE PERCEPTION**  
 Renwick E. Curry /in NASA, Washington 7th Ann. Conf. on Manual Control 1972 p 187-196 refs

CSCL 05E

A model for visual space perception is proposed that contains desirable features in the theories of Gibson and Brunswik. This model is a Bayesian processor of proximal stimuli which contains three important elements: an internal model of the Markov process describing the knowledge of the distal world, the a priori distribution of the state of the Markov process, and an internal model relating state to proximal stimuli. The universality of the model is discussed and it is compared with signal detection theory models. Experimental results of Kinchla are used as a special case. Author

**N73-10128\*** Forschungsinstitut fuer Anthropotechnik, Meckenheim (West Germany).  
**A PROPOSAL FOR PREPROCESSING, REDUCTION, AND SELECTION OF VISUAL INFORMATION IN AIRBORNE FLIGHT SIMULATION**  
 K.-P. Gaertner /in NASA, Washington 7th Ann. Conf. on Manual Control 1972 p 197-199 refs

CSCL 05E

A noncritical empirical detail-by-detail transformation of environmental information into flight display by purely physical methods characterizes the textured visual simulation as indiscernibly identical with the real scene. This method uses image storage, readout, image transformation, and graphic display to present a true color visual flight image to the pilot onboard aircraft in a purely electronic manner, employing analog-hybrid techniques. G.G.

**N73-10129\*** Michigan Univ., Ann Arbor.  
**MAPPING AN OPERATOR'S PERCEPTION OF A PARAMETER SPACE**  
 Richard W. Pew and Richard J. Jagacinski /in NASA, Washington 7th Ann. Conf. on Manual Control 1972 p 201-206 refs  
 Sponsored in part by NSF  
 (Contract NSR-23-005-364)

CSCL 05E

Operators monitored the output of two versions of the crossover model having a common random input. Their task was to make discrete, real-time adjustments of the parameters  $k$  and  $\tau$  of one of the models to make its output time history converge to that of the other, fixed model. A plot was obtained of the direction of parameter change as a function of position in the  $(\tau, k)$  parameter space relative to the nominal value. The plot has a great deal of structure and serves as one form of representation of the operator's perception of the parameter space. Author

**N73-10130\*** Systems Technology, Inc., Inglewood, Calif.  
**THE MEASUREMENT OF DRIVER DESCRIBING FUNCTIONS IN SIMULATED STEERING CONTROL TASKS**  
 David H. Weir and Charles K. Wojcik (Calif. Univ.) /in NASA, Washington 7th Ann. Conf. on Manual Control 1972 p 209-218 refs  
 Sponsored in part by Calif. Bus. and Transp. Agency and the Bur. of Public Roads

CSCL 05E

Measurements of driver describing functions in steering control tasks have been made using a driving simulator. The task was to regulate against a random crosswind gust input on a straight roadway, in order to stay in the center of the lane. Although

driving is a multiloop task in general, the forcing function and situation were configured so that an inner-loop visual cue feedback of heading angle of heading rate would dominate, and the driver's response was interpreted to be primarily single-loop. The driver describing functions were measured using an STI describing function analyzer. Three replications for each subject showed good repeatability within a subject. There were some intersubject differences as expected, but the crossover frequencies, effective time delays, and stability margins were generally consistent with the prior data and models for similar manual control tasks. The results further confirm the feasibility of measuring human operator response properties in nominal control tasks with full (real-world) visual field displays. Author

**N73-10131\*** Wright State Univ., Dayton, Ohio.  
**SOME INTERACTIONS AMONG DRIVER, VEHICLE, AND ROADWAY VARIABLES IN NORMAL DRIVING**  
Malcolm L. Ritchie, John M. Howard, and W. David Myers *In* NASA, Washington 7th Ann. Conf. on Manual Control 1972 p 219-222 refs  
CSCL 05E

Effects of road and vehicle conditions, visual warning signs, direction of turns, night time, and skill on automobile driver performance are studied in several experiments. Considered criteria are variability in speed and acceleration. G.G.

**N73-10132\*** California Univ., Berkeley.  
**ESTIMATION OF AUTOMOBILE-DRIVER DESCRIBING FUNCTION FROM HIGHWAY TESTS USING THE DOUBLE STEERING WHEEL**  
P. Delp, E. R. F. W. Crossman, and H. Szostak *In* NASA, Washington 7th Ann. Conf. on Manual Control 1972 p 223-236 refs  
(Grant AC-00260-02)  
CSCL 05E

The automobile-driver describing function for lateral position control was estimated for three subjects from frequency response analysis of straight road test results. The measurement procedure employed an instrumented full size sedan with known steering response characteristics, and equipped with a lateral lane position measuring device based on video detection of white stripe lane markings. Forcing functions were inserted through a servo driven double steering wheel coupling the driver to the steering system proper. Random appearing, Gaussian, and transient time functions were used. The quasi-linear models fitted to the random appearing input frequency response characterized the driver as compensating for lateral position error in a proportional, derivative, and integral manner. Similar parameters were fitted to the Gabor transformed frequency response of the driver to transient functions. A fourth term corresponding to response to lateral acceleration was determined by matching the time response histories of the model to the experimental results. The time histories show evidence of pulse-like nonlinear behavior during extended response to step transients which appear as high frequency remnant power. Author

**N73-10133\*** Systems Technology, Inc., Inglewood, Calif.  
**VISUAL MOTOR RESPONSE OF CREWMEN DURING A SIMULATED 90 DAY SPACE MISSION AS MEASURED BY THE CRITICAL TASK BATTERY**  
Wade Allen and Henry R. Jex *In* NASA, Washington 7th Ann. Conf. on Manual Control 1972 p 239-246 refs

(Contract NAS2-4405)  
CSCL 05E

In order to test various components of a regenerative life support system and to obtain data on the physiological and psychological effects of long-duration exposure to confinement in a space station atmosphere, four carefully screened young men were sealed in space station simulator for 90 days. A tracking test battery was administered during the above experiment. The battery included a clinical test (critical instability task) related to the subject's dynamic time delay, and a conventional steady tracking task, during which dynamic response (describing functions) and performance measures were obtained.

Good correlation was noted between the clinical critical instability scores and more detailed tracking parameters such as dynamic time delay and gain-crossover frequency. The comprehensive data base on human operator tracking behavior obtained in this study demonstrate that sophisticated visual-motor response properties can be efficiently and reliably measured over extended periods of time. Author

**N73-10134\*** Bolt, Beranek, and Newman, Inc., Cambridge, Mass.  
**PREDICTION AND ANALYSIS OF HUMAN PERFORMANCE IN A VTOL HOVER TASK**  
Sheldon Baron and David L. Kleinman *In* NASA, Washington 7th Ann. Conf. on Manual Control 1972 p 247-256 refs

(Contract NAS12-104)  
CSCL 05E

An optimal control model is used to predict pilot performance in a series of longitudinal hovering tasks. Configurational changes are considered that alter significantly the system response to both control and disturbance inputs. Model predictions of mean-squared performance are compared with measurements obtained in an independent experimental study of the task. In addition, the optimal control model is used to predict describing functions that correspond to the loop closing pilot transfer functions frequently employed in classical multiloop manual control analyses. Author

**N73-10135\*** Princeton Univ., N.J.  
**A PERFORMANCE MEASURE FOR MANUAL CONTROL SYSTEMS**  
Theodor A. Dukes and Pershing B. Sun *In* NASA, Washington 7th Ann. Conf. on Manual Control 1972 p 257-263 refs

(Contract DA-28-043-AMC-02412(E))  
CSCL 05E

A new performance measure is introduced for multivariable closed loop experiments with a human operator. The essential feature of the phase margin performance measure (PMPM) is that the performance of each control loop can be determined independently, with prescribed disturbance and error levels. A variable filter parameter is used as the PMPM within the loop and it assures a high workload at the same time. There is a straightforward relationship between the PMPM and the inner loop feedback augmentation that can be utilized in trade-off studies. An adjustment scheme that seeks the PMPM automatically is described as employed in a single loop control task. This task applies directly to the experimental study of displays for helicopters and VTOL aircraft. Author

**N73-10136\*** Systems Technology, Inc., Inglewood, Calif.  
**SERIAL SEGMENT METHOD FOR MEASURING REMNANT**  
R. E. Magdaleno *In* NASA, Washington 7th Ann. Conf. on Manual Control 1972 p 265-269 refs

CSCL 05E

For tracking tasks where a sum of sine waves forcing function is used it is often difficult and/or expensive to obtain the pilot's remnant in the vicinity of the sine waves. For the case where each sine wave has at least four times an integer number of cycle per run length, this paper illustrates the serial segments method for measuring remnant power spectral density in a frequency band centered on each sine wave. This method can be implemented on digital, hybrid, or analog Fourier coefficient analyzers, and is particularly advantageous on the latter since properties of Fourier coefficients are exploited to yield both a remnant measure and an improved estimate of the correlated component. Author

**N73-10137\*** Honeywell, Inc., Minneapolis, Minn.  
**A DESIGN PROCEDURE AND HANDLING QUALITY CRITERIA FOR LATERAL DIRECTIONAL FLIGHT CONTROL SYSTEMS**

G. Stein and A. H. Henke *In* NASA, Washington 7th Ann. Conf. on Manual Control 1972 p 271-284 refs

(Contract F33615-70-C-1190)  
CSCL 05E

A practical design procedure for aircraft augmentation systems is described based on quadratic optimal control technology and handling-quality-oriented cost functionals. The procedure is applied to the design of a lateral-directional control system for the F4C aircraft. The design criteria, design procedure, and final control system are validated with a program of formal pilot evaluation experiments. Author

**N73-10138\*** Air Force Systems Command, Wright-Patterson AFB, Ohio.

**APPLICATION OF MANUAL CONTROL THEORY TO THE STUDY OF BIOLOGICAL STRESS**

Clyde R. Repogle, Frank M. Holden, and Carroll N. Iay *In* NASA, Washington 7th Ann. Conf. on Manual Control 1972 p 285-289 ref

CSCL 05E

A study was run using both a stable, third-order task and an adaptive first-order unstable task singly and in combination to test the effects of 2 min hypoxia (22000 ft) on human operator. The results indicate that the RMS error in the stable task does not change as a function of hypoxic stress whereas the error in an unstable task changes significantly. Models involving human operator parameter changes and noise injection are discussed. Author

**N73-10139\*** National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.

**HUMAN TRANSFORMATION RATES DURING ONE-TO-FOUR AXIS TRACKING WITH A CONCURRENT AUDIO TASK**

Daniel L. Baty *In* its 7th Ann. Conf. on Manual Control 1972 p 293-306 refs

CSCL 05E

The information processing rates of six subjects performing one-, two-, three-, and four-axis compensatory tracking tasks, with and without a concurrent four-choice auditory task were determined. The purpose was to obtain further evidence concerning the nature of an hypothesized ceiling on human transformation rates. Interference was found among tasks, but the evidence concerning a ceiling on information processing rates was inconclusive. Author

**N73-10140\*** California Univ., Los Angeles.

**THE EFFECTS OF ATTENTION SHARING IN A DYNAMIC DUAL TASK ENVIRONMENT**

R. C. Cliff *In* NASA, Washington 7th Ann. Conf. on Manual Control 1972 p 307-325 refs

CSCL 05E

There are numerous examples of cases where the human operator is confronted with several tasks occurring simultaneously and continuously in time. The current study is an investigation into the nature of attention sharing between two continuous tasks with independent input-output modes. Eleven subjects were tested using a zero order compensatory control task with three levels of difficulty (input bandwidth) for each subject. As a secondary task on half of the trials, the subjects were also required to verbally shadow a random auditory input. Results from an extensive time and frequency domain analysis of the data are presented and discussed. The evidence supports a single channel model for continuous dual-task control. Author

**N73-10141\*** Systems Technology, Inc., Inglewood, Calif.

**MOTION CUE EFFECTS ON PILOT TRACKING**  
Robert F. Ringland and Robert L. Stapleford *In* NASA, Washington 7th Ann. Conf. on Manual Control 1972 p 327-338 refs

(Contracts NAS2-3650; NAS2-5261)  
CSCL 05E

The results of two successive experimental investigations of the effects of motion cues on manual control tracking tasks are reported. The first of these was an IFR single-axis VTOL roll attitude control task. Describing function data show the dominant motion feedback quantity to be angular velocity. The second experimental task was multi-axis, that of precision hovering of a VTOL using separated instrument displays with reduced motion amplitude scaling. Performance data and pilot opinion show angular position to be the dominant cue when simulator linear motion is absent. Author

**N73-10142\*** Connecticut Univ., Storrs.

**HUMAN OPERATOR DYNAMICS FOR AURAL COMPENSATORY TRACKING**

Edward W. Vinje (United Aircraft Res. Labs.) and Edward T. Pitkin *In* NASA, Washington 7th Ann. Conf. on Manual Control 1972 p 339-348 refs

CSCL 05E

The human operator's ability to control using aural information only and using combined aural and visual displays was investigated for a simple tracking task. Tracking error was presented to the test subjects using one- and two-ear displays. For both displays the pitch of the tone represented the magnitude of the tracking error. The operator's aural control characteristics were modeled as a describing function plus a remnant. The effects on the measured describing function and remnant of different system dynamics, changes in the frequency content of the input and different displays were determined during the study. The describing function and remnant data indicate that humans can control as well with aural cues as with visual cues for the task considered. However, the reduction in operator time delays, expected because of the generally faster human response to aural stimuli, was not evident in the results. It was also determined that the operators could control equally well with either the one- or two-ear display. Author

**N73-10143\*** Stanford Research Inst., Calif.

**A COMPUTER ASSISTED TELEOPERATOR CONTROL STATION WITH TACTILE FEEDBACK**

J. W. Hill and J. C. Bliss *In* NASA, Washington 7th Ann. Conf. on Manual Control 1972 p 349-361 refs

(Contract NAS2-5409)

CSCL 05E

A computer-assisted teleoperator control system for making comparative performance evaluations is described. A local and a remote control station, each with decision-making capability, communicate with each other through a simulated time delay. Supervisory control at three increasingly automatic levels is possible. The highest level of programmed control is facilitated through the ARM language which was developed to permit easily readable program manuscripts to be written and assembled into programs of motions by novice programmers. Experimental results show the advantage of this form of supervisory control with both direct and delayed (3 sec) manipulation tasks. In addition, two systems to measure and reproduce force distributions have been designed. One system reproduces contact on the external surfaces of the remote hand using 21 airjet simulators. Another system reproduces the shape of the contact between object and jaws using 288 piezoelectric (bimorph) stimulators. Author

**N73-10144#** Joint Publications Research Service, Arlington, Va.

**PROCESSING OF MEDICAL INFORMATION AND ASSESSMENT OF WORK CAPACITY IN SPACE FLIGHT**

2 Nov. 1972 23 p refs Transl. into ENGLISH from Kosm. Issled (Moscow), no. 4, 1972 p 614-619 (JPRS-57417) Avail: NTIS HC \$3.25

Articles, analyzing the motor efficiency of a cosmonaut in flight and the use of sample quantiles to condense, telemeter, and statistically process medical information are presented. Author

**N73-10145\*#** Autonetics, Anaheim, Calif.  
**ANALYSIS OF A DISPLAY AND CONTROL SYSTEM  
 MAN-MACHINE INTERFACE CONCEPT. VOLUME 1: FINAL  
 TECHNICAL REPORT**

D. R. Karl 8 Sep. 1972 214 p refs  
 (Contract NAS9-12266)  
 (NASA-CR-128576; C71-999/401-Vol-1) Avail: NTIS HC  
 \$12.75 CSCL 05E

An evaluation was made of the feasibility of utilizing a simplified man machine interface concept to manage and control a complex space system involving multiple redundant computers that control multiple redundant subsystems. The concept involves the use of a CRT for display and a simple keyboard for control, with a tree-type control logic for accessing and controlling mission, systems, and subsystem elements. The concept was evaluated in terms of the Phase B space shuttle orbiter, to utilize the wide scope of data management and subsystem control inherent in the central data management subsystem provided by the Phase B design philosophy. Results of these investigations are reported in four volumes. Author

**N73-10146\*#** Autonetics, Anaheim, Calif.  
**ANALYSIS OF A DISPLAY AND CONTROL SYSTEM  
 MAN-MACHINE INTERFACE CONCEPT. VOLUME 2:  
 APPENDICES A AND B Final Report**

D. R. Karl 8 Sep. 1972 152 p  
 (Contract NAS9-12266)  
 (NASA-CR-128577; C71-999/401-Vol-2) Avail: NTIS HC  
 \$9.75 CSCL 05E

**N73-10147\*#** Autonetics, Anaheim, Calif.  
**ANALYSIS OF A DISPLAY AND CONTROL SYSTEM  
 MAN-MACHINE INTERFACE CONCEPT. VOLUME 3:  
 APPENDICES C, D AND E Final Report**

D. R. Karl 8 Sep. 1972 93 p  
 (Contract NAS9-12266)  
 (NASA-CR-128578; C71-999/401-Vol-3) Avail: NTIS HC  
 \$6.75 CSCL 05E

**N73-10148\*#** Autonetics, Anaheim, Calif.  
**ANALYSIS OF A DISPLAY AND CONTROL SYSTEM  
 MAN-MACHINE INTERFACE CONCEPT. VOLUME 4:  
 APPENDIX F Final Report**

D. R. Karl 8 Sep. 1972 78 p  
 (Contract NAS9-12266)  
 (NASA-CR-128579; C71-999/401-Vol-4) Avail: NTIS HC  
 \$6.00 CSCL 05E

**N73-10149\*#** Fairchild Republic Div., Farmingdale, N.Y.  
**SPACECRAFT SANITATION AGENT DEVELOPMENT Final  
 Report**

18 Aug. 1972 74 p  
 (Contract NAS9-12205)  
 (NASA-CR-128591; MS142Y0004) Avail: NTIS HC \$5.75 CSCL  
 06I

The development of an effective sanitizing agent that is compatible with the spacecraft environment and the human occupant is discussed. Experimental results show that two sanitation agents must be used to satisfy mission requirements: one agent for personal hygiene and one for equipment maintenance. It was also recommended that a water rinse be used with the agents for best results, and that consideration be given to using the agents pressure packed or in aerosol formulations. E.H.W.

**N73-10150\*#** URS/Matrix Co., Essex, Md. Life and Environmen-  
 tal Sciences Div.  
**STUDY OF ASTRONAUT RESTRAINTS AND MOBILITY  
 AIDS IN A WEIGHTLESS SHIRTSLEEVE ENVIRONMENT**

Harry L. Loats, Jr. and G. Samuel Mattingly 27 Sep. 1972  
 73 p  
 (Contract NAS9-12574)  
 (NASA-CR-128590; PRL-339) Avail: NTIS HC \$5.75 CSCL  
 06K

A study, established to produce needed information about manual performance limits in intravehicular weightlessness such as the motions induced by the astronaut's direct application of force against the body of the vehicle or an object to be moved, is presented. Using both conventional and water immersion techniques, it was possible to develop realistic time estimates for astronaut station-to-station translation in Skylab, to simulate and analyze specific Skylab tasks involving force application and motion dynamics, and to evaluate certain thresholds of force application in weightlessness. The study was divided into three tasks. The first related to locomotion and verification or modification of present Skylab translation timelines. In all cases, translation times were less than the Skylab timelines indicated. The second task studied mass handling and transfer. Specifically, this involved measurement of the astronaut's ability to relocate the Skylab food lockers to stowage levels of three different heights and his ability to transfer the M509 PSS bottles between the OWS and the recharge station. The third task helped define the physical limits of man's ability to perform Skylab translation tasks under weightless conditions. Author

**N73-10151\*#** General Electric Co., Philadelphia, Pa. Reentry  
 and Environmental Systems Div.  
**EXPERIMENTS EVALUATING COMPLIANCE AND FORCE  
 FEEDBACK EFFECT ON MANIPULATOR PERFORMANCE  
 Final Report**

D. A. Kugath 25 Aug. 1972 66 p  
 (Contract NAS9-12536)  
 (NASA-CR-128605; DOC-72CAMSS100; MSC-07239) Avail:  
 NTIS HC \$5.50 CSCL 05E

The performance capability was assessed of operators performing simulated space tasks using manipulator systems which had compliance and force feedback varied. Two manipulators were used, the E-2 electromechanical man-equivalent (force, reach, etc.) master-slave system and a modified CAM 1400 hydraulic master-slave with 100 lbs force capability at reaches of 24 ft. The CAM 1400 was further modified to operate without its normal force feedback. Several experiments and simulations were performed. The first two involved the E-2 absorbing the energy of a moving mass and secondly, guiding a mass thru a maze. Thus, both work and self paced tasks were studied as servo compliance was varied. Three simulations were run with the E-2 mounted on the CAM 1400 to evaluate the concept of a dexterous manipulator as an end effector of a boom-manipulator. Finally, the CAM 1400 performed a maze test and also simulated the capture of a large mass as the servo compliance was varied and with force feedback included and removed. Author

**N73-10152\*#** Boeing Co., Seattle, Wash.  
**DEGRADATION OF LEARNED SKILLS. A REVIEW AND  
 ANNOTATED BIBLIOGRAPHY**

Gene R. Gardlin and Thomas E. Sitterely Jun. 1972 125 p  
 refs  
 (Contract NAS9-10962)  
 (NASA-CR-128611; D180-15080-1) Avail: NTIS HC \$8.25  
 CSCL 05E

An overview of the literature dealing with the retention of learned skills is presented. Basic effects of task type, training, retention interval, and recall variables are discussed, providing a background against which more recent literature dealing with operational spaceflights tasks is compared and assessed. Detailed and summary abstracts of research reports having particular relevance to the problem of spaceflight skill retention are provided. Author

**N73-10153\*#** Boeing Co., Seattle, Wash.  
**DEGRADATION OF LEARNED SKILLS. EFFECTIVENESS  
 OF PRACTICE METHODS ON SIMULATED SPACE FLIGHT**

**SKILL RETENTION Technical Report, Jul. 1970 - May 1971**  
 Thomas E. Sitterley and Wayne A. Berge Jul. 1972 96 p  
 refs  
 (Contract NAS9-10962)  
 (NASA-CR-128612; D180-15081-1) Avail: NTIS HC \$7.00  
 CSCL 051

Manual flight control and emergency procedure task skill degradation was evaluated after time intervals of from 1 to 6 months. The tasks were associated with a simulated launch through the orbit insertion flight phase of a space vehicle. The results showed that acceptable flight control performance was retained for 2 months, rapidly deteriorating thereafter by a factor of 1.7 to 3.1 depending on the performance measure used. Procedural task performance showed unacceptable degradation after only 1 month, and exceeded an order of magnitude after 4 months. The effectiveness of static rehearsal (checklists and briefings) and dynamic warmup (simulator practice) retraining methods were compared for the two tasks. Static rehearsal effectively countered procedural skill degradation, while some combination of dynamic warmup appeared necessary for flight control skill retention. It was apparent that these differences between methods were not solely a function of task type or retraining method, but were a function of the performance measures used for each task. Author

**N73-10154\*#** National Aeronautics and Space Administration, Washington, D.C.

**SOME RESULTS OF THE DEVELOPMENT AND INVESTIGATION OF INSTRUMENTS FOR MONITORING THE CARDIOVASCULAR SYSTEM**

I. N. Krayev Jul. 1972 13 p refs Transl. into ENGLISH from the publ. "Avtomaticheskii kontrol i metody elektricheskikh izmerenii, Vol. 2" Novosibirsk, Nauka, 1971 p 190-197  
 (NASA-TT-F-14492) Avail: NTIS HC \$3.00 CSCL 06B

A set of electronic instruments developed to study the heart, and to obtain more correct information on the functioning of the heart, is discussed. Included are a blood analyzer, an instrument for studying the blood coagulation process, an automatic sphygmomanometer, and an electromagnetic blood flow meter. Author

**N73-10155\*#** National Aeronautics and Space Administration, Washington, D.C.

**LIFE SUPPORT SYSTEMS OF SPACECRAFT**

G. Voronin, A. Polivoda, and Ye. Vinogradov Jun. 1972 15 p  
 Transl. into ENGLISH from Aviat. Kosmonavt. (Moscow), v. 9, 1966 p 44-47  
 (NASA-TT-F-14436) Avail: NTIS HC \$3.00 CSCL 06K

The supply and biosynthetic systems for the life support of a spacecraft are discussed, along with the regenerated physico-chemical systems. J.A.M.

**N73-10156\*#** National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.

**MEDICAL INFORMATION MANAGEMENT SYSTEM (MIMS): A GENERALIZED INTERACTIVE INFORMATION SYSTEM**

Sidney Alterescu, Ronald A. Schwarz (Federal City Coll.), and Louis S. Collins (Federal City Coll.) Sep. 1972 113 p  
 (NASA-TM-X-66076; X-207-72-374) Avail: NTIS HC \$7.75  
 CSCL 05B

An interactive information system is described. It is a general purpose, free format system which can offer immediate assistance where manipulation of large data bases is required. The medical area is a prime area of application. The report is designed to serve as a manual for potential users- nontechnical personnel who will use the system. Examples of the system's operation, commentary on the examples, and a complete listing of the system program are included. Author

**N73-10157#** Royal Aircraft Establishment, Farnborough (England).

**SOME EXPERIMENTS ON THE FRICTION OF FABRICS ON HUMAN SKIN**

J. E. Swallow and M. Webb Mar. 1972 20 p refs

(RAE-TR-72037; BR-28659) Avail: NTIS HC \$3.00

A method is described for measuring the friction of fabrics on human skin with particular relevance to the comfort of aircrew tropical clothing. The effects of fabric wetness, skin hairiness, operator difference, normal load and direction of fabric threads relative to the direction of pull have been investigated for six tropical overall fabrics. Author (ESRO)

**N73-10158#** Human Resources Research Organization, Alexandria, Va.

**DETERMINING TRAINING DEVICE REQUIREMENTS IN FIXED WING AVIATOR TRAINING Final Report**

Paul W. Caro, Oran B. Jolley, Robert N. Isley, and Robert H. Wright Apr. 1972 61 p refs  
 (Contract DAHC19-70-C-0012)

(AD-744447; HumRRO-TR-72-11) Avail: NTIS CSCL 05/9

A systematic study of all fixed wing pilot training programs at the U.S. Army Aviation School was conducted in Fy 1968. The objective was to determine whether training might be made more effective through greater use of synthetic flight training equipment and, if so, to specify the main characteristics of appropriate equipment. Secondary objectives were to assist in developing low cost devices for one course and to determine the probable cost-effectiveness of a commercially available device in another. A method was developed which identified specific and differential needs for synthetic equipment in each course and determined suitability of existing equipment to meet those needs. A generalizable, systematic method for determining requirements for synthetic training equipment in existing training programs resulted. Author (GRA)

**N73-10159#** American Inst. of Aeronautics and Astronautics, New York.

**AIAA EMPLOYMENT WORKSHOPS. VOLUME 2: AN ANALYTIC REPORT ON SOME EFFECTS OF TWENTY-TWO WORKSHOPS Final Report, 1 Sep. 1970 - 31 Dec. 1971**

Leonard Smith Jan. 1972 72 p

(Contract DL-82-36-71-01)

(PB-209367; DLMA-82-36-71-01-2-Vol-2) Avail: NTIS HC \$3.00 CSCL 051

Volume 2 of a two volume report is a detailed analysis made of attendees of 22 selected employment workshops put on by the American Institute of Aeronautics and Astronautics, the purpose of which was to teach unemployed aerospace and defense engineers and scientists how to look for work competitively. The attendees were surveyed during and at the conclusion of the three session workshops, two months after the conclusion of the workshop and six months after the conclusion of the workshop. The volume reports in detail on the profile of the attendees, their attitudes and their successes and failures in job hunting, what kinds of jobs they sought and found, and to what those who were successful attributed that success. GRA

**N73-10160#** Army Natick Labs., Mass. Clothing and Personal Life Support Equipment Lab.

**THE BODY SIZE OF SOLDIERS: US ARMY ANTHROPOMETRY, 1966 Final Report, 1966 - 1971**

Robert M. White Dec. 1971 342 p refs

(DA Proj. 1K0-24701-A-122)

(AD-743465; C/PLSEL-94; USA-NLABS-TR-72-51-CE) Avail: NTIS CSCL 06/1

As a part of the U.S. Armed Forces anthropometric surveys of 1966, a sample of 6682 Army men was measured, including basic trainees, infantrymen, armored crewmen, and aviation personnel. Seventy body measurements were taken on each man. The anthropometric data from this survey are presented and discussed. These new data represent the first major updating of body size information on U.S. Army personnel since the Army anthropometric survey of 1946. Changes in the body size of Army men between 1946 and 1966 are discussed and the Army data are compared with anthropometric data from other services. Author (GRA)

**N73-10161#** Air Force Human Resources Lab., Williams AFB, Ariz. Flying Training Div.  
**EVALUATION OF AIRBORNE AUDIO-VIDEO RECORDINGS AS A TOOL FOR TRAINING IN THE A-7D TACTICAL FIGHTER**

Joe A. Fitzgerald and David L. Moulton Oct. 1971 9 p  
 (AF Proj. 1123)

(AD-744041; AFHRL/FT-TR-72-55) Avail: NTIS CSCL 05/9

The report documents the results of a study to evaluate an airborne audio video recording system in a Head-Up Display (HUD) equipped fighter aircraft, the A-7D, as a method of improving the quality of training. The results, although lacking quantitative rigor, indicate that the use of audio video recording equipment can be of real value in the training of fighter pilots. It is recommended that such capability be a basic design consideration in all new fighter aircraft. Author (GRA)

**N73-10162#** Anthropology Research Project, Yellow Springs, Ohio.

**ANTHROPOMETRY OF US ARMY AVIATORS, 1970** Final Report, Nov. 1969 - Dec. 1971

Edmund Churchill, John T. McConville, Lloyd L. Laubach, and Robert M. White Dec. 1971 342 p refs

(Contract DAAG17-70-C-0055)

(AD-743528; USA-NLABS-TR-72-52-CE) Avail: NTIS CSCL 06/14

The report describes an anthropometric survey of U.S. Army aviators conducted at Fort Rucker, Alabama in 1970. Data for 85 body size measurements and for several variables describing the socio-military background of the survey subjects were gathered on a sample of 1482 flying personnel. Statistical summaries are presented for each measurement for the entire sample and for five subseries: enlisted men (crew chiefs, mechanics, door gunners), warrant officer and warrant officer candidate trainees, warrant officer rated pilots, commissioned trainees, and commissioned pilots. Summary statistics and percentiles for 80 anthropometric indices and for some 73 anthropometric variables computed from the measured dimensions are given, as is the correlation matrix for the measured variables and age.

Author (GRA)

**N73-10163#** Naval Submarine Medical Center, Groton, Conn.  
**FURTHER TESTS OF TRAINING TECHNIQUES TO IMPROVE VISUAL-MOTOR COORDINATION OF NAVY DIVERS UNDERWATER** Interim Report

Christine L. McKay, Jo Ann S. Kinney, and S. M. Luria 26 Oct. 1971 15 p refs

(M430603)

(AD-744936; NSMRL-684) Avail: NTIS CSCL 05/9

Two underwater experiments were undertaken to facilitate a diver's adjustment to the underwater distortion. One group of divers was given previous exposure to magnifying lenses before entering the water while a second group received one training session a week for ten weeks. Neither technique significantly improved the amount of adaptation found in previous studies. Inter-subject variability was high, however, with one subject showing practically complete adjustment for the distortion. Some preliminary screening tests might be devised to select future divers on the basis of relevant variables, including relative adaptability. Author (GRA)

**N73-10164#** Naval Postgraduate School, Monterey, Calif.  
**VIBRATION EFFECTS ON PILOT TRACKING PERFORMANCE USING A RIGID CONTROL STICK** M.S. Thesis

Peter Thomas Rodrick Mar. 1972 64 p refs

(AD-745193) Avail: NTIS CSCL 05/10

A simulator facility was built to study the effects of vibration on pilot tracking performance using a rigid control stick. Tests were conducted at frequencies from 5 to 50 hertz and accelerations up to 1.5 g's. Two vibration environments were studied: control stick vibration and whole body vibration. Twenty-two different frequency/g-level combinations were tested. The order of the runs was varied for each subject in an attempt to cancel out consistent learning effects. In general, performance scores

for whole body vibration were lower than those for control stick only vibration although g-levels were less. All subjects experienced greater discomfort on the whole body vibration tests. All subjects showed a noticeable drop in performance on some runs in the 20-25 Hz frequency range. Author (GRA)

**N73-10165#** Army Medical Research Lab., Fort Knox, Ky.  
**AUDITORY FEEDBACK AND CONDITIONING OF THE SINGLE MOTOR UNIT** Interim Report

Bruce C. Leibrecht, Andree J. Lloyd, and Sadie C. Pounder 15 Mar. 1972 13 p refs

(DA Proj. 3AO-61102-B-71-P)

(AD-745107; USAMRL-971) Avail: NTIS CSCL 05/10

The effects of direct auditory feedback of the electromyogram (EMG) on learning to control a single motor unit (SMU) were investigated. Seventeen human subjects were injected with bipolar fine-wire electrodes into the tibialis anterior muscle. A trial light indicated the onset of a trial. If the subject activated an SMU, a correct light appeared. A non-SMU response was followed by an incorrect light. All subjects received an initial training series with auditory EMG feedback followed by a retest at 2 weeks without EMG feedback. Speed of initial learning was substantially improved by direct EMG feedback. The nature and amount of learning, including the ability to use proprioceptive cues in controlling an SMU, were not affected, nor was retention of learning. Author (GRA)

**N73-10166#** Matrix Research Co., San Mateo, Calif.  
**UH-1H JOB PERFORMANCE TESTS (VNAF) SERIES TS-1**

1 Sep. 1971 24 p

(Contract F33615-70-C-1550)

(AD-745163) Avail: NTIS CSCL 05/9

The TS-1 test is one of a series of 10 advanced type job performance tests which were developed for an assessment of the effectiveness of the UH-1H (helicopter) job performance aids (JPA) in use by the Vietnamese Air Force (VNAF). It includes a test on troubleshooting and repairing a helicopter with a bad fuel start solenoid, procedures for inserting faults for correction, maintenance tasks, an information questionnaire on the technician's experience and training, a test of malfunction in helicopter starting, an instruction manual and guide, a performance evaluation sheet, and a form for recording the test conditions. GRA

**N73-10167#** Texas Univ., Austin.  
**BANDWIDTH REDUCTION OF SLEEP INFORMATION, VOLUME 2** Final Report, Sep. 1970 - Nov. 1971

A. J. Welch, Philip C. Richardson, Jane Mockford, and Joanne M. Aldredge 1 Nov. 1971 100 p refs

(Contract F41609-71-C-0002; AF Proj. 6319)

(AD-740946; TR-115-Vol-2) Avail: NTIS CSCL 06/2

The report discusses the possibility of extracting sleep information from heart rate data. Eight hours of sleep EEG, EOG and electrocardiograms were recorded on FM magnetic tape for two nights for each of eight subjects. The time in milliseconds between heart beats was written on digital magnetic tape. The data were grouped into records containing 128 consecutive beat-to-beat intervals and a large number of descriptors was computed for each record. These descriptors for each record were the mean value, the sample variance, the nine-interval histogram of Z scores, and a set of Fourier transforms. Analysis of variance was used as a general guide to descriptor significance for each subject. The discriminant analysis procedure described by Rao and popularized by Cooley and Lohnes was used to sleep stage classify heart rate data. Accuracy of the procedure was determined in terms of percent correct classifications, correlation coefficient of the computerized sleep pattern with respect to the EEG hand scored pattern, and an empirically derived cost function. Author (GRA)

**N73-10168#** American Inst. of Aeronautics and Astronautics, New York.

**AIAA EMPLOYMENT WORKSHOPS, VOLUME 1** Final Report, 1 Sep. 1970 - 31 Dec. 1971

Geoffrey A. Potter Jan. 1972 50 p  
(Contract DL-82-36-71-01)  
(PB-209366; DLMA-82-36-71-01-1-Vol-1) Avail: NTIS \$3.00  
CSCS 051

The report shows how and why AIAA devised and then operated 175 employment workshops for 14,600 unemployed engineers and scientists from the defense and aerospace industry in 43 cities across the country. Discussed are the successes and failures of the program and why AIAA thinks they happened. The workshops were designed to help unemployed professionals unaccustomed to having to look for work competitively to do so by teaching them through a peer group discussion technique how to understand the market situation. GRA

**N73-10169#** Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

**AN INVESTIGATION OF THE SYNCODER AS A PULSE INTERVAL PROCESSING DEVICE** M.S. Thesis

Richard B. Zellmer Jun. 1972 105 p refs  
(AD-746007; GGC/EE/72-19) Avail: NTIS CSCS 06/4

An investigation of a neural model called the syncoder is performed in which syncoder design, operation, and interconnected networks are reviewed. A regular rectangular-wave pulse train is used as a simulated neural pulse train, and a syncoder network capable of discriminating between temporally adjacent pulses is presented. This temporal discrimination device is then modified to create an interpulse interval recognition network capable of identifying rectangular wave interpulse intervals in the range 0.002 to 0.040 seconds. A syncoder network capable of detecting a simple pulse sequence defined by both spatial and temporal aspects of pulse occurrence is also developed. Finally, a conjectural scheme is suggested by which such interpulse interval and sequence detection devices might be combined to perform elementary neural information processing.

Author (GRA)

**N73-10170#** Army Test and Evaluation Command, Aberdeen Proving Ground, Md.

**LASER SAFETY GOGGLES** Final Report  
19 Jun. 1972 17 p refs

(AD-746208; TOP-10-3-198) Avail: NTIS CSCS 06Q

The report describes a method for the evaluation of laser safety goggles physical and functional performance characteristics. It identifies supporting test facilities and equipment required and provides procedures for preoperational inspection, physical characteristics; safety, personnel training, compatibility with combat tasks, durability, maintainability, human factors, and value analysis. The method is applicable to test without laser beam use. Tests for laser radiation screening out capability are excluded. Author (GRA)

**N73-11053** National Lending Library for Science and Technology, Boston Spa (England).

**DISORDERS OF THE NERVOUS SYSTEM IN DECOMPRESSION DISEASE**

G. A. Akimov, 10 Jul. 1972 13 p refs Transl. into ENGLISH from Zh. Nevropat. Psikhatr. (Moscow), v. 69, 1969 p 979-984 (NLL-DRIC-Trans-2788-(3623.66)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

On the basis of a clinical study of 56 cases with neurological symptoms in decompression sickness (caisson disease), the authors distinguished the following varieties: (1) cerebral forms, (2) spinal, (3) neural, and (4) obliterated. In 2 cases which were attributed to the cerebral (with comatose conditions) and spinal forms of decompression sickness, pathomorphological studies were also performed. It was established that the main significance should be connected with circulatory disturbances and the peculiarities of vascularization in the pathogenesis of nervous-system lesions. Author

**N73-11054\*** National Aeronautics and Space Administration, Washington, D.C.

**AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 106, SEPTEMBER 1972**

Sep. 1972 107 p refs  
(NASA-SP-7011(106)) Avail: NTIS HC \$3.00 CSCS 06E

This special bibliography lists 323 reports, articles, and other documents introduced into the NASA scientific and technical information system in August 1972. Author

**N73-11055\*** General Electric Co., Philadelphia, Pa.  
**CONVECTIONLESS ELECTROPHORETIC SEPARATION OF BIOLOGICAL PREPARATIONS** Final Report, 25 Jun. 1971 - 24 Jun. 1972

R. N. Griffin and L. R. McCreight 24 Jun. 1972 112 p refs  
(Contract NAS8-27797)

(NASA-CR-123920) Avail: NTIS HC \$7.75 CSCS 06A

Free electrophoresis in a zero gravity environment was investigated on the Apollo 14, and 16 flights. The Apollo 16 electrophoresis equipment and experiment are described along with the required ground-based testing. F.O.S.

**N73-11056\*** Brown Univ., Providence, R.I. Center for Dynamical Systems.

**MATHEMATICAL MODELING OF THE GLUCOSE HOMEOSTASIS IN HUMANS**

H. T. Banks and Christin A. Carter Jul. 1972 49 p refs  
(Grant NGL-40-002-015; DA-AROD)-31-124-71-G12S2)

(NASA-CR-129171; Lecture-Notes-72-1) Avail: NTIS HC \$4.50 CSCS 06S

A model of the glucose homeostasis system that allows in vivo validation is examined. A preliminary version of the model is given. E.H.W.

**N73-11057#** Defence Research Board, Ottawa (Ontario). Aviation Medical Research Unit.

**DRB AVIATION MEDICAL RESEARCH UNIT REPORTS, VOLUME 2: 1968-1971**

G. Melvill Jones, comp. Aug. 1972 235 p refs Prepared in cooperation with McGill Univ.

(DR-215) Avail: NTIS HC \$13.75

Relevant research in the field of sensory motor neurophysiology, in relation to orientation and disorientation in aerospace environments, is reported. Specific information cover the characteristics of mechanical neurological and subjective sensory response of the vestibular system to real movement-stimuli, with the intention of describing the basic capabilities of the system and the failure of these capabilities to match the extended movement environment of flight and space.

**N73-11058** Defence Research Board, Ottawa (Ontario).  
**THE FUNCTIONAL SIGNIFICANCE OF SEMICIRCULAR CANAL SIZE**

G. Melvill Jones *In its* DRB Aviation Med. Res. Unit Repts. Vol. 2: 1968-1971 Aug. 1972 p 1-15 refs Repr. of chapter in "Handbook of Sensory Physiology" v. 6 Berlin, Springer, 1969

(AMRU-R-69-1)

The influence of four physical dimensions of the semicircular canal on physiological processes is examined. Criteria examined included (1) ratio of viscous forces to inertia, (2) flow patterns generated by normal head movement, (3) very small Reynolds numbers encountered, and (4) damping. E.H.W.

**N73-11059** Defence Research Board, Ottawa (Ontario).  
**CHARACTERISTICS OF NEURAL TRANSMISSION FROM THE SEMICIRCULAR CANAL TO THE VESTIBULAR NUCLEI OF CATS**

G. Melvill Jones and J. H. Milsum, *In its* DRB Aviation Med. Res. Unit Repts. Vol. 2: 1968-1971. Aug. 1972 p 16-36 refs Repr. from J. Physiol. (London), no. 209, 1970 p 295-316

(AMRU-R-70-2)

The characteristics of the dynamic response of specifically canal-dependent neural units in cat vestibular nuclei were examined during sinusoidal rotation of the head in decerebrate cats over the narrow frequency range 0.25 to 1.7 Hz. Unit

action potential frequencies were averaged on line from extra-cellular steel micro-electrodes stereotaxically located in the vestibular nuclei through the intact cerebellum. Action potential frequency was approximately in phase with stimulus angular velocity, the mean phase for forty-six units being  $+11.4$  deg (S.E. of the mean  $\pm$  or  $-2.2$  deg). Correction for a form of dynamic asymmetry reduced this value almost to zero. Directionality was examined in 116 units, of which 62% were ipsilateral (e.g. calls on left side excited by left-going rotational velocity) and 38% contralateral. No significant differences in mean phase or gain were found in the sub-sets of spontaneously active/inactive cells and ipsilateral/contralateral cells. It is inferred that the cell population examined was a functionally homogeneous one in which the neural signal was closely tied to the angular velocity of canal rotation for the narrow band of sinusoidal rotational stimuli here employed. Author

**N73-11060** Defence Research Board, Ottawa (Ontario).  
**DYNAMIC ASYMMETRY IN NEURAL COMPONENTS OF THE VESTIBULAR SYSTEM**

J. H. Milsum and G. Melvill Jones *In its* DRB Aviation Med. Res. Unit Repts. Vol. 2: 1968-1971 Aug. 1972 p 37-55 refs Repr. from Ann. N. Y. Acad. Sci., no. 156, 1969 p 851-871

(AMRU-R-69-2)

An asymmetric form of shaping in the neural response to symmetric sinusoidal rotational stimulation of the semicircular canals was quantitatively examined in 24 decerebrate cats. Asymmetry in the neural response was defined as the ratio of the times from commencement of firing to maximum frequency and from maximum frequency to cessation of firing (skew ratio, Sk). For cells firing through more than half a cycle this characterization was determined from a duration equal to one-half cycle. The results from 141 averaged responses gave an Sk value of 0.84 indicating an overall tendency to development of an asymmetric, or a skewed, response. When responses firing all-round the cycle (32) were separated from those exhibiting threshold cutoff at some point in the cycle (109), respective Sk values of 0.95 and 0.78 were obtained. From these results, it is concluded that the rising phase of action potential frequency was significantly sharper (steeper) than the falling phase in cutoff responses, but that this was not the case for all-round-firing responses. The asymmetric response was largely independent of stimulus period over the whole range employed. Author

**N73-11061** Defence Research Board, Ottawa (Ontario).  
**RESPONSE OF SEMICIRCULAR CANAL DEPENDENT UNITS IN VESTIBULAR NUCLEI TO ROTATION OF A LINEAR ACCELERATION VECTOR WITHOUT ANGULAR ACCELERATION**

A. J. Benson, F. E. Gaudry, and G. Melvill Jones *In its* DRB Aviation Med. Res. Unit Repts. Vol. 2: 1968-1971 Aug. 1972 p 56-74 refs Repr. from J. Physiol. (London), no. 210, 1970 p 475-494. (AMRU-R-70-4)

Discharge frequencies of specifically lateral canal-dependent neural units in the vestibular nuclei of decerebrate cats were recorded in their spontaneous condition and when the animal was exposed to motion which generated a linear centripetal acceleration vector of  $4.4$  m/sec sq rotating round the head at  $0.52$  rev/sec. The motion did not include angular acceleration of the animal. Without exception all canal-dependent cells examined (29 cells in 9 cats) were more active during rotation of the vector in the direction of endolymph circulation shown to be excitatory to the individual cells, than during vector rotation in the opposite direction. The average change in discharge frequency due to rotation of the vector was commensurate with the involuntary oculomotor response induced by the same stimulus in the intact animal. The results suggest that the canals can be stimulated by the rotation of an appropriate linear acceleration vector. Author

**N73-11062** Defence Research Board, Ottawa (Ontario).  
**A QUANTITATIVE STUDY OF VESTIBULAR ADAPTATION IN HUMANS**

R. Malcolm and G. Melvill Jones *In its* DRB Aviation Med. Res. Unit Repts. Vol. 2: 1968-1971 Aug. 1972 p 75-94 refs Repr. from Acta Oto-Laryngol. (Uppsala), no. 70, 1970 p 126-135. (AMRU-R-70-1)

A mathematical model for short term adaptation to vestibular stimuli was presented in which the physiological response is driven by a signal proportional to the difference between the peripheral end-organ response (Oc) and a central reference level (R) in such a way that,  $dR/dt$  is approximately  $(Oc - R)$ . From this relation a transfer function is derived relating slow phase angular velocity of resulting nystagmus to the angular velocity of head rotation. The resulting model was tested by comparing its responses to controlled step and ramp angular velocity stimuli with those of human subjects. A close match was obtained in all cases, which strongly supports the view that a significant adaptive effect is at play. The main time constant of the adaptive term was 82 sec (S.E. 6.5) and the mean cupular restoration time constant (T sub c) was 21 sec. It is suggested that previous values quoted for T sub c represent underestimates of the true value owing to superposition of the adaptive term here described. The adaptive term accounts well for the phenomenon of secondary nystagmus, especially during either strong stimuli or prolonged rotations. Some implications of the findings in relation to clinical and aviation medicine are discussed. Author

**N73-11063** Defence Research Board, Ottawa (Ontario).  
**ORIGIN SIGNIFICANCE AND AMELIORATION OF CORIOLIS ILLUSIONS FROM THE SEMICIRCULAR CANALS: A NON-MATHEMATICAL APPRAISAL**

G. Melvill Jones *In its* DRB Aviation Med. Res. Unit Repts. Vol. 2: 1968-1971 Aug. 1972 p 95-110 refs Repr. from Aerospace Med., no. 41, 1970 p 483-490

(AMRU-R-70-6)

The physical origin of so-called coriolis illusions deriving from semicircular canal stimulation is examined in the functional context of the aerospace environment. It is shown that in the whole-vestibulo-postural system it is not enough to calculate mechanical cross coupling effects in the end-organ. Effects such as optokinetic fixation, the direction of prevailing gravitational field, vestibular adaptation, and habituation may substantially modify reflex and perceptual responses to the sensory message received in the brain stem. Experimental evidence indicates that reflex vestibular stabilisation of the head probably acts to minimise cross coupling effects in man's natural life, and this suggests ways of ameliorating these effects in flight. Author

**N73-11064** Defence Research Board, Ottawa (Ontario).  
**EFFECT OF CHANGES IN ILLUMINATION LEVEL ON ELECTRO-OCULOGRAPHY (EOG)**

A. Gonshor and R. Malcolm *In its* DRB Aviation Med. Res. Unit Repts. Vol. 2: 1968-1971 Aug. 1972 p 111-115 refs Repr. from Aerospace Med., no. 42, 1971 p 138-140

(AMRU-R-71-1)

Changes occur in the corneo-retinal potential of the eye when the level of ambient illumination is altered. These changes can seriously affect electro-oculographic (EOG) records, a technique frequently used for measuring nystagmus. Some EOG calibrations were done on seven human subjects for periods during which the illumination was varied between normal room light, red light, and total darkness. The time dependence of the observed variations was established and seen to be reasonably consistent between all subjects. For purposes of EOG calibration, no difference was found between a red light environment and total darkness. When experiments are to be performed in the dark, or with eyes closed, it is strongly recommended that subjects be dark adapted for at least 50 minutes prior to calibrating and recording eye position. Author

**N73-11065** Defence Research Board, Ottawa (Ontario).  
**A MODEL OF EYE MOVEMENTS INDUCED BY HEAD ROTATION**

N. Sugie and G. Melvill Jones *In its* DRB Aviation Med. Res. Unit Repts. Vol. 2: 1968-1971 Aug. 1972 p 116-141

refs Repr. from IEEE, Trans. SSC, SMC-1, 1971 p 251-260

(AMRU-R-71-3)

It is well known that head rotation will induce eye movements known as rotational nystagmus, the slow phase of which compensates for head rotation fairly well, and the quick phase of which takes place intermittently in the opposite direction to the preceding slow phase. From both frequency and transient responses, it is confirmed that the slow phase velocity is proportional to the output of the semicircular canal, the main transducer of head rotation. The relationship between the canal output and the quick phase is also discussed. A simple model is proposed in which the quick phase and slow phase are separately generated. In cats under controlled ether anaesthesia, it is found that both phases of the rotational nystagmus can be decomposed into primary and secondary components, and a new model of the vestibulo-ocular system is proposed which includes the simultaneous influence of these two components. The model is analyzed to find a condition where the summed effect of primary and secondary components of response constituting the slow phase of rotational ocular nystagmus can be made proportional to the canal output. Many simulation results are presented to demonstrate the validity of the model. Author

**N73-11066** Defence Research Board, Ottawa (Ontario).  
**VESTIBULO-OCULAR RESPONSES IN MAN DURING SLEEP**  
G. Melvill Jones and N. Sugie *In its* DRB Aviation Med. Res. Unit Rept. Vol. 2: 1968-1971 Aug. 1972 p 142-162 refs Submitted for publication  
(AMRU-R-70-3)

The vestibulo-ocular response of human subjects to prolonged oscillatory rotational stimulation was investigated during various stages of sleep and arousal. Five stages of oculomotor response are described: (1) alert and awake but with eyes closed, (2) drowsy or light sleep, (3) deep sleep, (4) wandering eye movement without saccades, and (5) very deep sleep. The effects relative to each stage are given. It is proposed that these effects could be accounted for first by desynchronization of saccadic burst activity in oculomotor neurones and then by preferential suppressions of the resulting degraded, or smoothed saccadic signal relative to the primary compensatory one. Eventually in deep sleep suppression of both signals would lead to Stage 5. It is shown that appropriate modification of a previously described model of the vestibulo-ocular system of the cat can simulate the major findings on this basis. The Rapid eye movement (REM) phase of sleep was never observed during the continuous oscillatory stimulus, even though some experiments continued uninterrupted for up to 6 hours. Author

**N73-11067** Defence Research Board, Ottawa (Ontario).  
**ORGANIZATION OF NEURAL CONTROL OF THE VESTIBULO-OCULAR REFLEX ARC**  
G. Melvill Jones *In its* DRB Aviation Med. Res. Unit Repts. Vol. 2: 1968-1971 refs Repr. from "The Control of Eye Movements" London, Academic Press, 1971 p 497-518

(AMRU-R-71-2)

The hydrodynamic response of the vestibulo-ocular reflex arc is examined. Data cover angular velocity of rotational simulation, neural signals, oculomotor response, and influence of saccades on oculomotor response. E.H.W.

**N73-11068** Defence Research Board, Ottawa (Ontario).  
**NEURAL RESPONSE OF THE VESTIBULAR SYSTEM TO TRANSLATIONAL ACCELERATION**  
G. Melvill Jones and J. H. Milsum *In its* DRB Aviation Med. Res. Unit Repts. Vol. 2: 1968-1971 Aug. 1972 p 183-190 refs Repr. from Proc. of Symp. on Systems Analysis Approach to Neurophysiol. Probl. Brainherd, 1969 p 105-117

(AMRU-R-69-3)

The sensitivity, trigonometric resolution, and phase of unit responses were investigated in specifically otolith-dependent cells in the vestibular nuclei of cats during sinusoidal linear acceleration.

It was concluded that: (1) some units respond with extremely high sensitivity to linear acceleration, (2) responses tend to manifest simple trigonometric resolution of linear acceleration applied to the end-organ, and (3) the otolith units do not appear to have a single dynamic dependence upon acceleration. Author

**N73-11069** Defence Research Board, Ottawa (Ontario).  
**MAN-MACHINE INTEGRATION: A LONG TERM LOOK**  
G. Melvill Jones *In its* DRB Aviation Med. Res. Unit Repts. Vol. 2: 1968-1971 Aug. 1972 p 191-228 refs Repr. from Aeronaut. J. (England), no. 72, 1968 p 831-846

(AMRU-R-68-3)

The prerequisites necessary for man to remain in control in man-machine integration are examined. These prerequisites include man's sensory input systems in the context of data acquisition from the machine and its environment and motor output in the context of neuromuscular control of the machine. The whole human organism as a component in the complete man-machine ensemble or control loop, as well as speculation on the impact of this entity, man-machine-hybrid, upon an evolving social structure are discussed. Author

**N73-11070#** Flying Personnel Research Committee, London (England).

**A THEORETICAL MODEL OF THE UTRICULAR OTOLITH AND ITS RESPONSE TO ANGULAR MOTION WITH RESPECT TO AN ACCELERATION IN SHEAR**  
G. R. Barnes Apr. 1972 50 p refs (FPRC-1315) Avail: NTIS HC \$4.50

A theoretical model is developed for the utricular otolith and its associated neural connections to the oculomotor system, based upon established anatomical and electrophysiological features. The dynamic behavior of the model is analyzed, particularly in its response to angular motion with respect to an acceleration in shear. The predictions of the model with appropriate restraints are compared with data from experiments carried out in man. Author

**N73-11071\*#** Translation Consultants, Ltd., Arlington, Va.  
**BEHAVIOR OF INTRAOCULAR PRESSURE, BLOOD PRESSURE AND BODY WEIGHT UNDER PEAK PHYSICAL EXERTION**

R. Kern. Washington NASA Nov. 1972 12 p refs Transl. into ENGLISH from Ophthalmologica (Basel), v. 147, 1964 p 82-92

(Contract NASw-2038)

(NASA-TT-F-14557) Avail: NTIS HC \$3.00 CSCL 06P  
Weight, blood pressure and intraocular pressure were measured in healthy young men prior to, and after a 50-km walk. Comparative tables show that on an average the weight and intraocular pressure decreases, while blood pressure increases. Author

**N73-11072\*#** National Aeronautics and Space Administration, Washington, D.C.

**MICROCOCCUS PIERANTONII. NEW SPECIES OF PHOTOGENIC BACTERIA OF THE LUMINOUS ORGAN OF RONDELETIA MINOR NAEF**

Giuseppe Zirpolo Jun. 1972 20 p refs Transl. into ENGLISH from Boll. Soc. Nat. (Napoli), v. 32, 1919 p 75-87 Presented at the Soc. Nat. Session, 18 Aug. 1918 (NASA-TT-F-14439) Avail: NTIS HC \$3.00 CSCL 06M

The photogenic bacteria (*Micrococcus pierantonii*) that constitute the luminous organ of *Rondeletia minor* NAEF are discussed. The isolated organ was pulped and inoculated in a broth of cuttlefish and agar. Within 24 hours luminous intense green colonies appeared. The effect of various broth cultures on the luminosity was studied. Summaries of the morphological cultural, and photogenic characteristics of the *Micrococcus pierantonii* are included. F.O.S.

**N73-11073\*#** Baylor Univ., Houston, Tex. Dept. of Psychiatry.  
**EFFECTS OF STRESS UPON PSYCHOPHYSIOLOGICAL**

**RESPONSES AND PERFORMANCE FOLLOWING SLEEP DEPRIVATION Final Report**

Robert Roessler and Jerry W. Lester 20 Oct. 1972 36 p refs

(Contract NAS9-11753)

(NASA-CR-128620) Avail: NTIS HC \$4.00 CSCL 06S

The usefulness of psychological and physiological variables in predicting performance under stress of 48 hours of sleep deprivation was investigated. Performance tests, with subjects of different ego strength personalities, in concept acquisition, reading comprehension, word association, word memory, and anagrams were conducted, and physiological measurements of (1) the phasic and tonic electrodermal, (2) galvanic skin response, (3) thermal skin resistance, (4) heart rate, (5) respiration, and (6) plethysmographic finger pulse volume were recorded. It was found that the changes in the pattern of performance were the result of testing subjects at times when they would normally be sleeping, and that sleep deprivation longer than 48 hours must be maintained to produce changes in simple or well learned tasks.

F.O.S.

**N73-11074\*# School of Aerospace Medicine, Brooks AFB, Tex. BIOMEDICAL ACCEPTABILITY OF 45- TO 60-DAY SPACE FLIGHT Final Report, 1967 - 1969**

John W. Ord and Stanley C. White Dec. 1971 29 p refs Sponsored by NASA

(AF Proj. 7755)

(NASA-CR-129131; AD-742974; SAM-Review-6-71;

SAM-TR-71-35) Avail: NTIS HC \$3.50 CSCL 06S

The principal known effects of the space flight environment upon the physiologic function of human subjects were reviewed as have the results and validity of biomedical ground-based simulation. Where known, the time courses of these physiologic changes were described. The ability to modify the deconditioning effects of space flight was discussed from the standpoints of improving the effectiveness of environmental control and life support systems and providing countermeasures (especially exercise) as a means of modifying the effects of weightlessness and a degree of physical inactivity. Biomedically, the current status of knowledge enables the prediction that 45 to 60 day manned space flights can be successfully accomplished.

Author

**N73-11076# Federal Aviation Administration, Washington, D.C. Office of Aviation Medicine.****G EFFECTS ON THE PILOT DURING AEROBATICS**

Stanley R. Mohler Jul. 1972 20 p refs

(FAA-AM-72-28) Avail: NTIS HC \$3.00

The increasing interest in the effects of acceleration forces on the human body as a result of improved aircraft performance and maneuverability is discussed. The following subjects pertaining to acceleration forces are presented: (1) the nature of aerobatic g forces, (2) human physiology in relation to g forces, (3) human tolerances to various levels and times of exposure to g forces, and (4) methods by which tolerance to g forces can be increased.

Author

**N73-11076\*# Techtran Corp., Glen Burnie, Md. SIXTY AMBULATORY PATIENTS TREATED WITH SALVARSAN**

E. Freund Washington NASA Nov. 1972 12 p refs Transl. into ENGLISH from Muench. Med. Wochschr. (Munich), v. 6, 1911 p 302-305

(Contract NASw-2037)

(NASA-TT-F-14618) Avail: NTIS HC \$3.00 CSCL 06E

Use of Salvarsan to treat sixty patients with various types of syphilis is described. Positive results as evidenced both by relief of symptoms (ulcers, etc.) and change of Wassermann test results from positive to negative are reported and compared with contemporary of other authors.

Author

**N73-11077\*# Translation Consultants, Ltd., Arlington, Va. WATER INTOXICATION AS A SIDE EFFECT OF CHLOR-****PROPAMIDE THERAPY**

E. Christensen and K. S. Rahbek Washington NASA Nov. 1972 9 p refs Transl. into ENGLISH from Ugeskrift. Laeger. (Copenhagen), v. 133, no. 41, Oct. 1971 p 2022-2025

(Contract NASw-2038)

(NASA-TT-F-14597) Avail: NTIS HC \$3.00 CSCL 06E

A case of chronic overhydration with acute exacerbations is described in a patient suffering from psychogenic polydipsia treated with chlorpropamide. It is demonstrated that the cause of the condition in this patient was psychogenic intake of water in connection with inhibition of renal excretion of fluid caused by chlorpropamide. Attention is drawn to problems of fluid retention in chlorpropamide therapy in patients with diabetes mellitus and heart, liver or renal diseases.

Author

**N73-11078\*# Translation Consultants, Ltd., Arlington, Va. ADVANTAGES OFFERED BY THE USE OF FRUCTOSE AS MONOSACCHARIDE ADDED TO SALINE SOLUTIONS USED IN THE ORAL REHYDRATION OF INDIVIDUALS SUFFERING FROM GASTROENTERITIS**

G. C. Biasini and A. Montaguti Washington NASA Nov. 1972 7 p refs Transl. into ENGLISH from Clin. Pediat. (Bologna), v. 49, 1967 p 624-628

(Contract NASw-2038)

(NASA-TT-F-14596) Avail: NTIS HC \$3.00 CSCL 06E

Tests of monosaccharide absorption by administering saline solutions with fructose, and glucose, for the purpose of rehydration to two groups of children suffering with diarrhea showed that the saline solution with fructose has a better therapeutic effect.

Author

**N73-11079\*# Techtran Corp., Glen Burnie, Md. APPARENT PLASMA HYPEROSMOLALITY IN ALCOHOLIC INTOXICATION**

M. Fontan, M. Caridroit, P. Parquet, and F. Cochez Washington NASA Nov. 1972 31 p refs Transl. into ENGLISH from Lille Med. (Lille), v. 12, no. 10, 1967 p 1320-1334

(Contract NASw-2037)

(NASA-TT-F-13910) Avail: NTIS HC \$3.75 CSCL 06E

The term apparent osmolality refers to the measured value expressed in milliosmols/kg of water determined by means of osmometers-cryoscopes whose operating principle is based on the decrease in the freezing point as a function of the concentration of micro- or macro-molecular particles in the medium. The apparent osmolality of plasma increases parallel to the level of alcoholemia; it is not accompanied by a parallel decrease in the measured resistivity of the plasma. The hyperosmolality caused by the ethanol molecule does not correspond to a plasma hypertonia.

Author

**N73-11080# Office of Naval Research, London (England).****EUROPEAN SCIENTIFIC NOTES, VOLUME 26, NO. 6**

Seymour L. Hess, ed. and Victoria S. Hewitson, ed. 30 Jun. 1972 35 p refs

(AD-746143; ONRL-26-6) Avail: NTIS CSCL 06/3

Contents: Aerospace research; Biological research; Origin of the solar system; Shipbuilding and ship research; Computer science; Potassium tantalum niobate; Diffraction gratings; Scientific devices exhibition; Cryogenics. GRA

**N73-11081# California Univ., Los Angeles. Brain Research Inst.****EFFECTS OF HYDRAZINE ON ELECTROPHYSIOLOGY, BEHAVIOR AND RUNWAY PERFORMANCE IN THE CAT Final Technical Report**

M. B. Sterman, M. D. Fairchild, and G. L. McRae May 1972 22 p refs

(Contract F33615-69-C-1441; AF Proj. 7163)

(AD-746014; AMRL-TR-71-82) Avail: NTIS CSCL 06/20

The effects of intraperitoneally administered hydrazine on electrophysiology, general behavior and integrated performance in cats was evaluated in a number of independent studies. Doses of 15 to 20 mg/kg hydrazine resulted in death 2 to 24 hours after administration, preceded by overt emesis, salivation, panting

and hyperactivity. Doses of 5 to 10 mg/kg produced emesis, hyperactivity and loss of appetite resulting in extensive weight loss. Exposure to 2 to 4 mg/kg produced lethargy and mild weight loss only. In runway performance tests, 1.5 mg/kg produced no significant alterations on the day of administration, but completely disrupted performance within 48 hours. A dose of 0.75 mg/kg hydrazine had no effects on the day of administration, but disrupted or altered performance were observed following a dose of 0.375 mg/kg hydrazine. Very low dose exposure to hydrazine can significantly alter performance capability without producing overt behavioral or physiological symptoms.

Author (GRA)

**N73-11082#** California Univ., Los Angeles.  
**EFFECTS OF MONOMETHYLHYDRAZINE (MMH) ON  
 EVOKED CEREBRAL NEUROELECTRIC RESPONSES** Final  
 Report

M. B. Sterman, M. D. Fairchild, T. Allison, W. R. Goff, and  
 Kenneth C. Back Jun. 1972 15 p refs

(Contract F33615-69-C-1441; AF Proj. 7173)

(AD-746302; AMRL-TR-72-52) Avail: NTIS CSCL 06/20

Studies of the effects of monomethylhydrazine (MMH) on the cerebral neuroelectric evoked response in the unanesthetized cat revealed that convulsive doses of this compound consistently produced a large increase in the primary negative response of the somatic sensory cortex which progressively changed with time and approached peak levels starting approximately 1 hour before seizure onset. Delay of seizures with neuromuscular paralysis was observed also. The possible significance of this finding in relation to mechanism of action in the nervous system was explored. These results obtained with MMH are consistent with those previously reported for unsymmetrical dimethylhydrazine (UDMH). As herein reported, the evoked response changes are similar to results obtained with the convulsant agent Metrazol, suggesting that these response changes may be a useful index of impending seizure in a variety of toxic and clinical conditions.

Author (GRA)

**N73-11083#** Miami Univ., Oxford, Ohio.  
**FACTORS AFFECTING THE DETECTION AND RECOGNITION  
 OF COLORED TARGETS** Final Technical Report, 1 Jul.  
 1970 - 15 May

Raymond M. White, Jr., Marvin J. Dainoff, and Richard E. Reynolds  
 Wright-Patterson AFB, Ohio AMRL May 1972 228 p refs

(Contract F33615-70-C-1766; AF Proj. 7183)

(AD-746297; AMRL-TR-72-38) Avail: NTIS CSCL 06/16

The literature was reviewed in the areas of (a) effects of limited stimulus energy and background factors on the detection and recognition of colored signal lights and (b) determining factors affecting observer's performance in absolute identification of target colors. Five experiments were conducted to determine the effects of two classes of variables on an observer's ability to quickly and accurately identify the reflected color of a target background and reaction time.

Author (GRA)

**N73-11084#** Radiation Research Associates, Inc., Fort Worth,  
 Tex.

**INITIAL RADIATION EXPOSURE FROM NUCLEAR WEAPONS**  
 Interim Report

Robert L. French and L. Glenn Mooney 15 Jul. 1972 89 p  
 refs

(Contract DAHC20-72-C-0123)

(AD-745906; RRA-T7201) Avail: NTIS CSCL 06/18

Recent data and methods for predicting the initial radiation exposure at or near the ground surface resulting from the detonation of nuclear weapons were reviewed and evaluated. State-of-the-art methods were then selected or developed for neutron dose, secondary gamma-ray dose from neutron interactions in the air and ground, and fission-product gamma-ray dose occurring during the first minute following a detonation. The neutron and secondary gamma-ray method is based on discrete ordinates calculations of neutron transport in an air-over-ground geometry and first-last collision method for source height effects.

The fission-product gamma-ray model is based on Monte Carlo air transport calculations.

Author (GRA)

**N73-11085#** Army Medical Research and Nutrition Lab., Denver,  
 Colo.

**EFFECTS OF ALTITUDE ON THE CEBUS APELLA MONKEY**  
 Larry J. Ackerman, Richard S. Demaree, Thomas J. Bucci, George  
 A. Kennedy, Carl L. Alden, Tony S. Myers, and Ralph Lazzara  
 Sep. 1971 51 p refs

(AD-745891; USAMRNL-328) Avail: NTIS CSCL 06/19

Previous studies have shown that abrupt translocation to high altitudes caused a cerebral edema in some humans. In this investigation Cebus apella monkeys were studied at sea level and 14,100 feet altitude to determine what extent cerebral spinal fluid dynamics, cerebral blood flow, and pathological changes of the brain and myocardium play in the pathogenesis of the symptoms of acute mountain sickness. Subhuman primates rapidly transported to 14,110 feet showed increased cerebral blood flow and increased cerebral spinal fluid pressure during the first five days of exposure to high altitude. Significant increases in the right ventricular/total heart weight ratios occurred after 5 days. After 3 months this ratio increased approximately 15% over sea level control values. This change was greater than that found in dogs but less than that in rats or rabbits after prolonged exposure. A mild perivascular cerebral edema occurred in some monkeys at 14,110 feet from 1 to 5 days. Monkey cardiac muscles showed edematous capillary endothelial cells after acute exposure to altitude, while prolonged exposure also caused swollen mitochondria and sarcoplasmic reticula with separation of myofibrils.

Author (GRA)

**N73-11086#** Wrightsville Marine Bio-Medical Lab., Wilmington,  
 N.C.

**STUDIES CONCERNING THE HIGH PRESSURE HYPEREXCITABILITY  
 IN THE SQUIRREL MONKEY** Final Report,  
 1 Apr. - 31 Mar. 1972

Ralph W. Brauer 13 Jul. 1972 16 p refs

(Contract N00014-69-C-0341; NR Proj. 101-762)

(AD-745779) Avail: NTIS CSCL 06/19

Development of knowledge on the high pressure neurological syndrome (HPNS) in vertebrates is described on the basis of five years of investigative effort. Besides tracing the historical sequence of events, the report details experimentation aimed at providing a basis for predicting the onset of severe HPNS complications in man at various compression rates ranging from those in current use for cautious descent of subjects seeking to reach maximum depths to the very fast compression rates contemplated in relation with submarine escape techniques. A variety of other data concerning the HPNS are reviewed briefly from the points of view of their bearing upon design of prophylactic or therapeutic procedures, formulation of questions requiring additional clinical exploration, and elucidation of basic biophysical mechanisms. Attention is called to the fact that the underlying mechanisms seem to be common not only to all vertebrates tested, but to a rather similar sequence elicited by high pressures in many invertebrates. Problems of adaptation and of selection for individual variation are touched upon.

Author (GRA)

**N73-11087#** Missouri Univ., Columbia. Space Sciences Research  
 Center.

**EFFECTS OF HYPEROXIA ON SULFHYDRYL CONCENTRATION  
 OF ESCHERICHIA COLI**

Jack L. Stees and Olen R. Brown Jul. 1972 26 p refs

(Contract N00014-67-A-0287-0002; NR Proj. 136-756)

(AD-746193; TR-4) Avail: NTIS CSCL 06/1

The concentration of reduced sulfhydryl (SH) in cell-free extracts of Escherichia coli grown with air as the gas phase was 26.8 plus or minus 1.2 nmoles SH/mg soluble protein. Exposure of bacteria to 1 ata of oxygen where growth continued but at a reduced rate, or to 6.2 ata of oxygen where growth was completely stopped, did not result in significant changes in intracellular SH concentration. Cell-free extracts exposed to 1.2 ata of oxygen resulted in SH oxidation at 0.5%/min, compared to 0.75%/min for reduced glutathione at 4.2 ata. Fractionation of cell-free extracts by ultrafiltration indicated that approximately

92% of the measurable SH-groups were protein-related. These data indicate that neither oxidation of intracellular SH, nor the relatively slow oxidation of surface SH-groups is a significant factor in the rapid growth inhibition of *E. coli* by hyperoxia. Bacterial reversal of possible intracellular SH oxidation during the interval between decompression and extraction was not excluded. Author (GRA)

**N73-11088#** SysteMed Corp., Dayton, Ohio.  
**CONTINUOUS ANIMAL EXPOSURE TO DI-CHLOROMETHANE** Final Report  
J. D. MacEwen, E. H. Vernot, and C. C. Haun May 1972  
40 p refs  
(Contract F33615-70-C-1046; AF Proj. 6302)  
(AD-746295; W-71005; AMRL-TR-72-28) Avail: NTIS CSCL 06/20

Continuous exposures of dogs, monkeys, rats and mice to 5000 ppm and 1000 ppm of dichloromethane vapor ( $\text{CH}_2\text{Cl}_2$ ) produced severe toxic effects on dogs, rats and mice. Dogs died after 3 weeks exposure to 1000 ppm and after 6 weeks exposure to 5000 ppm. Thirty percent of the mice also succumbed during four weeks exposure to 5000 ppm  $\text{CH}_2\text{Cl}_2$ . Although rats survived 14 weeks exposure to 5000 ppm, they experienced subnormal weight gains. Significant gross and histopathological hepatic lesions were noted in all 3 species at death or experimental termination in 14 weeks. In addition, rats showed abnormal kidney histopathology. Fat stains disclosed mild fatty increase in monkey livers after 14 weeks exposure to 1000 ppm  $\text{CH}_2\text{Cl}_2$ . Author (GRA)

**N73-11089#** Naval Submarine Medical Center, Groton, Conn. Research Lab.  
**PSYCHOLOGICAL EFFECTS OF PROLONGED EXPOSURE TO SONAR SIGNALS AT AN ELEVATED INTENSITY. 2: TWENTY-FOUR DAYS EXPOSURE TO SIGNALS AT 85 dB** Interim Report  
Benjamin B. Weybrew and Ernest M. Noddin 6 Dec. 1971  
32 p refs  
(AD-746103; NSMRL-691) Avail: NTIS CSCL 06/19

Ten carefully screened male subjects, 5 civilian men from the New London community and 5 Navy sonar men were secluded in the Audiology spaces of the Submarine Medical Research Laboratory for a total of 30 days, 4 pre-experimental (no beep), 24 days: exposure to the 85 dB beep and 2 recovery days. Administered daily, the test battery consisted of a sequential reaction time test, a hand-eye coordination test, a measure of muscular tension and 4 measures of mood and affect. Although in 8 of the ten men some depressive trends occurred in the first 3 days of the exposure period, the performance data demonstrated no evidence of significance impairment. Similarly, while 3 men reported mild re-occurring headaches, and 5 indicated the beep may have affected their sleep as well as their performance on certain testing procedures, the overall adjustment of the 8 men did not appear to be impaired allowing 1/2 - 3 days for adaptation. Author (GRA)

**N73-11090#** Army Combat Developments Command Medical Service Agency, Fort Sam Houston, Tex.  
**FATIGUE IN SUSTAINED TACTICAL OPERATIONS** Ph.D. Thesis  
P. B. Petersen 29 Jun. 1972 171 p refs  
(AD-746643) Avail: NTIS CSCL 06/16

Concepts for future U.S. tactical operations envision man's capabilities as encompassing rapid acclimation, fatigue reduction, changed wake-sleep cycles, and changes to the circadian cycle under sustained and continuous operational requirements. U.S. forces must be able to deal with an enemy who may have these capabilities. The study focuses on concepts for the reduction of fatigue in its various stages in sustained tactical operations, techniques of leadership, and on measures to prevent fatigue. Author (GRA)

**N73-11091\*#** Stanford Univ., Calif. Dept. of Electrical Engineering.  
**APPLICATION OF FREQUENCY DISCRIMINATION TECH-**

#### **NIQUE TO THE ANALYSIS OF ELECTROENCEPHALOGRAPHIC SIGNALS**

D. C. Lai and R. L. Lux (Utah Univ.) Oct. 1972 7 p refs  
Repr. from Proc. of the 28th Ann. Natl. Electron. Conf., Oct. 1972  
(Contracts NGR-46-001-038; NGR-05-020-575; Contract DAHC15-72-C-0232)  
(NASA-CR-129173) Avail: NTIS HC \$3.00 CSCL 06B

A frequency discrimination technique is realized by an inexpensive frequency discriminator for direct on-line measurement of the entrainment phenomenon in EEG as entrained by the frequency of a sensory stimulus. The use of this device for detecting the presence or absence of the stimulus effect and the measurement of the time delays in the entrainment is demonstrated. The EEG signal is first filtered by a narrow-band filter with center frequency about the alpha-rhythm of the individual. It is then reasonable to consider the alpha signal as narrow-band random process with the alpha frequency  $f$  sub alpha as the mean frequency of the spectral band. Author

**N73-11092#** Research Inst. of National Defence, Stockholm (Sweden).

#### **CAN ATTENTION BE DIVERTED?**

Rune Johansson and Agneta Jonsson Sep. 1971 25 p refs  
In SWEDISH: ENGLISH summary  
(FOA-2-C-2482-H5) Avail: NTIS HC \$3.25

Tachymeter studies are reported to determine the contrast difference required for detecting a target against a background of spot noise and terrain picture, respectively. It is shown that it is possible to direct the attention of an observer successfully towards the desired target. A delaying factor can be demonstrated but many other factors appear to interfere with it. Author

**N73-11093\*#** General Dynamics/Convair, San Diego, Calif.  
**STUDY OF PHYSIOLOGICAL AND BEHAVIORAL RESPONSE TO TRANSITIONS BETWEEN ROTATING AND NONROTATING ENVIRONMENTS**  
James F. Brady Washington NASA Nov. 1972 70 p refs  
(Contract NAS1-10775)  
(NASA-CR-2130; GDCA-DBD72-001) Avail: NTIS HC \$3.00 CSCL 06S

Future manned space missions may require transition between artificial gravity and weightlessness environments. The frequency and rate of such transition will influence the psychological responses of man. Abrupt transfers are examined between such rotating and nonrotating environments to determine the physiological and behavioral responses of man. Five subjects were tested using rates of rotation up to 5 rpm. Author

**N73-11094#** Civil Aeromedical Inst., Oklahoma City, Okla.  
**A COMPARATIVE STUDY OF FEMALE AND MALE AIR TRAFFIC CONTROLLER TRAINEES**

Bart B. Cobb, John J. Mathews, and Carolyn D. Lay May 1972 25 p refs  
(FAA-AM-72-22) Avail: NTIS HC \$3.25

This study compares age, education, pre-FAA experience, aptitudes, training-course performance measures, and post-Academy attrition rates of the 83 women who entered basic air traffic control (ATC) training at the FAA Academy during November 1968 through March 1970 with those of various samples of the 3,760 males who entered training during the same period. The study revealed no significant differences between the means of the female and male trainees with respect to age and educational level. The means of the training course grade averages of the two groups differed by only three-tenths of one point and there was no significant difference between the Academy attrition rate of 20.5 per cent for the females and 23.2 per cent for the 798 males. However, the groups differed markedly with respect to post-Academy attrition rates. It was determined that 33.3 per cent of the 66 females who completed Academy basic training were no longer in the air traffic management system as of April 1971 whereas only 19.1 per cent of the 613 males (within the sample of 798) who graduated from the Academy were subsequently attrited. Author

**N73-11095\*** # McDonnell-Douglas Astronautics Co., Huntington Beach, Calif. Biotechnology and Power Dept.  
**TEST RESULTS OF SIX-MONTH TEST OF TWO WATER ELECTROLYSIS SYSTEMS**  
 E. S. Mills and G. W. Wells Oct. 1972 559 p refs  
 (Contract NAS9-12048)  
 (NASA-CR-128629; MDC-G3019; MSC-07382) Avail: NTIS HC \$30.00 CSCL 06K

The two water electrolysis systems used in the NASA space station simulation 90-day manned test of a regenerative life support system were refurbished as required and subjected to 26-weeks of testing. The two electrolysis units are both promising systems for oxygen and hydrogen generation and both needed extensive long-term testing to evaluate the performance of the respective cell design and provide guidance for further development. Testing was conducted to evaluate performance in terms of current, pressure, variable oxygen demands, and orbital simulation. An automatic monitoring system was used to record, monitor and printout performance data at one minute, ten minute or one-hour intervals. Performance data is presented for each day of system operation for each module used during the day. Failures are analyzed, remedial action taken to eliminate problems is discussed and recommendations for redesign for future space applications are stated. Author

**N73-11096#** Civil Aeromedical Inst., Oklahoma City, Okla.  
**SELF-ESTIMATES OF DISTRACTIBILITY AS RELATED TO PERFORMANCE DECREMENT ON A TASK REQUIRING SUSTAINED ATTENTION**  
 Richard I. Thackray, Karen N. Jones, and R. Mark Touchstone Jul. 1972 9 p refs  
 (FAA-AM-72-25) Avail: NTIS HC \$3.00

Increasing automation of air traffic control tasks may have the undesirable side effect of increased monotony as a result of the anticipated reduction in task demands. In the present study, 50 subjects performed a monotonous, but perceptually demanding task, for approximately 30 minutes without rest. It was found that high-distractibility subjects (as determined from a questionnaire administered prior to the experiment) showed increasing lapses of attention during performance, while low-distractibility subjects failed to show any evidence of a decline in attention. Significant changes were obtained for respiration, respiration-period variability, heart-rate variability, and skin conductance during the task period, but the magnitude of these changes did not differ among the two distractibility groups. Author

**N73-11097\*** # George Washington Univ., Washington, D.C.  
**ARTERIAL PULSE WAVE PRESSURE TRANSDUCER Patent Application**  
 Chung Kim, Donald Gorelick, and Wayne Chen, inventors (to NASA) Filed 25 Sep. 1972 14 p  
 (NASA-Case-GSC-11531-1; US-Patent-Appl-SN-291845) Avail: NTIS HC \$3.00 CSCL 06B

An arterial pulse wave pressure transducer is described. The transducer is comprised of a fluid-filled cavity having a flexible membrane over the cavity and adapted to be placed on the skin over an artery. An arterial pulse wave creates pressure pulses in the fluid which are transduced by a pressure-sensitive transistor disposed in direct contact with the fluid into an electric signal. The electrical signal is representative of the pulse waves and can be recorded so as to monitor changes in the elasticity of the arterial walls. NASA

**N73-11098#** Toronto Univ. (Ontario). Inst. for Aerospace Studies.  
**AN UNSTABLE STEERING TASK WITH A SONIC BOOM DISTURBANCE**  
 K. W. Lips Sep. 1972 53 p refs  
 (UTIAS-TN-179) Avail: NTIS HC \$4.75

An initial study was made concerning the effect of sonic boom disturbances on an individual's compensatory tracking performance for an unstable system. The tracking task simulated automobile driving. It was found that most individuals were disturbed and recovered in varying degrees. These preliminary results, although somewhat qualitative, show that useful data can be obtained from this type of simulation. Author

**N73-11099#** Defence Research Information Centre, Orpington (England).  
**CALCULATION OF THE THERMAL RESISTANCE OF THE AIR LAYERS IN AIR-PERMEABLE CLOTHING**  
 V. I. Yankelevich Jul. 1972 9 p refs Transl. into ENGLISH from Tekhnol. Tekst. Prom. (USSR), no. 2, 1971 p.111-115  
 (AD-746037; DRIC-Trans-2717; BR-30094) Avail: NTIS CSCL 06/17

The thermal resistance of the air layers in clothing which allows air to permeate through it was investigated. The method described for calculating the thermal resistance of air-permeable articles making allowance for the thermal resistance of the air layer yields results close to the experimental ones. This makes possible the reliable design of heat protective clothing for any given conditions of work or climate. GRA

**N73-11100#** School of Aerospace Medicine, Brooks AFB, Tex.  
**EVALUATION OF LASER EYE PROTECTORS COMMERCIALLY AVAILABLE Technical Report, Feb. 1969 - Jun. 1971**  
 Donald R. Marston, Peter C. Landieri, and Patrick D. Walker Jul. 1972 38 p refs  
 (AF Proj. 7784)  
 (AD-746293; SAM-TR-72-8) Avail: NTIS CSCL 06/17

The transmission characteristics of commercially available laser eye protectors were measured with a Cary 14 spectrophotometer, to determine the conformance of each to the respective manufacturer's specifications. The luminous transmission of each eye protector was calculated relative to a 5750 K blackbody source of illumination (an approximation of the sea-level illumination of sunlight), and generally proved to be consistent with that advertised by the respective manufacturer. These measurements were also used to determine qualitatively the protection wavelength region for each device. Each of the eye protectors was exposed directly to high-intensity radiation from the lasers in order to measure the high optical density (OD) inherent in most of these devices and to confirm that the specified OD was always maintained. The following types of lasers were used for these tests--a normal pulse neodymium, a Q-switch ruby, a normal pulse ruby, and a continuous-wave helium-neon. Also outlined in this report are some guidelines for the design, selection, and use of eye protectors. Author (GRA)

**N73-11101#** California Univ., Irvine.  
**BIOCYBERNETICS: AN INTERACTIVE MAN-MACHINE INTERFACE Semiannual Technical Report, 1 Jan. - 30 Jun. 1972**  
 R. F. Thompson and T. J. Teyler 20 Jul. 1972 18 p refs  
 (Contract DAHC15-72-C-0121; ARPA Order A1001)  
 (AD-746179) Avail: NTIS CSCL 05/9

The research project described deals with the capability of training a human subject to control and/or interact with complex electronic or mechanical systems. Basically the project involves the detection of bioelectrical phenomena that are analogs of ongoing cognitive processes and the utilization of these phenomena to control external events. The project also allows the system being controlled to communicate with the human operator in either a feedback or an interactive manner. In bypassing the subject's manual or verbal response apparatus an appreciable time saving is achieved. By eliminating the normal feedback/interactive modes of communication currently employed by machines (generally visual signals produced mechanically or electronically) a further potential time saving is realized. However, the major advantage of the proposal is the virtually automatic control of systems operation by the trained subject. Author (GRA)

**N73-11102#** Beta Industries, Inc., Dayton, Ohio.  
**A STATISTICAL EVALUATION OF THE INJURY POTENTIAL OF A SQUARE WAVE ENERGY ABSORBER Final Report**  
 Norman S. Phillips, Richard W. Carr, and William B. Walcott Fort Eustis, Va. Army Air Mobility Res. and Develop. Lab. Jun. 1972 57 p refs

(Contract DAAJ02-70-C-0055; DA Proj. 1F1-62203-A-529)  
 (AD-745919; 8II-214-5; USAAMRDL-TR-72-9) Avail: NTIS  
 CSCL 06/19

The report presents a quantitative measure of the effects of energy absorber stroke length upon cumulative probability of injury. The response of a seated subject to a vertical deceleration pulse representing a helicopter crash was calculated for a given seat and clothing weight. The seat-man system was analytically supported by a square wave energy absorber selected to generate no greater than 23 G for a 5th percentile man. The calculated response, DRI, provides a probability of spinal injury for the seated occupant. Since all parameters necessary for response computations had known statistical properties, it was possible to calculate the joint probability of injury for a particular deceleration pulse and subject weight. By calculating the statistical values for many deceleration and weight combinations, sufficient to represent the total population of both, a cumulative probability of injury was generated. Stroke length of the energy absorber required for each combination of deceleration and weight was calculated. By examining the effects of a limited stroke length, it was possible to generate a curve of stroke length available versus cumulative probability of injury. The curve indicates that for a realistic stroke length (12 inches), the cumulative probability of injury is 0.119. By doubling the stroke available or by halving it, the cumulative probability is decreased or increased by 7 percent. Comparisons with previously reported data indicate that the injury potential of the square wave is significantly higher than is theoretically achievable. Author: (GRA)

N73-11103# Navy Clothing and Textile Research Unit, Natick, Mass.

**EVALUATION OF HEAT LOSS FROM NAVY DIVERS' WET SUIT**

Dale A. Reins and James C. Shampine Jul. 1972 24 p refs  
 (AD-747276; TR-102; Rept-4-70) Avail: NTIS CSCL 06/17

In a series of over 200 tests, subjects wore standard, 3/16 inch, closed-cell neoprene-foam, air-sea rescue suits in water of 55, 45, and 35 deg. F. The tests were designed to identify areas of the body where major heat losses occur. Other physiological parameters were monitored to assure the physical safety of test subjects while body temperature and metabolic rates were measured. Recommendations are made as to areas in which insulative values could be increased without hampering free movement of the wearer, and design modifications are suggested to limit free movement of water into and out of the suit. Author (GRA)

N73-11104# Rowland and Co., Haddonfield, N.J.  
**SUPPORT OF ADVANCED DEVELOPMENT OBJECTIVE 43-13, HUMAN FACTORS TECHNOLOGY** Annual Report, 1 Dec. 1970 - 15 May 1972

Edward Marlowe, Carlos Escobar, and George E. Rowland 15 May 1972 142 p refs

(Contract N00014-70-C-0126; NR Proj. 154-319)  
 (AD-744984; R/C-72-3-108; AR-2) Avail: NTIS CSCL 05/9

The report describes the results and progress made in the continued development of a data management system to provide improved capabilities to handle the daily and historical performance data of Naval student pilots. The system will include data processing techniques for the extension of current student failure risk predictions of student training outcomes and, where feasible, the inclusion of data processing techniques that would aid in the achievement of individualized training goals. GRA

1. The first part of the document discusses the importance of maintaining accurate records of all transactions.

2. It is essential to ensure that all entries are supported by appropriate documentation and receipts.

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3. The second part of the document outlines the procedures for handling discrepancies and errors.

4. It is important to identify the cause of any errors and take corrective action immediately.

5. The third part of the document provides a detailed explanation of the accounting cycle.

6. Each step of the cycle is clearly defined and explained in detail.

7. The fourth part of the document discusses the role of the accountant in the business.

8. It is the responsibility of the accountant to provide accurate and timely financial information.

9. The fifth part of the document covers the various methods of depreciation.

10. Each method is explained with its respective advantages and disadvantages.

11. The sixth part of the document discusses the importance of budgeting.

12. A budget is a financial plan that helps to control costs and achieve organizational goals.

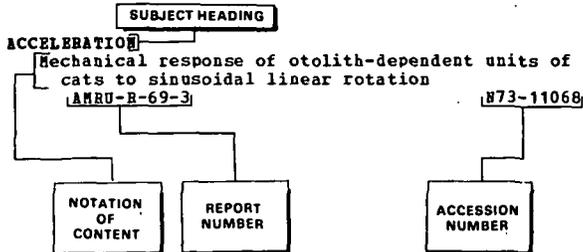
13. The seventh part of the document covers the various types of taxes.

14. Each type of tax is explained with its respective calculation and reporting requirements.

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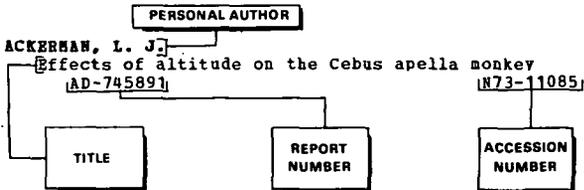
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