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**AEROSPACE MEDICINE
AND BIOLOGY**

A CONTINUING BIBLIOGRAPHY

WITH INDEXES

(Supplement 106)

SEPTEMBER 1972

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

NASA SP-7011 (106)

Aerospace Medicine and Biology

Pages 361-405

SEPTEMBER

1972

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY
WITH INDEXES

(Supplement 106)

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 August 1972 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 August 1972 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*. The first issue of the bibliography was published in July 1964; since that time, 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 on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the bibliography consists of a bibliographic citation accompanied 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 are reproduced exactly as they appeared originally in *IAA* or *STAR*, including the original accession numbers from the respective announcement journals. This procedure, which saves time and money, accounts for the slight variation in citation appearances.

Two indexes—subject and personal author—are included.

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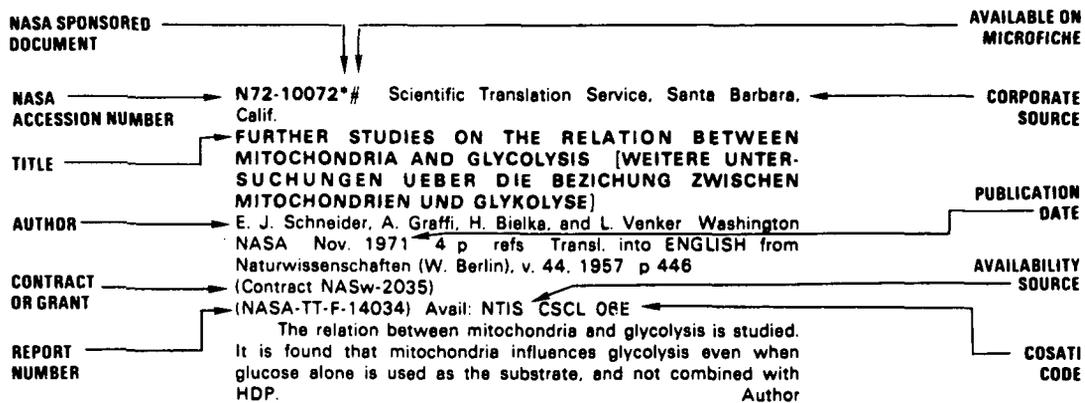
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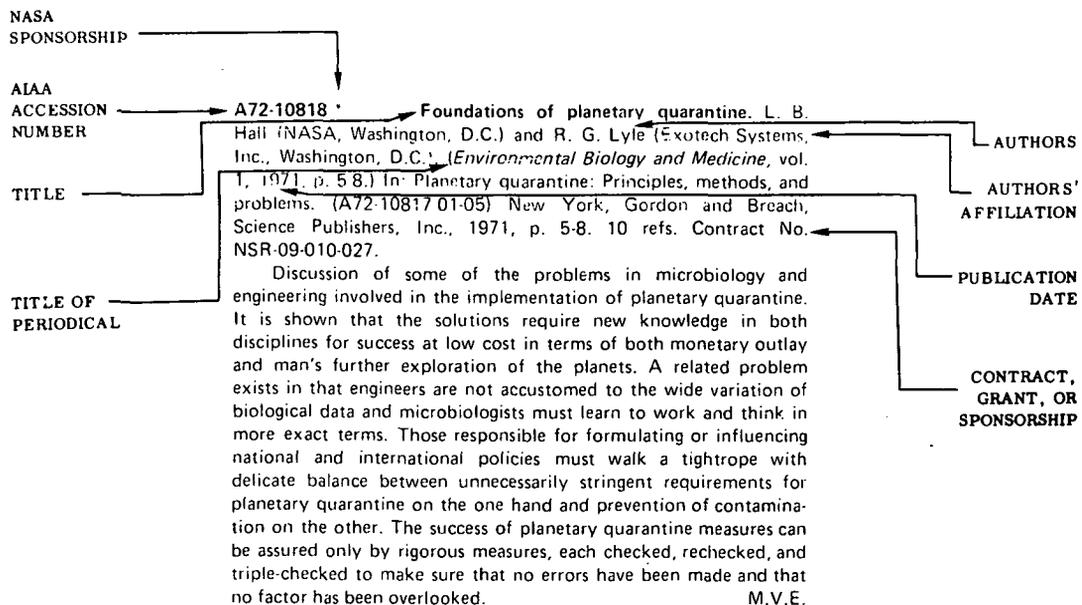
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TYPICAL CITATION AND ABSTRACT FROM IAA



AEROSPACE MEDICINE AND BIOLOGY



A Continuing Bibliography (Suppl. 106) SEPTEMBER 1972

IAA ENTRIES

A72-31272 # Man and computer (Chelovek i vychislitel'naia tekhnika). V. M. Glushkov, V. I. Branovitskii, A. M. Dovgiallo, Z. L. Rabinovich, and A. A. Stognii. Kiev, Izdatel'stvo Naukova Dumka, 1971. 295 p. 169 refs. In Russian.

The various problems arising in the development of man-computer systems are examined with particular reference to the problem of ensuring a highly effective interaction between man and automatic means. Methods of studying man-computer systems are analyzed, together with the capabilities of such systems, and their applications. Technological and mathematical aspects of man-machine interaction are discussed. V.P.

A72-31282 Factors discriminating men with coronary heart disease from healthy controls. S. G. Cotton, J. M. Nixon, R. G. Carpenter, and D. W. Evans (Cambridge University; Addenbrooke's Hospital, Cambridge, England). *British Heart Journal*, vol. 34, May 1972, p. 458-464. 32 refs. Research supported by the United Cambridge Hospitals and East Anglian Regional Hospital Board.

In our study, 91 men, under 65 years of age, with clinically overt coronary heart disease were compared with 98 healthy men in respect of fasting plasma cholesterol, triglyceride and other lipid moieties, relevant past and family history, smoking habits, a ponderal index, blood pressure, and prevalence of corneal arcus, xanthomata, and baldness. Some dietary aspects were also taken into account. The analysis showed that the main discriminators were diastolic blood pressure, arcus, baldness, xanthelasma, a family history of hypertension, past smoking habits, and hyperlipidaemia. Of these factors, diastolic hypertension emerges as much the most important.

(Author)

A72-31283 Platelet studies in patients with coronary artery disease and in their relatives. J. R. Hampton (Nottingham University, Nottingham, England) and R. Gorlin (Peter Bent Brigham Hospital, Boston, Mass.). *British Heart Journal*, vol. 34, May 1972, p. 465-471. 15 refs. PHS-supported research.

Measurement of the platelet electrophoretic response to adenosine diphosphate (ADP) has been used to study platelets from two groups of patients thought to have coronary artery disease, and a group of relatives of men who had suffered myocardial infarctions before the age of 45. Of 34 patients diagnosed by clinical, biochemical, and electrocardiographic criteria to have had myocardial infarctions, 32 had platelets that were abnormally sensitive to ADP. The coronary arteries of 12 further patients with chest pain were assessed by angiography: of these, 8 were found to have

coronary artery disease and 4 had normal coronary arteries. Seven of the 8 patients with abnormal coronary arteries had platelets that were abnormally sensitive to ADP; one of the 4 patients with normal coronary arteries had abnormal platelets. Of 29 relatives of young men with arterial disease, 17 had platelets that were abnormally sensitive to ADP. Of 107 subjects studied in the course of other experiments, 3 were found to have platelets that showed this abnormality. (Author)

A72-31293 * Exobiology, Jupiter and life. P. M. Molton (NASA, Ames Research Center, Exobiology Div., Moffett Field, Calif.). *Spaceflight*, vol. 14, June 1972, p. 220-223. 18 refs.

Recent experiments in an environmental chamber have shown that not even hardy terrestrial bacteria can survive on the Martian surface. The planet Jupiter is now considered by many to be the most likely place to find nonterrestrial life. Atmospheric simulation experiments for Jupiter that have been performed involve spark or semicorona discharges in mixtures of methane and ammonia at room temperature and a pressure lower than atmospheric. Terrestrial microorganisms have been shown capable of surviving 24 hr under a range of possible Jovian atmospheric conditions. The final mode of approach to the question of Jovian life concerns theoretical studies on the sort of chemical systems from which life could be generated. G.R.

A72-31313 # Calibrated low frequency acceleration vibrocardiography - Its hemodynamic determinants and clinical application. T. Matsuzaki (Tokyo, University, Tokyo, Japan). *Japanese Heart Journal*, vol. 13, Jan. 1972, p. 1-19. 53 refs.

Using a compact and lightweight precordial accelerometer, low-frequency acceleration vibrocardiography (A-VCG) was studied in normal subjects and patients with coronary heart disease. Experimental studies in anesthetized dogs were also made. The objective was to examine the correlation between the amplitude of main waves and some indices of hemodynamics. Results are presented which suggest that the S-wave amplitude in A-VCG reflects contractility of the left ventricle, and that the A/S wave ratio and changes in S-wave amplitude during various conditions offer useful means for detecting latent impairment of the functional reserve of left ventricle. O.H.

A72-31364 The rhodopsin content and the visual threshold of human rods. W. A. H. Rushton and D. S. Powell (Florida State University, Tallahassee, Fla.). *Vision Research*, vol. 12, June 1972, p. 1073-1081. 10 refs. NSF Grant No. GU-2612; Contract No. AT(40-1)-2690; Grant No. NIH-1-R01-EY-00684-01-VIS.

Measurement in the living human eye, by retinal densitometry, of the bleaching of rhodopsin by known light energies, and the course of its regeneration in the dark. The results fitted Rushton's kinetic equation, and thus the pigment level at any time after any

known bleach could be predicted. Rod dark adaptation curves were traced following bleachings that ranged from 0.1 up to 99%. Except during the first 5 min all these curves coincided with the predicted rhodopsin regeneration curves. The threshold was raised 1000-fold for 10% bleached. F.R.L.

A72-31365 The early phase of dark adaptation. W. A. H. Rushton and D. S. Powell (Florida State University, Tallahassee, Fla.). *Vision Research*, vol. 12, June 1972, p. 1083-1093. 8 refs. NSF Grant No. GU-2612; Contract No. AT(40-1)-2690; Grant No. NIH-1-R01-EY-00684-01-VIS.

Study of the phenomenon occurring when, immediately after a small bleach (6%) the threshold is 50 times higher than expected of rhodopsin, but soon returns to the rhodopsin level. This early dark adaptation curve is the same if the bleaching energy (It) is the same whether or not t is 0.5 sec or 0.5 min. It appears that the threshold rise after bleaching is due to a powerful photoproduct 'X-opsin' that rapidly decays and reaches equilibrium with free opsin. This could account for the early high threshold, its rapid fall unaccompanied by rhodopsin regeneration, and the final equilibrium where the log threshold rise is proportional to the free opsin and hence to X-opsin in equilibrium with it. F.R.L.

A72-31366 * Disparity masking. W. Richards (MIT, Cambridge, Mass.). *Vision Research*, vol. 12, June 1972, p. 1113-1124. 22 refs. NIH-NASA-supported research; Contract No. F44620-69-C-0108.

Demonstration that the depth sensations normally associated with disparity may be cancelled or reduced by the addition of small, extraneous surround objects. For example, when a large bar is altered by adding much smaller bars to its ends, the disparity of the added ends plays a very significant role in the depth of the original bar. If the sign of the disparity of the added ends is opposite that of the larger inner bar, the depth of the configuration may be lost completely or be reversed in reference to the fixation plane. The effects of such small surrounds upon the primary central stimulus reveal new properties of stereoscopic mechanisms and have implications for electrophysiological studies. F.R.L.

A72-31367 Optical and neuronal principles of visual image transmission - A uniform mathematical treatment of the retinal image and the excitability of retinal ganglion cells using linear systems theory (Optische und neuronale Grundlagen der visuellen Bildübertragung - Einheitliche mathematische Behandlung des retinalen Bildes und der Erregbarkeit von retinalen Ganglienzellen mit Hilfe der linearen Systemtheorie). B. Fischer (Freiburg, Universität, Freiburg im Breisgau, West Germany). *Vision Research*, vol. 12, June 1972, p. 1125-1144. 30 refs. In German. Research supported by the Deutsche Forschungsgemeinschaft and Stiftung Volkswagenwerk.

The linear systems theory is used for a quantitative mathematical description of the retinal image and the excitability of retinal ganglion cells. The input-output relations for linear transformations are presented. Gauss functions were chosen as transfer functions. Luminance distributions of several stimulus patterns at the receptor layer are calculated and plotted. All calculations were performed for real two-dimensional excitation patterns and receptive fields. The common mathematical concept of optical imagery and the neuronal summation characteristics at threshold stimulation of the receptive field may serve as a basis for a uniform and closed theory of visual information processing. O.H.

A72-31368 The effect of stimulus orientation on the phi phenomenon. J. P. Frisby (Sheffield, University, Sheffield, England). *Vision Research*, vol. 12, June 1972, p. 1145-1166. 20 refs.

It is a well established physiological fact that there exist in the visual systems of a variety of animals movement detecting cells which are also sensitive to stimulus orientation. Equally, it is an accepted psychological fact that if an orientation difference exists between a pair of phi stimuli then the probability of obtaining a movement perception is less than when no such difference is present. An attempt is made to relate these parallel observations. Three experiments are reported which explored systematically the effect of stimulus orientation on the probability of obtaining an optimal movement perception and which together suggested that this effect is curvilinear in nature, possessing one change of slope at around 20-25 deg and another at around 40-60 deg. A physiological hypothesis based on orientation/movement units is advanced to account for this result. (Author)

A72-31369 Responses of monkey optic tract fibers to monochromatic lights. R. T. Marrocco (California, University, Berkeley, Calif.). *Vision Research*, vol. 12, June 1972, p. 1167-1174. 14 refs. Grant No. PHS-NB-02274.

The responses of monkey optic tract fibers to equal-energy flashes of monochromatic lights of different areas were recorded with microelectrodes. The cone inputs to these units were studied by chromatic adaptation. Six types of fibers were found which appeared to be functionally identical to previously identified types of LGN cells. Opponent fibers responded with excitation to some regions of the spectrum and with inhibition to others. Non-opponent fibers responded in a single fashion to all wavelengths tested. Chromatic adaptation revealed that opponent fibers received inputs from one cone type in the RF center and from a second type in the RF surround. Inconclusive results were obtained from adaptation studies on non-opponent fibers. Results suggested little change in the processing of chromatic information from the ganglion cell to the LGN cell levels. (Author)

A72-31370 Maintained activity of monkey optic tract fibers and lateral geniculate nucleus cells. R. T. Marrocco (California, University, Berkeley, Calif.). *Vision Research*, vol. 12, June 1972, p. 1175-1181. 16 refs. Grant No. PHS-NB-02274.

The maintained discharge rates (MDRs) of monkey optic tract fibers and LGN cells were recorded for a wide range of light intensities. 'On' center optic tract fibers increase their firing almost linearly over 8 log units of background lights, while 'off' center units show the opposite pattern. 'On' center LGN cells show increases in rate up to .01 cd/sq m and decreases thereafter; 'off' center units showed decreases in MDR up to .01 cd/sq m and increases in rate thereafter. The MDRs of tract fibers and LGN cells differ at high luminance levels because of a stronger tonic antagonism from the LGN receptive field surround than from optic tract receptive field surrounds. These differences in surround antagonism can be demonstrated with transient stimuli also. (Author)

A72-31379 Temporal discrimination of two-pulse stimuli as a function of psychophysical method and luminance. H. W. Mertens and M. F. Lewis (Civil Aeromedical Institute, Oklahoma City, Okla.). *Optical Society of America, Journal*, vol. 62, June 1972, p. 823-826. 13 refs.

Discussion of two experiments which extended psychophysical models of the theory of signal detectability (TSD) to the study of the temporal discrimination of brief two-pulse visual stimuli. The first experiment tested the TSD prediction that observer sensitivity is independent of the psychophysical method used in measurement. The second experiment measured discrimination with a two-alternative forced-choice procedure at three luminance levels, and it was found that discriminability increased with luminance. This significant luminance effect is in agreement with the previous

findings of Lewis and Mertens (1971) concerning the effect of luminance variation in the photopic range on two-pulse thresholds.
F.R.L.

A72-31380 Relative luminous efficiencies of the eye for near-IR and -UV laser light. S. M. Hamadani and G. Magyar (ESRO, European Space Research Institute, Frascati, Italy). *Optical Society of America, Journal*, vol. 62, June 1972, p. 830, 831. 6 refs.

Results of measurements which show that the relative luminous efficiency is the same for laser light as for incoherent light. A ruby-laser-pumped near-IR tunable dye laser and its second harmonic was used for the experiment; a flash-lamp-pumped dye laser in the yellow region of the spectrum was also used. Comparison was made by the step-by-step method.
F.R.L.

A72-31448 Hemodynamic and thermal aspects of prolonged intermittent exercise. J.-M. R. Detry, M. G. Gerin, A. A. Charlier, and L. A. Brasseur (Hôpital St. Pierre, Louvain, Belgium). *Internationale Zeitschrift für angewandte Physiologie einschliesslich Arbeitsphysiologie*, vol. 30, no. 3, 1972, p. 171-185. 29 refs. Research supported by the European Community for Coal and Steel.

Nine young normal subjects were studied during two types of prolonged intermittent exercise requiring periods of heavy work alternating with intervening rest periods in the first type and light work in the second type. In a third experiment, heavy exercise was repeated after 1 hr of rest and followed by light exercise. Hemodynamic variables and body temperature were measured sequentially. Prolonged intermittent work was characterized by progressive increase in heart rate, fall in stroke volume and mean brachial pressure while cardiac output remained constant. These variations occurred more rapidly when rest periods were replaced by light work.
G.R.

A72-31449 Input and output in the system of thermoregulation during rest and exercise. III - The role of water balance in thermoregulation during rest and exercise (Antriebe und effektorische Massnahmen der Thermoregulation bei Ruhe und während körperlicher Arbeit. III - Über den Einfluss des Wasserhaushaltes auf die Thermoregulation bei Ruhe und Arbeit). M. Scarperi, S. Scarperi, K. Behling, A. Bleichert, and J. Kitzing (Hamburg, Universität, Hamburg, West Germany). *Internationale Zeitschrift für angewandte Physiologie einschliesslich Arbeitsphysiologie*, vol. 30, no. 3, 1972, p. 186-192. 16 refs. In German.

During experiments in a hot environment the sweat rate and heat conductance remain nearly constant in spite of a steady increase of core temperature. Therefore, the water loss during the experiments has to be taken in account in input-output correlations. In the experiments presented here, we replaced the water loss during the experiments. Under this condition, the correlation equations described in the second part of this paper, hold without a correction factor. In such experiments, esophageal temperature during exercise attains a steady level within the first half hr. After 2 hr, esophageal temperature in a warm climate is markedly lower than in the control experiments.
(Author)

A72-31450 Input and output in the system of thermoregulation during rest and exercise. IV - An analog model of thermoregulation during rest and exercise (Antriebe und effektorische Massnahmen der Thermoregulation bei Ruhe und während körperlicher Arbeit. IV - Ein analoges Modell der Thermoregulation bei Ruhe und Arbeit). A. Bleichert, K. Behling, J. Kitzing, M. Scarperi, and S. Scarperi (Hamburg, Universität, Hamburg, West Germany). *Internationale Zeitschrift für angewandte Physiologie einschliesslich Arbeitsphysiologie*, vol. 30, no. 3, 1972, p. 193-206. 6 refs. In German.

The model considered makes use of a simple two compartment system including core and shell. All computations were conducted with the aid of two analog Telefunken RA 742 computers. The model predicts steady state values reached after 2 hrs, taking into account esophageal and mean skin temperature, heat conductance, sweat rate, and increased oxygen uptake in the cold. At higher simulated work loads the model does not predict an indifference range. It is concluded that the range of indifference is the consequence of the nonlinear properties of the regulation system.

G.R.

A72-31506 Cutaneous perception of microwaves. S. M. Michaelson (Rochester, University, Rochester, N.Y.). *Journal of Microwave Power*, vol. 7, June 1972, p. 67-73. 28 refs. AEC-supported research.

Results of studies indicate that when a 40 sq cm area of the face is exposed to microwaves, thermal sensation can be elicited within 1 sec at power densities of 21 mW/sq cm for 10,000 MHz, and 58.6 mW/sq cm for 3000 MHz. Within 4 sec, the threshold is lowered by approximately 50%. Thresholds for pain reaction of the inner forearm were also studied. The data indicate that microwave sensation may provide a protection factor against exposure to microwaves at levels that could be injurious.
D.F.L.

A72-31509 Visual temporal integration and simple reaction time. M. L. Kietzman (New York State, Dept. of Mental Hygiene, Brooklyn; Queens College, Flushing, N.Y.) and B. J. Gillam (New York State, Dept. of Mental Hygiene, Brooklyn, N.Y.). *Perception and Psychophysics*, vol. 11, May 1972, p. 333-340. 25 refs. NSF Grant No. GB-5615; Grant No. PHS-MH-11688.

Intensity-time reciprocity for simple reaction time (RT) to foveal impulses of light was demonstrated up to 11 msec by using two experimental paradigms. The first paradigm was designed to separate two possibly confounded factors displayed by previous studies investigating the effects of increased stimulus duration on RT: (1) an asymptotic RT as a function of the increasing energy of a pulse as its duration is increased, and (2) the breakdown of integration as the pulse duration is increased. The second paradigm was designed to avoid the first factor, so as to maximize the possibility of finding partial integration at long durations. In this paradigm, partial integration was demonstrated for additional light input presented as long as 64 msec after stimulus onset. The failure of other studies to demonstrate temporal integration for RT is discussed in terms of these paradigms.
D.F.L.

A72-31513 # Electronic head-up display (Elektronicky projekcni ukazatel na urovni oci pilota). M. Beranovsky. *Zpravodaj VZLU*, no. 6, 1971, p. 5-17. 9 refs. In Czech.

Features of head-up displays, providing indications of aircraft instrument data in a symbolic form at the pilot's eye level, are described, and the advantages of this method of indication are emphasized. A basic block diagram of the display is presented with a short description of the function of the individual units involved. Attention is also given to methods for the indication of instrument data and to main indication principles. Finally, a review is given of instrument data and the symbolism as used in instruments of this type. A brief explanation of individual symbols is also presented.
O.H.

A72-31514 # Perceptual analysis of sound. H. Duifhuis. Eindhoven, Technische Hogeschool, Doctor in de Technische Wetenschappen Dissertation, 1972. 177 p. 247 refs.

Aspects of the hearing theory are discussed, with the emphasis on the functions of the peripheral portion of the auditory system. Details are given on experiments in the subjective analysis of the

hearing process in frequency and time associated with pitch perception. The experiments deal with the audibility of harmonics in periodic pulses and periodic white noise, show the limitation of the ear's frequency resolving power and provide an estimate of the selectivity of the ear. Further topics include the behavior of masking as a function of time and the transfer characteristics of the peripheral portion of the auditory system. A hypothesis is proposed to describe the behavior of the auditory receptor. V.Z.

A72-31515 The stress of hot environments. D. McK. Kerslake. Cambridge, Cambridge University Press (Monographs of the Physiological Society, No. 29), 1972. 324 p. 440 refs. \$19.50.

The problem of heat stress is examined from a theoretical point of view. The physical principles of heat exchange at the skin surface, including the problem of heat balance of sweating skin, are first dealt with. The effects of clothing are outlined. Respiratory heat exchange and water loss is discussed. Attention is also given to several physiological responses, such as the regulation of body temperature, the central control of sweating, the effect of local conditions on sweat rate, and the control of body conductance. The feasibility of basing an index of steady heat stress on physical principles is examined. Finally, some of the more important indices of heat stress, based on analysis of heat exchange, physiological observations, and subjective preference are reviewed and evaluated. O.H.

A72-31615 Study of the influence of the absorbent on the sensitivity of the evaporograph (Etude de l'influence de l'absorbant sur la sensibilité de l'évaporographe). J.-C. Loulergue (Institut d'Optique Théorique et Appliquée, Orsay, Essonne, France). *Nouvelle Revue d'Optique Appliquée*, vol. 3, Mar.-Apr. 1972, p. 95-102. 9 refs. In French.

Study and experimental comparison of the performance of an evaporograph according to the nature of the infrared absorbent utilized. A photometric study of the detector shows that the best contrast of the evaporographic images is obtained with a metal black absorbent. Some colored evaporographic photographs are presented. F.R.L.

A72-31629 * Prebiotic phosphorylation of thymidine at 65 C in simulated desert conditions. M. J. Bishop, R. Lohrmann, and L. E. Orgel (Salk Institute for Biological Studies, San Diego, Calif.). *Nature*, vol. 237, May 19, 1972, p. 162-164. NASA-NIH-supported research.

The phosphorylation of thymidine is described for a variety of conditions at 65 C to demonstrate that the reaction could readily take place in deserts at the present time. This might be used as an indication that urea-phosphate mixtures could have been important as phosphorylating agents on the primitive earth. Reaction products were identified by comparing their chromatographic and electrophoretic mobilities with those of authentic materials and by enzymatic degradation. The results show that good yields of nucleotides are obtained when nucleosides are heated with urea-phosphate mixtures at 65 C. Reactions proceed more rapidly at moderate humidities than in a stream of dry nitrogen. Occasional wetting results in even faster and more extensive reactions. There was no reaction for a mixture of urea and trimetaphosphate. D.F.L.

A72-31639 Microrheology and light transmission of blood. I - The photometric effects of red cell aggregation and red cell orientation. H. J. Klose, E. Volger, H. Brechtelsbauer, L. Heinich, and H. Schmid-Schönbein (München, Universität, Munich, West Germany). *Pflügers Archiv*, vol. 333, no. 2, 1972, p. 126-139. 24 refs. Research supported by the Deutsche Forschungsgemeinschaft.

The flow dependence of the optical density of whole blood was studied by measuring light transmission of blood in viscometric flow. The light transmission of human blood showed a biphasic behavior when plotted as a function of shear rate. Bovine blood, which does not form aggregates, shows minimum light transmission at rest. Light transmission then rises progressively with shear. Equine blood, which has strong aggregation characteristics, shows a progressive decrease of light transmission with shear. Amphibia blood (*rana esculanta*) shows a very pronounced increase in light transmission at low shear rates, but no progression with shear. G.R.

A72-31640 Microrheology and light transmission of blood. II - The photometric quantification of red cell aggregate formation and dispersion in flow. H. Schmid-Schönbein, E. Volger, and H. J. Klose (München, Universität, Munich, West Germany). *Pflügers Archiv*, vol. 333, no. 2, 1972, p. 140-155. 23 refs. Research supported by the Deutsche Forschungsgemeinschaft.

The responsible factor for the non-Newtonian viscosity characteristics of blood is the aggregation of red cells into three-dimensional structures at low shear rates. A transition into a fluid drop-like state takes place at high rates of shear. The shear rates and, thus, the shear stresses necessary to keep red cell aggregates dispersed were determined by measuring the light transmission under flow. In addition, the degree of red cell aggregation at low flow rates and the rate of aggregate reformation were studied. After plasma dilution, all effects of red cell aggregation were less pronounced. G.R.

A72-31700 * A common modality of action of simulated space stresses on the oxidative metabolism of ethylmorphine, aniline and p-nitroanisole by male rat liver. R. L. Furner, E. D. Neville, K. S. Talarico, and D. D. Feller (NASA, Ames Research Center, Environmental Biology Div., Moffett Field, Calif.). *Toxicology and Applied Pharmacology*, vol. 21, 1972, p. 569-581. 27 refs.

High gravity, cold and starvation elicited similar responses in male Simonson rats. These responses included a decreased rate in body weight gain, increased metabolism of aniline and p-nitroanisole, and no consistent pattern of change in the metabolism of ethylmorphine. Cold and starvation increased the amount of hepatic cytochrome P-450, while hypobaric-hyperoxia caused no change in any of the parameters measured. When 1% acetone was given to the rats in their drinking water, the effects on drug metabolism were similar to those produced by food restriction in that the metabolism of aniline and p-nitroanisole was increased, and the metabolism of ethylmorphine unchanged. The type I binding spectrum of acetone suggests that it is either a substrate, inhibitor, or both for hepatic oxidative enzymes. D.F.L.

A72-31723 * Mutations induced in *Tradescantia* by small doses of X-rays and neutrons - Analysis of dose-response curves. A. H. Sparrow (Brookhaven National Laboratory, Upton, N.Y.), A. G. Underbrink, and H. H. Rossi (Columbia University, New York, N.Y.). *Science*, vol. 176, May 26, 1972, p. 916-918. 19 refs. AEC-NASA-supported research; Grants No. PHS-RL-00074-11; No. PHS-CA-12536. NASA Order A-44246A.

Dose-response curves for pink somatic mutations in *Tradescantia* stamen hairs were analyzed after neutron and X-ray irradiation with doses ranging from a fraction of a rad to the region of saturation. The dose-effect relation for neutrons indicates a linear dependence from 0.01 to 8 rads; between 0.25 and 5 rads, a linear dependence is indicated for X-rays also. As a consequence the relative biological effectiveness reaches a constant value (about 50) at low doses. The observations are in good agreement with the predictions of the theory of dual radiation action and support its interpretation of the effects of radiation on higher organisms. The doubling dose of X-rays was found to be nearly 1 rad. (Author)

A72-31724 **An eagle's eye - Quality of the retinal image.** R. Shlaer (Rochester, University, Rochester, N.Y.; Chicago, University, Chicago, Ill.). *Science*, vol. 176, May 26, 1972, p. 920-922. 18 refs. Grant No. NIH-NB-00624.

The optical quality of a living eagle's eye was determined by an ophthalmoscopic method. The visual system of the eagle under test was found to be capable of from 2.0 to 2.4 times human resolution. Some other eagle species may reach up to 3.6 times human visual acuity. O.H.

A72-31725 * **Zinc in *Entamoeba invadens*.** R. S. Morgan (Pennsylvania State University, University Park, Pa.) and R. F. Sattilaro. *Science*, vol. 176, May 26, 1972, p. 929, 930. 17 refs. Grant No. NGR-39-009-008.

Atomic absorption spectroscopy, electron microprobe analysis, and dithizone staining of trophozoites and cysts of *Entamoeba invadens* demonstrate that these cells have a high concentration of zinc (approximately one picogram per cell or 1% of their dry weight). In the cysts of this organism, the zinc is confined to the chromatoid bodies, which previous work has shown to contain crystals of ribosomes. The chemical state and function of this zinc are unknown. (Author)

A72-31766 **Revised lead-equations for frontal-plane electrocardiography.** P. C. Y. Wong (Baptist Hospital, Kowloon, Hong Kong) and T. Y. Lee (Hong Kong Baptist College, Hong Kong). *Journal of Electrocardiology*, vol. 5, no. 1, 1972, p. 25-38. 10 refs.

A new approach to the relationship among the frontal-plane electrocardiographic leads using electric-field projections as the primary working quantities is introduced. A general expression relating any one electric-field projection to its two neighbors is derived. With this approach, the total number of lead equations is reduced, and the numerical factors involved therein are also restricted from four to only one. The electric-field projections of the six leads do satisfy the revised lead-equations as well as the vector requirements. From an experiment based on 5060 measurements or 506 data points, the theoretical factor of one divided by the square root of three is statistically confirmed to within .5%. (Author)

A72-31769 # **Improved otolaryngological investigation techniques in the practice of aviation medicine (Puti usovershenstvovaniia otolaringologicheskikh issledovaniy v praktike aviatsionnoi meditsiny).** V. B. Bazarov. *Voenna-Meditsinskii Zhurnal*, Dec. 1971, p. 55-58. 8 refs. In Russian.

Methods are proposed for a more comprehensive and accurate characterization of the vestibular analyzer function and of the latter's interrelation with other receptor systems of the organism. The application of these methods is expected to result in more effective prophylactic practices. M.V.E.

A72-31770 **Platelet aggregates in intramyocardial vessels of patients dying suddenly and unexpectedly of coronary artery disease.** J. W. Haerem (Ullevål Hospital, Oslo, Norway). *Atherosclerosis*, vol. 15, Mar.-Apr. 1972, p. 199-213. 25 refs. Research supported by the Norwegian Council on Cardiovascular Diseases and J. L. Tiedemanns Tobaksfabrik-Johan H. Andresens Medisinske Fond.

The intramyocardial vessels of 54 patients were examined by microscopical screening of standard myocardial sections. The sinus and atrioventricular nodes, the bundle of His, and the bundle branches were included in the sections. Twenty-seven patients died suddenly and unexpectedly of coronary artery disease. Sixteen patients had chronic coronary disease, but died of noncardiac

diseases. Eleven patients died without known coronary disease. Among patients who had no acute major lesion in the epicardial arteries, those who died suddenly of coronary disease had the highest number of intramyocardial arteries with platelet aggregates. In some instances of sudden coronary death with no major acute lesion in the epicardial arteries, a hampering of the intramyocardial circulation by platelet aggregates possibly plays a part in the pathogenesis of the fatal event. G.R.

A72-31787 **A study of pilot reaction capability to sound stimulus.** V. W. Eveleigh (Syracuse University, Syracuse, N.Y.). *IEEE Transactions on Aerospace and Electronic Systems*, vol. AES-8, Mar. 1972, p. 205-207.

An experiment is described which was used to evaluate a typical pilot's ability to activate a switch in response to a sound stimulus. Regularly spaced voice countdown, irregular voice countdown, initiation of a tone, and termination of a tone were each used as the stimulus. The individual under test was given a task similar to that involved in maintaining accurate flight conditions to occupy his attention. The regular voice countdown is shown to be least accurate in defining the switching time, providing a mean delay of approximately -0.09 sec (actually a stimulus anticipation) and a standard deviation of a bit more than 0.2 sec. In each of the other cases, a mean delay of approximately 0.25 sec and a standard deviation of approximately 0.09 sec were obtained. This compares favorably with previous experimental results. (Author)

A72-31825 **Zero-gravity testing of a waste management system.** B. Cooper and J. V. Wagner (Fairchild Hiller Corp., Farmingdale, N.Y.). In: International Astronautical Congress, 20th, Mar del Plata, Argentina, October 5-10, 1969, Proceedings.

Oxford, Pergamon Press, Ltd.; Warsaw, Panstwowe Wydawnictwo Naukowe, 1972, p. 811-824.

A zero-gravity flight test program has been conducted to evaluate the design concept of accomplishing waste collection by an airflow technique in a zero-gravity environment. The waste management system to be evaluated was required to collect, inactivate, and store the urine, feces, emergency diarrheal disorders, vomitus and debris generated throughout the mission of the space vehicle. The system also incorporates provisions for volumetric determination of each micturition of each crew member as well as a crewman personal hygiene cleaner. The flight test program in a KC-135 aircraft verified the most critical parameters of waste collection, liquid/gas separation, and volume determination. Test data were accumulated during the 20-30 sec of zero gravity achieved in each parabolic trajectory. These data permitted evaluation of the test configurations so that comparative conclusions could be obtained in arriving at a final design for the actual space vehicle. O.H.

A72-31826 **A life-supporting biological system with lower and higher plants (Biologicheskaiia sistema zhizneobespecheniia s nizshimi i vysshimi rasteniiami).** L. V. Kirenskii, I. A. Terskov, I. I. Gitel'zon, G. M. Lisovskii, B. G. Kovrov, Iu. N. Okladnikov, M. S. Rerberg, V. N. Belianin, I. N. Trubachev, and F. Ia. Sil'ko (Akademiia Nauk SSSR, Moscow, USSR). In: International Astronautical Congress, 20th, Mar del Plata, Argentina, October 5-10, 1969, Proceedings. Oxford, Pergamon Press, Ltd.; Warsaw, Panstwowe Wydawnictwo Naukowe, 1972, p. 825-829. In Russian.

A basic two-member life-supporting system is described. It consists of a man in a pressurized cabin and a simple green alga, chlorella, which is being grown in an alga cultivator. The cultivator is coupled with air from the cabin. The assimilation coefficient of the chlorella is equal to the respiratory coefficient of the man. Water regeneration is effected simultaneously with the regeneration of the atmosphere and with the photosynthetic process. The food supply of

the man is in the form of a lyophilized ration. The described three-member system consists of the same cabin and alga cultivator, but in addition includes a tube in which wheat is growing and which is coupled with the cabin and the alga cultivator. Results of measurements made with this system indicate full compatibility of all members, relative to gas exchange, and compatibility of the man with the chlorella and the wheat, relative to water exchange. D.F.L.

A72-31827 * Bioastronautic aspects of Apollo biomedical operations. J. W. Humphreys, Jr. (NASA; USAF, Washington, D.C.) and C. A. Berry (NASA, Manned Space Flight Center, Houston, Tex.). In: International Astronautical Congress, 20th, Mar del Plata, Argentina, October 5-10, 1969, Proceedings. Oxford, Pergamon Press, Ltd.; Warsaw, Panstwowe Wydawnictwo Naukowe, 1972, p. 831-849.

Bioastronautic results of the 3105 man-hours of Apollo space flight. The absence of solar flare eliminated the radiation problem for Apollo, but for prolonged flight the problem has not been solved. Crews have adapted generally to weightlessness and used it to advantage. Body weight loss is noted, and it is only partly due to fluid loss. Sleep appears to be impaired. The preventive medicine program has been difficult to conduct but in the later flights it effectively reduced the incidence of upper respiratory and gastrointestinal infection. Motion sickness has been noted, but all astronauts adapted well. Cardiovascular deconditioning has been similar in degree and duration to that noted after the Gemini flights. The loss of red blood cell mass of Gemini was found only in Apollo 9, which was the only Apollo flight where the astronauts were exposed to pure oxygen at 5 psia for prolonged periods. F.R.L.

A72-31828 Some results of experiments with plant objects exposed aboard the Zond-5 probe (*Nekotorye rezul'taty issledovaniia rastitel'nykh ob'ektami, eksponirovannykh na avtomaticheskoi stantsii 'Zond-5'*). V. V. Antipov, N. L. Delone, E. M. Morozova, G. P. Parfenov, and P. P. Saksonov (Akademiia Nauk SSSR, Moscow, USSR). In: International Astronautical Congress, 20th, Mar del Plata, Argentina, October 5-10, 1969, Proceedings. Oxford, Pergamon Press, Ltd.; Warsaw, Panstwowe Wydawnictwo Naukowe, 1972, p. 851-857. 12 refs. In Russian.

The biological effect of space flight factors, particularly radiation, on the earth-moon route was investigated using seeds of some higher plants - winter and spring wheat, barley, bean, pine, pea - Allium cepa bulbs, and plant Tradescantia paludosa. Cytological, genetic and physiologic techniques were used to detect possible changes. The cytological analysis of primary roots grown from seeds and bulbs showed a statistically significant amount of chromosome rearrangement in some cells. The highest number of rearrangements was found in pine seedlings. The stimulatory (seeds of wheat, pea, etc.) and inhibitory (tomato seeds) effects of space flight factors on the germination and growth of the seeds tested were revealed. When determining the mitotic index, a correlation between an increase of the number of mitoses and growth stimulation of experimental plants was established. An analysis of chromosome rearrangements in roots of Tradescantia paludosa showed no significant differences between the experimental and control plants. (Author)

A72-31917 # On the effect of ionizing radiation upon the retina in man and animal. G. G. Demirchoglian (Armenian Academy of Sciences, Laboratory of Visual Reception, Yerevan, Armenian SSR). *COSPAR, Plenary Meeting, 15th, Madrid, Spain, May 10-24, 1972, Paper. 21 p. 27 refs.*

The phenomenon of light flashes observed by the American astronauts on exposure to primary cosmic radiation during translunar flights is one of the latest manifestations of the extremely high sensitivity of the retina to such radiation. The interpretations of this

phenomenon are based either on the hypothesis of the Vasilov-Cherenkov radiation in ocular media, or on the direct stimulation of photoreceptors. The mechanism responsible for the light flashes perceived by the astronauts is considered, giving attention to the passage of the particles through different eye tissues, and to photochemical or other reactions in the retina. G.R.

A72-31918 # Some results of medical investigations performed during the flight of the research orbital station Salyut. N. N. Gurovskii, O. G. Gazonko, N. M. Rudnyi, A. A. Lebedev, and A. D. Egorov. *COSPAR, Plenary Meeting, 15th, Madrid, Spain, May 10-24, 1972, Paper. 22 p.*

The main purposes of the medical investigations were to study the mechanisms underlying basic functional changes of the human body during prolonged weightlessness and to evaluate the efficiency of certain measures used to maintain high performance of crew members engaged in long-term space flight. In-flight investigations recorded fatigue level, heart rate, and other cardiovascular indices. Blood samples and blood smears were also taken in flight. Results of analyses showed that the urea content increased in all the cosmonauts, while sugar content in the blood declined on the 5th and 15th days, and increased on the 22nd day, perhaps in anticipation of mission termination. The cholesterol content remained unchanged throughout the flight. Visual acuity remained about the same in all the cosmonauts during the entire mission. Analysis of the microbiological data indicated that the most important human automicroflora, from epidemiological considerations during extended space missions, are staphylococci, alpha-hemolytic streptococci, and bacteria of the Klebsiella genus. Other medical evaluation indicated a possibility of decreasing cardiovascular conditioning during long space flights. D.F.L.

A72-31932 # Gravity sensing by plants. P. Larsen (Arhus Universitet, Arhus, Denmark). *COSPAR, Plenary Meeting, 15th, Madrid, Spain, May 10-24, 1972, Paper. 26 p. 36 refs.*

A brief description of the effects of gravity on plants, particularly their orientation with reference to its direction, is followed by a presentation of evidence for the operation of specific 'gravity sensors,' statoliths, subcellular bodies which move or reorient themselves upon reorientation of a plant organ with respect to the direction of the force of gravity. In the singly reacting apical cells of rhizoids of Chara, the statoliths locally regulate the growth of the cell wall simply by blocking or permitting the access of carriers of cell wall material. In multicellular structures (root and stem tips etc.) the statoliths, most likely amyloplasts (starch-containing plastids), must act by creating in the organ a transversal polarity which can be transmitted to the growing region, often several mm away. In addition, gravity produces what may be called tonic effects, which quantitatively modify the reaction of the organ to the gravitational stimulation. (Author)

A72-31993 * # Survival of bacterial isolates exposed to simulated Jovian trapped radiation belt electrons and solar wind protons. D. M. Taylor (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.), C. A. Hagen, G. M. Renninger, G. J. Simko, C. D. Smith, and J. A. Yelinek (Bionetics Corp., Pasadena, Calif.). *COSPAR, Plenary Meeting, 15th, Madrid, Spain, May 10-24, 1972, Paper. 16 p.*

The presented study was designed to determine the effect of these radiation environments on spacecraft bacterial isolates. A bacterial subpopulation from Mariner Mars 1971 spacecraft (nine sporeforming and three nonsporeforming isolates) plus two comparative organisms were exposed to electron irradiation at different energies for various periods in a vacuum. The radioresistance of the subpopulation is shown to be dependent upon the type of isolate and

upon the energy and dose of electrons. Temperature affected the radio-resistance of only the sporeforming isolates. The subpopulation was found to be less resistant to lower-energy than to higher-energy electrons. Protons at an energy similar to the proton energy in the solar wind were effective in reducing populations of both sporeforming and nonsporeforming spacecraft isolates. D.F.L.

A72-32046 Effectiveness of IR covert illuminators. F. J. Gardiner (RCA, Aerospace Systems Div., Burlington, Mass.). In: Electro-Optical Systems Design Conference, New York, N.Y., September 14-16, 1971, Proceedings. Chicago, Industrial and Scientific Conference Management, Inc., 1971, p. 154-159. 5 refs.

Discussion of the sensitivity of human vision to covert sources of illumination intended to make possible or to aid night observation by providing a desired resolution or image quality, without being seen or detected by the unaided human eye. Data are presented that make possible visibility range estimates for several monochromatic and broadband IR illuminator and filter combinations, and it is shown that the 'covertness' of several 'covert' illuminators is clearly a matter of degree. The Nd laser is shown to be outstanding in its covert illumination capability, though not without some eye damage safety problems. M.V.E.

A72-32199 Lamellar structure of bleached and unbleached rod photoreceptor membranes. J. M. Corless (Duke University, Durham, N.C.). *Nature*, vol. 237, May 26, 1972, p. 229-231. 37 refs.

Strips of dark-adapted *Rana pipens* retinas were dissected in dim red light and were folded to appose the outer segment layers, effectively doubling the number of diffracting units in X-ray beams, in an X-ray diffraction study of the disk membrane profile and the location of rhodopsin within the profile. Diffraction patterns were obtained after the introduction of various amounts of sucrose into the frog Ringer solution. Some evidence indicated that the membrane structure was essentially unaltered after sucrose addition. Evidence was obtained for the partial localization of the rhodopsin molecule near the cytoplasmic interface. V.Z.

A72-32200 Measurement of momentary velocity in a study of human gait. N. H. Molen and W. Boon (Amsterdam, Free University, Amsterdam, Netherlands). *Journal of Biomechanics*, vol. 5, May 1972, p. 273-276.

This study describes a method of measurement in the field of biomechanical research, which determines the walking-speed of the subject in a forward movement. The measuring is based on the procedure of a subject stretching a magnetic tape, while it runs through a playback head. Pulses have been fed into the tape in advance so that the signal frequency is proportional to the momentary walking-speed of the subject in the course of movement. In a frequency/dc converter, the signal frequency is converted into a proportional dc-voltage. The frequency response of the output signal is being analyzed and compared to the frequency response obtainable in a speed measuring system in which a tachogenerator is applied. (Author)

A72-32315 * # Manipulator systems extend man's capabilities in space. S. Deutsch (NASA, Washington, D.C.) and E. Heer (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). *Astronautics and Aeronautics*, vol. 10, June 1972, p. 30-41. 49 refs.

Teleoperator components include manipulators and end effectors, sensors, a mobility unit, radio or hard-wire communications receiver and information processor, information display, man in the control loop at various levels of sophistication, the controls, and

the transmitter. Possible applications of teleoperators in space cover a wide spectrum from various research and operational missions in earth orbit in conjunction with the space shuttle, space stations, and satellites to vehicles to explore the moon, planets and their moons, asteroids and comets. G.R.

A72-32320 # Two zero-g showers. J. H. Myer (Hughes Research Laboratories, Malibu, Calif.). *Astronautics and Aeronautics*, vol. 10, June 1972, p. 68, 69.

Prolonged interplanetary excursions and space-station attendance will require better hygienic facilities for the crew than are presently offered to them. The crew needs a zero-g whole-body shower. Two shower designs are described. For extremely cramped quarters or as a back-up system, a flexible enclosure in the form of a zippered mummy bag allows adequate bathing. The other design uses a stall in the form of two truncated conical shells joined at their large diameter. A crewman in this bath experiences a familiar environment. He is enveloped in water spray and is free to scrub, wash, rinse and dry. G.R.

A72-32350 * Further observations on the phenomenon of secondary vacuolation in living cells. P. Mahlberg (Indiana University, Bloomington, Ind.). *American Journal of Botany*, vol. 59, Feb. 1972, p. 172-179. 11 refs. Research supported by Indiana University; Contract No. NAS9-9211.

The dynamics of secondary vacuole movement is studied in living hair cells of *Tradescantia virginiana*. The pattern of movement of these vacuoles is found to be similar to that described by the author previously for organelles in cultured cells. Evidence is presented in support of the thesis that the occurrence and dynamics of secondary vacuoles is a common phenomenon for plant cells. O.H.

A72-32488 # A method for the determination of 1,3 diphosphoglycerate in red blood cells. Ch. Schewe, G. Jacobasch, and S. Rapoport (Berlin, Humboldt-Universität, Berlin, East Germany). *Acta Biologica et Medica Germanica*, vol. 28, no. 3, 1972, p. 437-443. 16 refs.

A method for the determination of 1,3 DPG in red blood cell is described. Its principle includes a rapid gentle deproteinization, a concentration step by precipitation with cold acetone and fluorometric estimation of the 1,3 DPG with the backward GAPD reaction in the presence of hydrazine. Excess of GAP and of inorganic phosphate do not interfere. The overall yield of 1,3 DPG is 80-85%. The concentration of 1,3 DPG in rabbit blood is 0,67 micromole. (Author)

A72-32489 # The influence of varying parameters upon the electromyogram recorded with surface electrodes. I - The influence of electrode localization upon the electrical activity recorded from limb muscles (Die Beeinflussung des mittels Oberflächenelektroden abgeleiteten Elektromyogramms durch ableitetechnische Variablen. I - Zum Einfluss der Elektrodenlokalisation auf die von Extremitätenmuskeln ableitbare elektrische Muskelaktivität). H. Kramer and G. Küchler (Deutsches Zentralinstitut für Arbeitsmedizin, Berlin, East Germany). *Acta Biologica et Medica Germanica*, vol. 28, no. 3, 1972, p. 481-488. 35 refs. In German.

Surface electrodes were used for bipolar or unipolar recording the electrical muscle activity of untrained probands during repeated short-term contractions of muscles biceps and triceps brachii (pressure or traction of less than 15 per cent of the maximum voluntary strength) against a given constant resistance. The level of the mean electrical muscle activity as well as the mean amplitude of related peaks of the EMG potentials depended on the position of the surface electrode. (Author)

A72-32490 # The influence of varying parameters upon the electromyogram recorded with surface electrodes. II - The influence of distance, surface area and pressure of the electrodes against the skin upon recordable electrical muscular activity (Die Beeinflussung des mittels Oberflächenelektroden abgeleiteten Elektromyogramms durch ableitetechnische Variablen. II - Zum einfluss von Abstand, Flächengröße und Andruck der Elektroden auf die ableitbare elektrische Muskelaktivität). H. Kramer, H. Frauendorf, and G. Küchler (Deutsches Zentralinstitut für Arbeitsmedizin, Berlin, East Germany). *Acta Biologica et Medica Germanica*, vol. 28, no. 3, 1972, p. 489-496. 8 refs. In German.

Surface electrodes were used for bipolar recording the electromyogram of large skeletal muscles during defined muscular tensions. The distance between the electrodes, the area of the electrodes and the pressure of the electrodes against the skin were systematically varied. The mean electrical muscle activity was found to be independent of the area of the surface electrodes. The recorded electrical activity rose with increasing pressure of the electrodes against the skin in 4 out of 6 trials. When the distance between the electrodes was varied in a longitudinal direction to the muscle the mean electrical activity reached a maximum at a distance of 6 to 10 cm. It is noted that the maximum depends on the conduction velocity of the action potentials and the mean frequencies occurring in the EMG which were recorded by means of surface electrodes.

(Author)

A72-32491 # Dependence of illumination potentials of isolated frog retina upon extracellular chloride ion concentration (Die Abhängigkeit der Belichtungspotentiale der isolierten Froschnetzhaut von der extrazellulären Chloridionkonzentration). H. Berger (Jena Universität, Jena, East Germany). *Acta Biologica et Medica Germanica*, vol. 28, no. 3, 1972, p. 515-529. 79 refs. In German.

The dependence of illumination potentials (ERG) upon extracellular chloride ion concentration was studied on isolated retina of *Rana esculenta*, immersed in Ringer's solution according to Hamasaki. If the latter is buffered with a phosphate mixture (10 mM), the a-wave deepens (especially at the start of circulation), the b-wave becomes smaller and more sluggish, and the fast component of the d-wave starts to grow quickly after several minutes. Equimolar substitution of sulfate for chloride in the nonbuffered solutions causes reduction of the b-wave. This effect is attached to chloride-deficiency depolarization. The a-wave too decreases in chloride deficiency. This fact and the behavior of the negative on-effect in chloride-free solutions is taken to mean that the negative monophasic is an inhibitory sum potential that is formed with participation of chloride ions. The temporal behavior of the d-wave (amplitude) at the beginning of circulation with chloride-poor solution is reminiscent of a building-up process which is followed by a monotonous increase in amplitude until a saturation value is reached. (Author)

A72-32492 # Myocardial contractility - General aspects (La contractilité myocardique - Aspects généraux). J. C. Haissly (Hôpital Universitaire Saint-Pierre, Brussels, Belgium) and P. Vandermoten (Bruxelles, Université Libre, Brussels, Belgium). *Acta Cardiologica*, vol. 27, no. 2, 1972, p. 111-131. 56 refs. In French.

The cardiac muscle in vitro is shown to be subject to variations in its contractile state. These variations affect also its characteristic force-velocity curve. The maximum velocity peak of this curve (VP) reflects the contractility condition of the myocardium independently from the muscle fiber length. VP measurements of the left ventricle in situ make possible early detection of functional impairments well in advance of any apparent deterioration in its pumping performance. Some still unsolved theoretical and practical difficulties associated with these VP measurements are discussed. M.V.E.

A72-32493 # Myocardial contractility assessment in man (Appréciation de la contractilité myocardique chez l'homme). P.

Besse. *Acta Cardiologica*, vol. 27, no. 2, 1972, p. 134-172. 40 refs. In French.

Discussion of some of the basic notions underlying the exploration of human heart physiopathology. The analysis of cardiac performance is shown to be guided by two mutually complementary concepts: the heart as a pump and the heart as a muscle. Comparing the heart to a pump leads to consideration of the filling, evacuation, and valve-performance characteristics, the contraction homogeneity, and pressure variation pattern. Viewing the heart as a muscle calls for the determination of such mechanical properties of its fibers as those of stiffness, elasticity, and contractility, using sometimes such aids as Hill's (1936) model. A survey of these pump and muscle characteristics is followed by a review of some examples of contractility alterations in human patients. M.V.E.

A72-32494 # External methods of myocardial contractility assessment (Méthodes externes d'appréciation de la contractilité myocardique). J. Cosyns (Cliniques Universitaires Saint-Pierre, Louvain, Belgium). *Acta Cardiologica*, vol. 27, no. 2, 1972, p. 225-236. 26 refs. In French.

Apexocardiograms and carotid pulse measurements, representing external left-ventricle monitoring methods, are evaluated with respect to their reliability as indicators of cardiac function and myocardial contractility, in experimental studies on animals and normal human subjects. Preliminary results indicate that it is possible to follow the evolution of intraventricular indices by analyzing the rapidly ascending apexocardiogram phase with the aid of the mathematical treatment usually applied to internal pressure curve analyses. M.V.E.

A72-32495 # Ventricular volume measurement by the isotope method (Mesure des volumes ventriculaires par méthode isotopique). J. Di Matteo, A. Vacheron, C. Le Pailleur (Hôpital Necker, Paris, France), and P. de Vernejoul (Commissariat à l'Energie Atomique, Service Hospitalier Frédéric Joliot, Orsay, Essonne, France). *Acta Cardiologica*, vol. 27, no. 2, 1972, p. 249-259. 9 refs. In French.

Description of a radiocardiography method involving an injection into the subclavian vein of a radioisotope whose passage through the cardiac cavities is recorded, making it possible to obtain meaningful ventricular volume measurements. The latter are shown to differ significantly between normal cases and those of ischemic heart diseases with or without left ventricular insufficiency and nonobstructive myocardial pathologies. M.V.E.

A72-32496 # Significance of ventricular volume measurements obtained by dilution methods (Signification des mesures des volumes ventriculaires par les méthodes de dilution). A. Maseri (CNR, Laboratorio di Fisiologica Clinica, Pisa, Italy). *Acta Cardiologica*, vol. 27, no. 2, 1972, p. 263-270. 9 refs. In French.

Discussion of the results of a systematic study on the uniformity of intraventricular blood mixing in man. The study is based on indicator dilution techniques making possible ventricular volume measurements from indicator washout curves. It is concluded that, while the washout method cannot provide a correct estimate of ventricular volumes, it causes less discomfort to patients than angiography and should be used for obtaining useful information on the direction of ventricular volume changes. M.V.E.

A72-32497 # Measurement of the left-ventricle intracavity volume by the angiography method (La mesure du volume endocavitaire ventriculaire gauche par méthode angiographique). Ph. Brun, G. Cannel, and F. Herremann (Hôpital Henri Mondor, Créteil, Val-de-Marne, France). *Acta Cardiologica*, vol. 27, no. 2, 1972, p. 271-278. 5 refs. In French.

Review of the principal techniques used for measuring the left-ventricle intracavity volume in man on the basis of angiographic

data. The difficulties associated with these techniques are outlined, along with the means used to cope with the difficulties. Common criticisms levelled at angiographic methods are discussed. M.V.E.

A72-32498 # **Cardiocirculatory adaptation to chronic hypoxia.** P. Moret, F. Duchosal (Genève, Université, Geneva, Switzerland), E. Covarrubias (Universidad Peruana, Lima, Peru), and J. Coudert (Instituto del Torax, La Paz, Bolivia). *Acta Cardiologica*, vol. 27, no. 2, 1972, p. 283-305. 66 refs. Research supported by the World Health Organization, Fondation S. I. Patiño, Swiss Cardiology Foundation, Cantonal Hospital, and University of Geneva; Grant No. PHS-HE-06910-06.

The results of studies are reviewed on coronary flow, myocardial oxygen consumption, and myocardial efficiency conducted on three groups of Indians: two inhabiting the high plateaus of the Andes at 3700 m and at 4375 m above sea level and the third living at sea level. Resting coronary flow in the first two groups is found to be significantly lower than in the third. Myocardial oxygen consumption is also significantly lower. Left ventricular work is practically the same at all three levels, and myocardial efficiency is approximately 30 per cent greater at high altitudes. M.V.E.

A72-32572 # **An introduction to electromagnetic interaction hazards of electromedical equipment.** J. E. Bridges and E. E. Brueschke (IIT Research Institute, Chicago, Ill.). In: *Purdue Symposium on Electromagnetic Hazards, Pollution and Environmental Quality*, Lafayette, Ind., May 8, 9, 1972, Proceedings.

Lafayette, Ind., Purdue University, 1972, p. 121-134. 37 refs. Research supported by the Illinois Institute of Technology.

Hazards can exist where therapeutic electronic medical equipment can interact with the electromagnetic environment. These interactions can be categorized as: (1) interference malfunctions, (2) functional damage, (3) reliability degradation, and (4) direct shock. Trends in increased levels of electromagnetic pollution coupled with further reliance on electronic medical instrumentation can be expected to compound these hazards in the near future unless remedial action is undertaken. Effective remedial action is hampered by lack of quantitative data on equipment susceptibility, related electromagnetic environments, and the frequent need for confirming *in vivo* tests. (Author)

A72-32573 # **Design of an illumination facility for biological exposure to microwaves.** F. L. Cain, H. A. Ecker, and W. R. Free (Georgia Institute of Technology, Atlanta, Ga.). In: *Purdue Symposium on Electromagnetic Hazards, Pollution and Environmental Quality*, Lafayette, Ind., May 8, 9, 1972, Proceedings.

Lafayette, Ind., Purdue University, 1972, p. 135-137. Contract No. N00014-67-0159-0008.

Description of a newly developed illumination system which makes it possible to expose both animal and human subjects to accurately controlled microwave radiation over the frequency range from 1 to 12 GHz for extended periods of time. Using this facility, reliable data can be obtained under long-term accurately controlled environmental conditions for studying the problem of whether exposure to low-level electromagnetic radiation is detrimental to human health. O.H.

A72-32574 # **An ultra-broadband probe for RF radiation measurements.** S. Hopfer (General Microwave Corp., Farmingdale, N.Y.). In: *Purdue Symposium on Electromagnetic Hazards, Pollution and Environmental Quality*, Lafayette, Ind., May 8, 9, 1972, Proceedings.

Lafayette, Ind., Purdue University, 1972, p. 173-178. Contract No. F30602-71-C-0276.

Theoretical relations are derived which underlie an ultra-

broadband probe design for measuring the intensity of microwave radiation for the purposes of studying its harmfulness to human health. The features and performance parameters of a probe built in accordance with these theoretical relations are also outlined. O.H.

A72-32601 **Environmental progress in science and education; Institute of Environmental Sciences, Annual Technical Meeting, 18th, New York, N.Y., May 1-4, 1972, Proceedings.** Mount Prospect, Ill., Institute of Environmental Sciences, 1972. 610 p. Members, \$12.; nonmembers, \$20.

The subjects discussed are in the areas of water pollution, bioenvironmental engineering, data reduction, environmental health effects, marine environmental technology, and vacuum cryogenics. Other topics considered are related to social problems of noise, the recovery of nutrients from waste materials, laboratory management, shock and vibration, the remote sensing of the environment, nuclear radiation, corporate environmental protection, and the future environment. Aspects of air pollution technology are also examined, together with advances in industrial waste treatment.

G.R.

A72-32602 # **Non-linear effects in head impact and protection analysis.** S. L. Gordon (U.S. Naval Material Command, Naval Air Development Center, Warminster, Pa.), G. D. Moskowitz, and J. L. Rose (Drexel University, Philadelphia, Pa.). In: *Environmental progress in science and education; Institute of Environmental Sciences, Annual Technical Meeting, 18th, New York, N.Y., May 1-4 1972, Proceedings.* Mount Prospect, Ill., Institute of Environmental Sciences, 1972, p. 71-76. 18 refs.

Head injuries caused by nonpenetrating impact blows are considered. The examination of a cross-section of the head suggests that a multilayered structure should be utilized as a realistic head model for the analysis of impact blows. Additional layers can be employed to take into account the effectiveness of a protective device. Modeling considerations are discussed, together with questions of the mathematical approaches to be used, giving attention to a one-dimensional analysis and a two-dimensional analysis. The behavior of various layered models is compared. G.R.

A72-32603 # **A statistical investigation of crash accelerations effects on a seated occupant.** R. W. Carr (Beta Industries, Inc., Dayton, Ohio). In: *Environmental progress in science and education; Institute of Environmental Sciences, Annual Technical Meeting, 18th, New York, N.Y., May 1-4, 1972, Proceedings.*

Mount Prospect, Ill., Institute of Environmental Sciences, 1972, p. 77-81. 5 refs. Contract No. N00156-71-C-0669.

An emergency landing of an aircraft will expose the passengers and the crew to potentially dangerous accelerations. Approaches must be found to protect the occupants of the aircraft from injury. A convenient method for accomplishing this makes use of an energy absorber placed between the floor of the aircraft and the seat. The dynamic response of an energy absorber system for a seated man is considered. The technique employed in the study for ascertaining energy absorber performance can be used to evaluate the injury reduction capability of any energy attenuation device. G.R.

A72-32604 # **Dilatant suspensions for impact protection.** F. W. Cooke (Clemson University, Clemson, S.C.), G. M. Overall (Villanova University, Villanova, Pa.), W. B. Tarpley, Jr. (Aero-projects, Inc., West Chester, Pa.), and R. C. May (Franklin Institute Research Laboratories, Philadelphia, Pa.). In: *Environmental progress in science and education; Institute of Environmental Sciences, Annual Technical Meeting, 18th, New York, N.Y., May 1-4, 1972, Proceedings.* Mount Prospect, Ill., Institute of Environmental Sciences, 1972, p. 82-88. 10 refs.

The tendency of dilatant fluids to become stiffer upon sudden shearing makes them uniquely suitable for employment as impact energy absorbing materials. A program involving the development of dilatant suspensions for use in aircraft ejection seat cushions is discussed. Impact absorption properties for a range of dilatant suspensions are characterized and compared with currently available ejection seat cushion materials. An attempt is made to correlate, as quantitatively as possible, the results of the impact tests with data from actual ejection tests. Two dilatant systems are found to exhibit superior impact properties. One system consists of 50% starch and 2% sorbitan monolaurate in concentrated (26.5%) NaCl solution, while the other system contains 80.5% glass microbeads in water.

G.R.

A72-32605 # Airbag restraint for general aviation aircraft. J. Sommers, Jr. (FAA, National Aviation Facilities Experimental Center, Atlantic City, N.J.). In: Environmental progress in science and education; Institute of Environmental Sciences, Annual Technical Meeting, 18th, New York, N.Y., May 1-4, 1972, Proceedings. Mount Prospect, Ill., Institute of Environmental Sciences, 1972, p. 89-93.

Various passenger restraint systems were tested with the aid of a horizontal dynamic car type device. The primary purpose of the test work was to determine the structural adequacy of in-use belted restraint systems relative to their floor attachments when subjected to various dynamic load levels. It was found that the airbag/seat belt system definitely lessens the peak loads on the upper torso components of the body when compared with the seat-belt-alone system.

G.R.

A72-32606 # Dynamic and structural characteristics of human skin - A comparative study with chamois leather. B. Finlay, J. H. Evans, J. F. North, T. Gibson, and R. M. Kenedi (Strathclyde University, Glasgow, Scotland). In: Environmental progress in science and education; Institute of Environmental Sciences, Annual Technical Meeting, 18th, New York, N.Y., May 1-4, 1972, Proceedings. Mount Prospect, Ill., Institute of Environmental Sciences, 1972, p. 94-111. 26 refs.

On the basis of well established data for human skin the dynamic mechanical response of chamois leather used in anthropometric dummy studies has been investigated under conditions of low and high strain rate. Low rate torsional studies have shown that chamois leather in either a wet or a dry state is not a good dynamic mechanical analog of human skin. No definite conclusions could be drawn on the basis of impact studies at the higher strain rates associated with crash and blast.

G.R.

A72-32607 # A brain injury model for crash helmet design. J. H. McElhaney, V. L. Roberts, and R. L. Stalnaker (Michigan University, Ann Arbor, Mich.). In: Environmental progress in science and education; Institute of Environmental Sciences, Annual Technical Meeting, 18th, New York, N.Y., May 1-4, 1972, Proceedings. Mount Prospect, Ill., Institute of Environmental Sciences, 1972, p. 112-116. 19 refs.

A head injury model capable of predicting head injury through a maximum strain criteria (MSC) has been developed. This model is coupled to a helmet model and the combination allows the prediction of optimum helmet performance characteristics within a given set of constraints including size and weight. Several model exercises consisting of varying coupling parameters are presented. It is concluded that helmet performance is improved by decreasing elastic stiffness and increasing damping properties. However, in applying these results, care must be taken to avoid bottoming of the suspension or liner.

(Author)

A72-32608 A new method of measuring the mechanical impedance of men or dummies. G. Rowlands (Royal Aircraft Establishment, Farnborough, Hants., England). In: Environmental progress in science and education; Institute of Environmental Sciences, Annual Technical Meeting, 18th, New York, N.Y., May 1-4, 1972, Proceedings. Mount Prospect, Ill., Institute of Environmental Sciences, 1972, p. 117-119.

In the past, measurement of the mechanical point impedance of the human body, or a dummy, has been accomplished by measuring the force and velocity vectors at the body/vibrator interface and calculating the impedance by complex division. A difficulty inherent in these measurements is that one is measuring and comparing dissimilar quantities, with dissimilar amplitude and phase characteristics and dissimilar calibrations. This paper outlines a method in which the impedance is calculated by measuring the acceleration at two positions (neither on the body) on a reference impedance system, consisting of a circular spring supporting a mass, on which the subject or dummy may sit. By comparing the complex ratio of the accelerations on the mass and the vibrator, with and without the subject, the value of the impedance of the subject may be calculated.

(Author)

A72-32630 # Some ideas on crash energy absorption. E. H. Schell (U.S. Navy, Shock and Vibration Information Center, Washington, D.C.). In: Environmental progress in science and education; Institute of Environmental Sciences, Annual Technical Meeting, 18th, New York, N.Y., May 1-4, 1972, Proceedings. Mount Prospect, Ill., Institute of Environmental Sciences, 1972, p. 455-465. 7 refs.

Fundamental aspects of rigid body crash energy absorption are reviewed, with appropriate cautions concerning the responses of nonrigid bodies. Design for human tolerance is discussed, and the conclusion is reached that an optimum value of deceleration exists which provides a minimum social loss from highway accidents. It is shown that serious injury and death can be reduced if an increase in mild injuries can be tolerated. Overconservative estimates of human tolerance are as bad as underconservative estimates. Small vehicles have lower damage potentials than large vehicles with higher kinetic energies in a crash situation. However, their occupants are more likely to suffer injury and death. It is proposed that all vehicles be equipped to protect vehicles of lower weights. A logarithmic energy absorber is proposed and the necessary force-deflection curve is developed to make the proposal practical. It is shown that space used for the absorption of low speed crash energy to prevent insurance damage is relatively useless in absorption of high speed crash energy where as much space as possible is necessary to save lives.

(Author)

A72-32729 * Isolation of carbohydrate-metabolizing, extremely halophilic bacteria. G. A. Tomlinson (Santa Clara University, Santa Clara, Calif.) and L. I. Hochstein (NASA, Ames Research Center, Moffett Field, Calif.). *Canadian Journal of Microbiology*, vol. 18, no. 5, 1972, p. 698-701. 8 refs. NASA Contract No. SCC-007.

Four previously unrecognized strains of extremely halophilic bacteria that utilize carbohydrates have been isolated. Gas production proved an unreliable index of carbohydrate metabolism; therefore, carbohydrate utilization was measured by determining acid formation and sugar disappearance during growth. By these procedures, carbohydrate utilization was readily detected. The results suggest that carbohydrate dissimilation by extremely halophilic bacteria may be more common than previously thought and that the apparent rarity of carbohydrate-metabolizing halophiles may be an artifact of the isolation procedures used.

(Author)

A72-32746 Exchange diffusion in human red blood cells. H. Lubowitz (Washington University, St. Louis, Mo.). *Society for Experimental Biology and Medicine, Proceedings*, vol. 140, May 1972, p. 153-156. 16 refs. Grant No. PHS-AM-14586-01.

Characteristics of a model for the study of diffusional movement in human red blood cells have been examined. The results obtained support the view that exchange diffusion is one of the processes which contribute to transmembrane cation movement in human red blood cells. O.H.

A72-32747 Length of cardiac cycle and QT interval during exercise and recovery in athletes and nonathletes. G. C. Ring and P. Y. Leong (Malaya, University, Kuala Lumpur, Malaysia). *Society for Experimental Biology and Medicine, Proceedings*, vol. 140, May 1972, p. 273-277. 12 refs.

Electrocardiograms obtained during exercise on a treadmill and on a bicycle ergometer have shown that the relation between the QT and RR intervals can be represented by a simple equation. During recovery from exercise, the RR intervals lengthened much faster than the QT intervals. The alveolar pCO₂ increased during the exercise while QT shortened. O.H.

A72-32748 Dynamic behavior of endocardial structures in the baboon heart. D. C. Randall, J. A. Armour, and W. C. Randall (Washington, University, Seattle, Wash.; Loyola University, Maywood, Ill.). *Society for Experimental Biology and Medicine, Proceedings*, vol. 140, May 1972, p. 278-284. 11 refs. Grants No. NIH-FR-00166; No. NIH-HE-08682.

Strain gauge arches and/or intramyocardial pressure transducers were applied to the interventricular septum and papillary muscles in the intact baboon heart to study the dynamic behavior of the endocardial structures. Comparative data are presented upon responses in heart rate, systolic blood pressure, and contractile force of epicardial and endocardial muscle of the left ventricle during different experimental manipulations. The results are analyzed. O.H.

A72-32761 The Index of Preprogramming (IP) - A statistical method for evaluating the role of feedback in simple movements. R. A. Schmidt (Michigan, University, Ann Arbor, Mich.). *Psychonomic Science*, vol. 27, Apr. 25, 1972, p. 83-85. 9 refs.

A preprogrammed response is one in which the motor commands are determined in advance and which is carried out without feedback control. The Index of Preprogramming (IP) is proposed as a measure of preprogramming or of the degree of feedback involvement in movement. Evidence presented indicates that the IP is sensitive to variables which should manipulate the degree of preprogramming. Possible limitations of the IP as well as potential applications to research on motor skills are discussed. (Author)

A72-32762 Speed of size scaling in human vision. R. Sekuler and D. Nash (Northwestern University, Evanston, Ill.). *Psychonomic Science*, vol. 27, Apr. 25, 1972, p. 93, 94. 8 refs. Grants No. NIH-EY-321; No. NIH-NS-10094.

Ss compared the forms of pairs of rapidly presented rectangles. The rectangles varied in size and frontal plane orientation. The speed of mental size scaling was estimated from the relationship of judgment time to the size discrepancy between the rectangles. In addition, the speed of mental rotation was estimated by the increase in judgment time produced by a discrepancy between the orientations of the rectangles. Size scaling and mental rotation seem to be largely independent of one another. (Author)

A72-32763 Preparatory-response vs information-seeking interpretations of preference for signaled loud noise - Further limits on human informational cognitive control. J. J. Furedy, D. Fainstat, P. Kulin, L. Lasko, and S. Nichols (Toronto, University, Toronto, Canada). *Psychonomic Science*, vol. 27, Apr. 25, 1972, p. 108-110. 9 refs.

Fifty-six subjects received a series of .3-sec noises of varying intensity (80, 90, 100, 110, or 120 dB). Half the noises were preceded by an 8-sec signal, and a postexperimental questionnaire indicated a reliable group preference for signaled over unsignaled noise. A preparatory-response interpretation of the preference requires the presence of informational cognitive control, defined as occurring whenever the signal reduces the subjectively rated intensity of a noxious inescapable outcome. No such reduction was observed, even though the subjective intensity ratings were clearly sensitive to physical noise-intensity differences. The results are consistent with an information-seeking interpretation of the preference-for-signaled-noise phenomenon. (Author)

A72-32764 Aspects of visual and acoustic imagery. R. J. Weber and J. Kelley (Oklahoma State University, Stillwater, Okla.). *Psychonomic Science*, vol. 27, Apr. 25, 1972, p. 121, 122. Research supported by the Oklahoma State University.

Rates of processing imagined letters for visual properties (VP) and for acoustic properties (AP) are assessed. The most rapid imaginal conditions show that letters of an alphabetic list are processed at almost 2 per second for both visual and acoustic properties. Indirect evidence is presented to show that implicit verbal control of letter sequencing may be involved for both visual and acoustic imagination when processing alphabetic lists, thus revealing a link between visual and verbal coding. (Author)

A72-32766 # A contribution to the parameter estimation of a certain class of dynamical systems. M. Hajek (Vysoka Skola Chemicko-Technologiccka, Prague, Czechoslovakia). *Kybernetika*, vol. 8, no. 2, 1972, p. 165-173. 7 refs.

A procedure is developed for finding the theoretical number of parameters determinable in a dynamic biological system on the basis of the latter's input-output behavior. An explicit formula is given for a single-input single-output system. The results obtained are not limited to biological systems and hold for practically any system with lumped parameters. M.V.E.

A72-32949 The accuracy of diffusion-constant measurements by digital autocorrelation of photon-counting fluctuations. E. R. Pike (Royal Radar Establishment, Malvern, Worcs., England). (*Centre National de la Recherche Scientifique, Colloque International sur la Diffusion de la Lumière par les Fluides, France, July 15-17, 1971.*) *Journal de Physique*, vol. 33, Feb.-Mar. 1972, Supplement, p. C1-177 to C1-180. 16 refs.

We discuss the accuracy of a measurement of a spectral linewidth using the method of digital correlation of single-clipped photon counting fluctuations with a given light flux and a given duration of experiment. Statistical effects due to the random nature of the light field and the photoelectric process limit this accuracy, so that the longer the duration of the experiment the more accurate the result, if all other factors are equal. Theoretical and experimental results are presented which show the accuracies obtainable as functions of the sample time, detector area, and clipping level. (Author)

A72-32987 Noise annoyance susceptibility. N. M. Moreira and M. E. Bryan (Salford, University, Salford, Lancs., England). (*British Acoustical Society, Spring Meeting, Birmingham, England,*

Apr. 5-7, 1971.) *Journal of Sound and Vibration*, vol. 21, Apr. 22, 1972, p. 449-462. 21 refs.

Investigation of the variations of annoyance due to tape recorded noise in a group of 34 normal hearing subjects. It has been found that there are significant differences between subjects in their rating of three different types of noise, 20 samples of which were played at levels varying from 55 to 95 dBA. It was also found that subjects were stable in their judgements of annoyance over a two-month period. Those subjects most sensitive to noise showed greater initial annoyance but their annoyance grew less rapidly with increasing noise level than that of those least sensitive to the noise. The former also tended to have steeper loudness functions than the latter; this result is in general support of the receptivity 'hypothesis'. While sensitivity to annoyance by noise (or noise annoyance susceptibility) does not appear to depend upon such personal factors as age, sex, education, job responsibility, nor such personality traits as determined by the EPI and the MMPI, it is apparently quite strongly related to various measures of personality given by the Rorschach Projection Test. A tentative personality profile of a noise sensitive individual is proposed, and some support for this is found from noise annoyance field studies and from individual loudness function data. It is suggested that in order to predict an individual's annoyance to a particular noise it is necessary to know not only the level of the noise but also his personality. (Author)

A72-32991 # Comparative estimation of formation and preservation of temporary connections in alert and hypnotic state (Sravnitel'naya otsenka obrazovaniia i sokhraneniia vremennykh svyazi v sostoianii bodrstvovaniia i v gipnoze). L. S. Dubirnyi (Donetskii Gosudarstvennyi Meditsinskii Institut, Donetsk, Ukrainian SSR). *Zhurnal Vyshei Nervnoi Deiatel'nosti*, vol. 22, Mar.-Apr. 1972, p. 312-315. 7 refs. In Russian.

A conditioned cardiac reflex elaborated to metronome knocks was studied in two groups of subjects (ten subjects in each). In the first group a muscular load in the form of 20 sit-ups was used as an unconditioned stimulus; in the second group it was a suggested performance of the same load. After stabilization the reflex was extinguished. Statistical processing and comparison of the results have shown that the cardiac conditioned reflex formed in a hypnotic state is considerably more stable both in the process of elaboration and extinction. (Author)

A72-32992 # EEG of the sensomotor region of the human brain in a state of motor readiness and during movement of the hand (EEG sensomotornoi oblasti mozga cheloveka pri sostoianii dvigatel'noi gotovnosti i pri dvizhenii kisti ruki). L. M. Puchinskaia (Akademiia Nauk SSSR, Institut Vyshei Nervnoi Deiatel'nosti i Neirofiziologii, Moscow, USSR). *Zhurnal Vyshei Nervnoi Deiatel'nosti*, vol. 22, Mar.-Apr. 1972, p. 368-376. 16 refs. In Russian.

It is shown that (1) the spoken instruction to be ready for active movement (clenching of the fist) upon imminent command and (2) the preparation of the hand for passive movement by placing a special plate beneath the palm both produce sensomotor-area EEG changes which are analogous to changes produced by the movement itself. The EEG variations correspond by nature and location to proprioceptive influences. Effects of closed and opened eyes during these experiments were also studied. Opening of the eyes stimulated the appearance of the rolandic rhythm. This may be regarded as a result of diminished readiness due to the switching on of visual control. Proprioceptive influences depress both alpha and beta rhythms in the sensomotor region. T.M.

A72-32993 # Dynamics of cerebral blood circulation in orienting reaction in man (Dinamika krovoobrashcheniia mozga pri orientirovochnoi reaktcii cheloveka). D. A. Kamenov and N. A. Filippicheva (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR). *Zhurnal Vyshei Nervnoi Deiatel'nosti*, vol. 22, Mar.-Apr. 1972, p. 385-393. 24 refs. In Russian.

A study of changes in a number of parameters of the rheoencephalogram in fronto-mastoidal records at the moment of an

orienting reaction (OR) to an indifferent sound in 26 practically healthy young subjects and of the arousal in nine has shown that both OR and arousal involve functional changes in cerebral blood circulation. Under optimal conditions they are manifested in an enhancement of the pulse blood supply of the brain and the related dilatation of the peripheral brain vessels. The cerebral vascular OR component is pronounced to the utmost in response to the first stimulus and is rapidly extinguished when the stimulus is repeated. Changes in cerebral hemodynamics during arousal are less pronounced than during OR, which appears to reflect a lower level of activation of the brain in the first case as compared with the second. (Author)

A72-33025 A non-linear theory of the distribution of pulmonary ventilation. T. J. Pedley, M. F. Sudlow, and J. Milic-Emili (Imperial College of Science and Technology, London, England). *Respiration Physiology*, vol. 15, May 1972, p. 1-38. 30 refs. Research supported by the Leverhulme Trust Fund, Medical Research Council, Nuffield Foundation, Merchant Taylors Co., and Brompton Hospital Research Fund.

A theory for the distribution of ventilation in a two-compartment model of the lung is developed. The theory neglects inertial forces, but allows resistance and compliance to vary with lung volume, and allows resistance to vary with flow rate, all in a nonlinear manner. Numerical solutions to the basic equation are found for the distribution of inspired gas between the upper and lower lobes of erect human lungs. Results show how a bolus of labeled gas inspired at various volumes and flow rates would be distributed. The computations are made for a wide range of physiological and anatomical parameters, so that the influence of various factors, such as overall lung volume, airway resistance and pressure-volume relations, on the distribution of inspired gas can be explored. The flow rate at which reversal occurs is most sensitive to changes in lung volume. It is indicated that the theory can be extended to calculate the ventilation distribution in situations other than uniform inspiration. D.F.L.

A72-33097 # Effect of motivation on the conditioned slow negative potential of the human brain cortex (Vliianie motivatsii na uslovnyi medlennyi otritsatel'nyi potentsial kory golovnogo mozga cheloveka). E. A. Kostandov and Iu. L. Arzumanov (Tsentral'nyi Nauchno-Issledovatel'skii Institut Sudebnoi Psikhologii, Moscow, USSR). *Akademiia Nauk SSSR, Doklady*, vol. 203, Apr. 21, 1972, p. 1429-1432. 13 refs. In Russian.

Comparative study of the dependence of the conditioned slow negative potential on motivation in human subjects reacting to an imperative stimulus under conditions of low motivation, high motivation, and punishment avoidance. It is found that under conditions of enhanced motivation the conditioned slow negative potential significantly increases and the reaction time decreases. Moreover, the highest values of the conditioned slow negative potential and the shortest reaction times were obtained under conditions of punishment avoidance as opposed to mere verbal instruction to perform as quickly as possible. A.B.K.

A72-33098 # Hypokinesia (Gipokineziia). K. M. Smirnov (Akademiia Nauk SSSR, Institut Fiziologii, Novosibirsk, USSR). *Uspekhi Fiziologicheskikh Nauk*, vol. 3, Jan.-Mar. 1972, p. 3-20. 169 refs. In Russian.

Consideration of the consequences of inadequate muscle activity in humans. Data concerning ordinary motor activity in humans and its reduction in industrially advanced societies are presented. The results of studies of the consequences of hypokinesia under natural conditions of life and in experiments are cited. The effect of prolonged limited or local muscle activity on humans is assessed on the basis of data obtained in situations in which most of the muscles are inactive or are limited to maintaining a posture. A.B.K.

A72-33099 # The hippocampus (Gippokamp). L. S. Gamberian and I. N. Koval' (Akademiia Nauk Armianskoi SSR,

Laboratoriia Neurobioniki, Armenian SSR). *Uspekhi Fiziologicheskikh Nauk*, vol. 3, Jan.-Mar. 1972, p. 21-51. 271 refs. In Russian.

Review of the basic data on the morphology and physiology of the hippocampus. It is shown that the hippocampus is related to mechanisms of the emotions and memory, to the formation of time links and the control of visceral activity, and to the formation of motivations and endocrine control. The hippocampus is one of the structures of the cortico-subcortical integrating system, which achieves simultaneous integration of trigger signal excitations (a conditioned stimulus), circumstantial stimuli, and the memory apparatus. It is shown that the polymodality of the hippocampus functions arises from the fact that the hippocampus belongs to the group of formations which satisfy 'cortex' criteria. A.B.K.

A72-33100 # Seasonal rhythms of the functioning of the endocrine system in hibernating mammals (Sezonnye ritmy funktsionirovaniia endokrinnoi sistemy u zimospishchikh mlekopitaiushchikh). M. G. Kolpakov, S. G. Kolaeva, and G. S. Shaburova (Akademiiia Nauk SSSR, Institut Fiziologii, Novosibirsk, USSR). *Uspekhi Fiziologicheskikh Nauk*, vol. 3, Jan.-Mar. 1972, p. 52-68. 72 refs. In Russian.

Review of the literature dealing with the state of the endocrine system at various periods in hibernating mammals. On the basis of the literature data and the authors' own findings an attempt is made to analyze the endocrine mechanisms participating in the formation of individual phases of the cycle and possible oscillators of these phases. It is noted that two types of biological clocks - central and peripheral - figure in the regulation of the seasonal rhythms of the endocrine system in hibernating mammals as well as in homeothermal animals. The presence of a distinct hierarchy in the endocrine system, due to the leading position of hypothalamic regulation, is fully evident in the seasonal rhythms of hibernating mammals. However, during hibernation, when the central mechanisms are inhibited, a peculiar disconnection of the cosubordinated factors is observed, when the role of the 'metronome' may be taken over by peripheral elements, such as the pancreas and the thyroid gland, which remain active during hibernation. A.B.K.

A72-33170 Auditory induction - Perceptual synthesis of absent sounds. U. Smith (Wisconsin, University, Milwaukee, Wis.). *Science*, vol. 176, June 9, 1972, p. 1149-1151. 6 refs. Research supported by the University of Wisconsin; NSF Grant No. GB-26459.

Within certain auditory patterns, fainter sounds may be 'heard' clearly when replaced by louder sounds having appropriate spectral compositions. This auditory induction of fainter by louder sounds can cancel the perceptual effects of masking. It is pointed out that phonemic restorations appear to be a specialized application to speech of the much broader phenomenon of auditory induction. The rules governing auditory induction indicate that it helps maintain stable auditory perception in a frequently noisy environment. G.R.

A72-33324 Federal regulation of occupational noise exposure. F. A. Van Atta (U.S. Department of Labor, Washington, D.C.). *Sound and Vibration*, vol. 6, May 1972, p. 28-31.

The objectives of the United States Department of Labor in controlling occupational noise exposures are explained. They are to prevent hearing impairment resulting from occupational noise exposure in a large percentage of the working population. These goals are being approached through measurement of environmental noise, noise reduction where necessary or ear protection as a final resort. Periodic hearing tests are recommended to check on the efficiency of these control measures. (Author)

A72-33325 The effectiveness of earplugs. J. M. Flugrath and J. B. Turbeville, Jr. (Memphis State University, Memphis, Tenn.). *Sound and Vibration*, vol. 6, May 1972, p. 32, 33.

Five experienced listeners from the Memphis State University Speech and Hearing Center were subjects in the evaluation of various earplugs for real-ear attenuation of narrow-band white noise. Subjective evaluations by the five listeners as to the 'wearability' of the earplugs were also given consideration. Test results suggest that factors in addition to attenuation should be given careful consideration in the selection of earplugs. (Author)

A72-33371 * Effect of large amounts of dihydroxyacetone in the diet of rats. J. Shapira (NASA, Ames Research Center, Moffett Field, Calif.). *Western Pharmacology Society, Proceedings*, vol. 15, 1972, p. 65-67. 14 refs. Contract No. NAS2-3458.

Experiments in which dihydroxyacetone (DHA) was used as nutrient for growing rats have not fulfilled the expectation that DHA could be used as a significant portion of the diet. Any attempt to treat major cerebral damage by prolonged administration of DHA is strongly contraindicated. For this reason, regenerated formose mixtures containing appreciable amounts of DHA will not be suitable as a significant portion of the diet for the crews of long-duration space missions. O.H.

A72-33424 * Angiographic analysis of heart geometry. H. Sandler and D. Rasmussen (NASA, Ames Research Center, Moffett Field, Calif.). In: Roentgen-, cine- and videodensitometry: Fundamentals and applications for blood flow and heart volume determination. Stuttgart, Georg Thieme Verlag, 1971, p. 212-223. 57 refs.

Basic steps in the acquisition and reconstruction of cardiac dimensions obtained from angiocardiograms for spatial reconstruction and analysis are described, and example applications include a reconstruction of the human left ventricle and a study of the motion of the free wall of the right ventricle in a dog. Computer analysis of the spatial motion of implanted tantalum markers is discussed along with corrections for distortion and magnification incurred in the process. Graphics display of three-dimensional ventricle models is examined, and future improvements in angiocardiographic studies are considered. T.M.

A72-33519 The thermodynamics of life (La thermodynamique de la vie). I. Prigogine (Bruxelles, Université Libre, Brussels, Belgium). *La Recherche*, vol. 3, June 1972, p. 547-554, 559-562. 10 refs. In French.

Consideration of the relation between the origin and maintenance of biological order and the physical laws of thermodynamics. The implications of the first and second laws of thermodynamics, which make it possible to describe most systems in physics, are reviewed. The possibility of describing highly ordered biological structures as equilibrium states governed by the second law of thermodynamics is assessed. A new concept - that of a 'dissipative' structure - is introduced to facilitate the study of the problem of biological order. These structures are nonequilibrium structures to which the second law of thermodynamics does not apply. The Bénard instability is cited as an example of a dissipative structure. The origin of a dissipative structure is explained by taking into account the fluctuations capable of giving rise to it in a thermodynamics of irreversible phenomena. This is done within the framework of a generalized thermodynamics developed by the author. The role of dissipative structures in the current functioning of living beings and in prebiological stages is investigated. A.B.K.

A72-33542 * Contributions of the space program to our knowledge of motion sickness. A. Graybiel (U.S. Naval Aerospace Medical Center, Aerospace Medical Institute, Pensacola, Fla.). *Astronautica Acta*, vol. 17, Apr. 1972, p. 5-25; Discussion, p. 24. 51 refs. NASA-sponsored research. NASA Order R-93.

A slow rotation room (SRR) was used in a laboratory setting to study experimental motion sickness. This SRR simulates, to some degree, the conditions on a rotating spacecraft. Habitability of the chamber was ascertained by subjects who remained in the room for over a month with experimenters in attendance. Control over stressful accelerations involved regulation of the room's angular velocity and the subject's head rotations. By standardizing the head rotations, the strength of the disturbing stimulus became a function of the room's angular velocity. Mild acute episodes of motion sickness were readily kept under control. Certain techniques demonstrated that a subject's susceptibility may be expressed in terms of the number of head motions at a particular angular velocity to reach a chosen endpoint. Investigations using prolonged exposure used rapid increase in rpm to terminal velocity to evoke symptoms, or incremental increase to terminal velocity to prevent them. The effectiveness of 16 representative antimotion sickness drugs is discussed. D.F.L.

A72-33543 **Physiological reactions and their possible protection during long-term weightlessness (Fiziologicheskie reaktsii i vozmozhnye sredstva zashchity pri dlitel'nom prebyvanii v usloviakh nevesomosti).** B. B. Egorov (Akademii Nauk SSSR, Moscow, USSR). *Astronautica Acta*, vol. 17, Apr. 1972, p. 27-31. In Russian.

The paper gives the results of investigations dealing with the possibilities of normalizing certain physiological processes that change during weightlessness, thus decreasing the body tolerance to accelerations. The data presented cover the application of muscle bioelectrostimulation to normalize afferent impulses, to increase the energy load of the muscular tissue and to develop 'the physiological anti-acceleration suit.' In our experiments the mineral metabolism was stabilized with the aid of alternating gradient hypoxia. It is suggested that hyperoxic and hypercapnic gas mixtures be used as a method of increasing the body tolerance to accelerations. (Author)

A72-33544 * **Advanced research to qualify man for long term weightlessness.** W. L. Jones (NASA, Office of Manned Space Flight, Washington, D.C.). *Astronautica Acta*, vol. 17, Apr. 1972, p. 33-43; Discussion, p. 41, 42.

NASA is in the process of conducting a broad program of research and development of technology to qualify, support, and permit the successful use of man in long-term space flight. The technological tasks include human engineering, extravehicular engineering, life support, and human research to assess the effect of space stresses on human physiology and psychology. Various testing techniques that are being used may have future relevance to world health. These include a biocybernetic approach to the study of cardiovascular stresses, measurement of blood flow by means of the Doppler effect, and a device for simulating radiation dosages similar to those produced in solar flares. The planned program includes a study of both humans and animals. D.F.L.

A72-33545 **Isolation, confinement, and group dynamics in long duration spaceflight.** J. F. Kubis (Fordham University, New York, N.Y.). *Astronautica Acta*, vol. 17, Apr. 1972, p. 45-72; Discussion, p. 70-72. 102 refs.

A study was conducted that is pertinent to certain social and emotional crises which might arise among astronaut crews in flights of long duration. The problem of crowding (person proximity) was examined in an exploratory experiment which utilized the concept of 'personal space.' It was noted that galvanic skin responses of the subjects increased upon intrusion of their space by a stranger or friend, but to a lesser degree, in the case of a friend. When the subjects were questioned about their inner experience, the galvanic response became greater as the questions became more intimate, and became very pronounced when either friend or stranger was present. One interpretation of the results is that the stress associated with crowding is psychosocial in nature. The implication for group

dynamics is the sensitivity of subjects to intrusions into their inner mental life, whether by friends or strangers. Results of the tests show the importance of astronaut training for the purpose of coping with such social crises that might threaten group integrity. D.F.L.

A72-33546 **Some compensatory reactions during a prolonged state of weightlessness (Nekotorye kompensatsionnye reaktsii v dlitel'nom sostoianii nevesomosti).** J. Walawski (Akademia Medyczna, Warsaw, Poland). *Astronautica Acta*, vol. 17, Apr. 1972, p. 73-77; Discussion, p. 77. In Russian, with discussion in English.

The presented paper discusses the influence of weightlessness on the cardiovascular system, the blood, digestive tract, muscles and bones, metabolism, and the nervous system. Certain attenuated neurohormonal effects were observed in hypothermia combined with weightlessness. The hypodynamia that was observed was judged to be due to the absence of afferent impulses from antigravitational musculature in weightlessness. Autonomic symptoms are linked to a disturbed balance between different components of the autonomic nervous system. D.F.L.

A72-33547 **Physiological problems of prolonged weightlessness (Fiziologicheskie problemy dlitel'noi nevesomosti).** N. N. Gurovskii and A. A. Kiselev (Akademii Nauk SSSR, Moscow, USSR). *Astronautica Acta*, vol. 17, Apr. 1972, p. 79-85, 87; Discussion, p. 85, 86. In Russian, with discussion in English.

Results of an experiment onboard the Cosmos-110 biosatellite in which two dogs were exposed to weightlessness for about 22 days. Changes in cardiodynamics characterized as the syndrome of the heart functional hypodynamics are revealed. The functions of the digestive, motor, coagulatory and other systems of the animal organism are examined. Among the changes observed, the following phenomena should be emphasized: 30% body weight loss; significant disturbance of the ion equilibrium and related water loss; disturbed enzyme-forming function of the large intestine resulting in a sharp increase of the content of intestinal enzymes - enterokinase and alkaline phosphatase; 10-11% reduction of the mineral concentration of the bone tissue; and decrease of the lysozyme activity. (Author)

A72-33548 **The role of weightlessness in wakefulness and voluntary motor activity (Rôle de l'absence de pesanteur dans la vigilance et le déclenchement de l'activité motrice).** R. Grandpierre (Ecole Pratique des Hautes Etudes, Paris; Bordeaux, Université, Bordeaux, France). *Astronautica Acta*, vol. 17, Apr. 1972, p. 89-94, 96, 97; Discussion, p. 94-96. In French, with discussion in English.

Different physiological processes of voluntary motor activity were studied through the observation of animals during ballistic flight in the compartment of various rockets. The electrical activity of different brain areas and of muscles, both at rest and in action, were recorded for wistar rats, cats, and nemestrina monkeys. The speed of sensory and motor nerve impulses and their potentials were also recorded. The effect of weightlessness was noted on the psychomotor apparatus in that a monkey showed no voluntary motor activity while in the weightless state, but showed a return of the psychomotor reactions as it was descending, stabilized by a parachute. The results of the experiments seem to confirm the Gemini series experiments that a few tenths of g are sufficient to maintain certain physiological functions, and especially wakefulness. The described space flights show the importance of impulses from the middle ear in maintaining wakefulness. D.F.L.

A72-33549 **Aspects of perceptual deprivation in relation to the space environment.** T. C. D. Whiteside (RAF, Institute of Aviation Medicine, Farnborough, Hants., England). *Astronautica Acta*, vol. 17, Apr. 1972, p. 99-106. 9 refs.

The space environment gives rise to difficulties of a similar nature to those already encountered in high altitude flight. Partial or complete weightlessness deprives the muscle joint sensors of the usual method of determining the position of an active or inactive limb, so that hand-eye coordination, for example, tends to be impaired, unless the action is performed sufficiently slowly for the error to be seen and corrected. The effect of weightlessness on the vestibular labyrinth alters otolithic function more so than canal function, so that erroneous sensations tend to arise, and reflex eye movements take place unnecessarily. The lack of visible detail, which may occur when the individual is so light-adapted as not to be able to see a starlit background, presents an empty visual field in which accommodation and fixation, depending as they do on correction of an error signal, may be unable to function. D.F.L.

A72-33550 **Reactivity of an organism in long-duration space flights (Reaktivnost' organizma v usloviakh dlitel'nykh kosmicheskikh poletov).** P. V. Vasil'ev (Akademiia Nauk SSSR, Moscow, USSR). *Astronautica Acta*, vol. 17, Apr. 1972, p. 107-111, 112; Discussion, p. 111. 48 refs. In Russian, with discussion in English.

It is shown that weightlessness and hypodynamia result in reduced orthostatic and vestibular tolerance, increased susceptibility to infections, and changed reactivity to drugs. These conditions result in a lowering of the ability of the organism to endure acceleration and physical activity. Previous results establish that weightlessness and hypodynamia produce certain changes in the circulatory, excretory, regulatory, and respiratory systems, as well as in different metabolic processes. D.F.L.

A72-33551 **The reflex control of blood volume and the deconditioning of space pilots during weightlessness.** O. H. Gauer, C. Behn, P. Eckert, D. Kaiser, and K. Kirsch (Berlin, Freie Universität, Berlin, West Germany). *Astronautica Acta*, vol. 17, Apr. 1972, p. 113-117; Discussion, p. 116, 117. Research supported by the Deutsche Forschungsgemeinschaft; Contract No. F61052-68-C-0069.

Astronauts in orbital flight experience a disturbance of body fluid balance which always results in a considerable weight loss. In an attempt to reach an understanding of this phenomenon, the blood volume regulatory effect was studied by means of observations of the changes in urine volume. The study was based upon the fact that any isotonic expansion of blood volume leads to diuresis, and vice versa. The weightlessness that is experienced in orbital flight was simulated by water immersion techniques. After an immersion of eight hours, a considerable increase was observed in the Na/K quotient. The blood volume was reduced after the engorgement of the intrathoracic blood stores after a period of immersion. This would substantiate the claim that the diuretic reflex serves as a control of blood volume. The distribution and redistribution of the extracellular fluid volume between the intravascular and interstitial space were also studied during the immersion tests, as well as the effect of immersion on 'venous tone.' D.F.L.

A72-33552 **Effects of weightlessness on mineral metabolism - Experience to date.** G. D. Whedon (National Institutes of Health, National Institute of Arthritis and Metabolic Diseases, Bethesda, Md.). *Astronautica Acta*, vol. 17, Apr. 1972, p. 119-128; Discussion, p. 126, 127. 10 refs.

First efforts to assess mineral loss in space flight were made by bone densitometry of the os calcis before and after Gemini flights 4, 5, and 7. With this technique, apparent calcium losses ranging from 2.5 to 15% were measured in the os calcis, which is probably not accurately representative of the degree of change of the entire skeleton. The first comprehensive effort to measure mineral metabolic changes by the metabolic balance technique was made in conjunction with Gemini 7. The study involved dietary intake control and collections of all excreta before, during, and after this

14-day flight. Significant calcium loss occurred with interindividual differences. The changes in calcium and electrolyte metabolism observed probably represent the composite effect of several different concurrent and counteracting physical influences. Ground studies are currently needed to sort out the effects of hyperoxia, diminished atmospheric pressure, and other factors. D.F.L.

A72-33554 **Reactivity of the organism under extremal effects (K voprosu reaktivnosti organizma pri ekstremal'nykh vozdeistviakh).** V. V. Antipov, B. I. Davydov, M. D. Nikitin, E. F. Panchenkova, and P. P. Saksonov (Akademiia Nauk SSSR, Moscow, USSR). *Astronautica Acta*, vol. 17, Apr. 1972, p. 137-143. 12 refs. In Russian.

The effective floating (swimming) time of mice subjected to chest-to-back centrifugal overloads of 2 g for 20 min was studied at various intervals after acceleration. The effective floating time immediately after acceleration did not differ from that of the control animals. The effective floating time was found to increase one to two hours after acceleration, and to decrease markedly four hours after acceleration. An increase in the resistance of mice to physical loads seven days after acceleration was reliably established. The data reveal a lasting effect of overloads on the functional changes. V.P.

A72-33555 **Immunological consequences of the combined effects of hypothermia, asphyxia and ionizing radiation.** R. K. Andjus, O. Rajevski, and V. Rajevski (Beograd, Univerzitet; Institute for Biological Research, Belgrade, Yugoslavia). *Astronautica Acta*, vol. 17, Apr. 1972, p. 145-154; Discussion, p. 153. 8 refs.

In an experiment designed to study the tolerance to oxygen deprivation in deep hypothermia, rats were deprived of oxygen supply by tracheal clamping at different levels of reduced body temperature. It was noted that relatively long periods of total oxygen deprivation became tolerable in deep hypothermia. It was also observed that lack of oxygen may, in turn, protect against the lethal effect of ionizing radiation. However, in rats who had survived hypothermia, asphyxia, and high-dose ionizing radiation, the defense mechanism against particulate antigens appeared to be much weakened. Compared to the consequences of maximal sublethal irradiation delivered under conventional conditions, the immunological consequences of high-dose irradiation, which is made tolerable by the combined effects of hypothermia and oxygen deprivation, are characterized by a deeper and longer lasting suppression of the primary immunological responsiveness to particulate antigens. The experiments suggest a method for achieving degrees of immunosuppression otherwise unobtainable by maximal sublethal irradiation. D.F.L.

A72-33556 **Scope and limitations of environmental radiation control in space.** H. J. Schaefer (U.S. Naval Aerospace Medical Center, Aerospace Medical Institute, Pensacola, Fla.). *Astronautica Acta*, vol. 17, Apr. 1972, p. 155-164. 19 refs.

The unpredictability of solar flares is one reason given for a sharp departure from established radiation safety procedures for terrestrial conditions, in protecting man from environmental ionizing radiation in space. In this direction, it is shown that a scale of incremental dose levels and related effects on man is needed, instead of the defined maximum permissible dosages. Although protection in shelters is feasible during solar proton storms, while on the moon or planets, the shielding of space vehicles would impose a prohibitive weight penalty. The risk of a major proton event while in orbit has to be accepted and appears to be quite moderate for the lunar mission. Chronic damage from galactic exposure presents another serious problem from the standpoint of future space operations of long duration. Quantitative assessment of the radiation load indicates that the price in life shortening and other chronic effects can be substantial. D.F.L.

A72-33557 **Functional significance and neural mechanisms of sleep.** G. Moruzzi (Pisa, Università, Pisa, Italy). *Astronautica Acta*, vol. 17, Apr. 1972, p. 165-169; Discussion, p. 168. 13 refs.

In the investigation of the functional significance and neural mechanisms of sleep, a distinction is made between fast and slow recovery processes of the central nervous system. Fast recovery processes are mainly related to conduction and synaptic transmission of nerve impulses, and do not require prolonged disorganization of the neural mechanism. Slow recovery processes occur only when the activity of neuronal populations is interrupted or severely disorganized for long periods of time. The hypothesis is presented that sleep is related to slow recovery processes, which would be required only by the structures underlying the higher nervous activities. A prolonged period of inactivation does not occur in the respiratory center or in the cerebellum. These structures apparently do not require sleep recovery. Although mammalian sleep is characterized by the alteration of two stages of sleep, synchronized and desynchronized, it is unknown how the fall of the ascending reticular system leads to the activation of those thalamic and hypothalamic structures that are related to these two stages of sleep. D.F.L.

A72-33558 **Cerebral metabolism and circulation in wakefulness, sleep and coma.** D. H. Ingvar (University Hospital, Lund, Sweden). *Astronautica Acta*, vol. 17, Apr. 1972, p. 171-176, 178; Discussion, p. 176, 177. 36 refs.

Physiological parameters of wakefulness and sleep are discussed, as well as parameters of related states like coma and epileptic seizures. Consciousness is only 'produced' by the central nervous system at a certain metabolic level which is accompanied by a certain rate of cerebral blood flow. During mental activity, small regional changes of the cerebral blood flow can be recorded. These changes apparently reflect events in the cortex related to mentation. In ortho-sleep, only minor metabolic changes seem to take place, in distinction to para-sleep wherein cerebral blood flow is augmented. Coma due to intoxications or brain stem injury is accompanied by a reduction of the cerebral metabolism and blood flow. In epileptic seizure, however, the functional activity and brain metabolism increase to levels above normal range, and lead to loss of consciousness. The cerebral blood flow rate appears to be ultimately set by the demands of the tissue itself (metabolic regulation). D.F.L.

A72-33559 **Some biochemical aspects of paradoxical sleep deprivation.** L. Rakic (Institute for Biological Research, Belgrade, Yugoslavia). *Astronautica Acta*, vol. 17, Apr. 1972, p. 179-184. 19 refs.

In cats deprived for three to eight days of the paradoxical phase of sleep (PS), different regions of the brain were analyzed for their content of gamma-aminobutyric acid (GABA), aspartic acid, glutamic acid, glycogen (free, bound, and total), and phosphatidopeptides. It was found that GABA and aspartic acid changed their concentrations during PS deprivation to a much greater extent than glutamic acid. The concentration of GABA and of aspartic acid increased in the reticular formation, the thalamus, and the frontal cortex. A reduced concentration of these compounds was observed in the colliculi and in the caudate nucleus. The concentration of total and bound glycogen decreased significantly in the pons, caudate nucleus, and the thalamus of PS deprived animals. Phosphatidopeptides increased in a number of structures (pons, lateral geniculate body), but decreased in the hypothalamic region, and remained practically unchanged in all of the cortical regions, as well as in the cerebellum. D.F.L.

A72-33560 * **Biotelemetry and computer analysis of sleep processes on earth and in space.** W. R. Adey (California, University, Los Angeles, Calif.). *Astronautica Acta*, vol. 17, Apr. 1972, p. 185-202; Discussion, p. 201, 202. 21 refs. Contracts No. AF

49(638)-1387; No. Nonr-233(91); Grants No. NIH-NB-01883; No. NIH-NB-2503; No. NIH-MH-03708; No. NsG-237-62; No. NsG-502; No. NsG-505; No. NsG-1970; No. DADA17-67-C-7124.

Developments in biomedical engineering now permit study of states of sleep, wakefulness, and focused attention in man exposed to rigorous environments, including aerospace flight. These new sensing devices, data acquisition systems, and computational methods have also been extensively applied to clinical problems of disordered sleep. A 'library' of EEG data has been prepared for sleep in normal man, and characterized for its group features by computational analysis. Sleep in an astronaut in space flight has been examined for the first and second 'nights' of space flight. Normal 90-min cycles were detected during the second night. Sleep patterns in quadriplegic patients deprived of all sensory inputs below the neck have indicated major deviations. G.R.

A72-33561 **The problem of sleep and its limitations during prolonged space flights (Problema sna i ego ogranichenii primenitel'no k kosmicheskim poletam bol'shoi prodolzhitel'nosti).** V. P. Zukhar' (Akademii Nauk SSSR, Moscow, USSR). *Astronautica Acta*, vol. 17, Apr. 1972, p. 203-208; Discussion, p. 207, 208. 17 refs. In Russian, with discussion in English.

Factors which affect the normal sleeping routine of man in space are examined, with particular reference to weightlessness, hypokinesia, hypodynamia, nervous emotional tension, the effect of confinement to the cabin, and the changes in the 24-hour rhythm, lighting, air temperature, and noise background. Results of sleep studies under space flight simulating conditions are discussed, and the effectiveness of various means of organizing the rest and sleep periods of cosmonauts is evaluated and compared. V.P.

A72-33562 * **Past and future space flight experiments on man and their spin-off contribution to world health.** C. A. Berry and L. F. Dietlein (NASA, Manned Spacecraft Center, Houston, Tex.). *Astronautica Acta*, vol. 17, Apr. 1972, p. 209-214.

The manned space-flight program has created some requirements which were new to the practice of medicine. The remoteness of the patient made it necessary to provide sensing and transmitting capability for various physiologic functions. The space and weight penalties in a spacecraft required that such sensors and related equipment be miniaturized and of a noninterfering nature as far as the crewmen were concerned. The need for continually increasing flight durations created a requirement for a type of equipment reliability previously unknown to medicine. The requirement to protect the crewmen against the environment of space and provide a habitable spacecraft has produced a series of ground-based medical applications. G.R.

A72-33563 **Signals on the state of man in flight (Signalny sostoiannii cheloveka v polete).** E. A. Asratian and P. V. Simonov (Akademii Nauk SSSR, Institut Vysshei Nervnoi Deiatel'nosti i Neirofiziologii, Moscow, USSR). *Astronautica Acta*, vol. 17, Apr. 1972, p. 215-221; Discussion, p. 219, 220. 8 refs. In Russian, with discussion in English.

The behavior of a number of psychological parameters which are influenced by strong emotions is studied in ground and flight tests, giving particular attention to the level of emotion. Data concerning changes in the breathing cycle, in the EEG, in the pulse rate, and in the voice (frequency spectrum) of the test subjects are applied to the determination of the functional state of an astronaut in space. V.P.

A72-33564 **Contribution of space programs to our knowledge of hematology.** W. N. Jensen (George Washington University, Washington, D.C.). *Astronautica Acta*, vol. 17, Apr. 1972, p.

223-227; Discussion, p. 225, 226.

The hematologic abnormality observed in astronauts of the U.S. Space Program was a decrease in blood volume. There was no constant trend associated with the duration of the flights. The magnitude of the change in red cell mass was small and apparently not associated with specific physiologic disadvantages which might be reflected in degradation of cardiovascular or work performance. Considerations of the possible causes of the loss of red cell mass have to take into account differences between space and earth's environment including relative hyperoxia, decreased atmospheric pressure, vibration, weightlessness, acceleration and deceleration forces, and thermal variations. Studies of the effects of these factors are discussed. G.R.

A72-33646 **Stabilized images - Functional relationships among populations of orientation-specific mechanisms in the human visual system.** M. J. Schmidt, M. P. Cosgrove, and D. R. Brown (Purdue University, Lafayette, Ind.). *Perception and Psychophysics*, vol. 11, June 1972, p. 389-392. 16 refs. Grant No. NIH-HD-00909.

Two experiments are presented in which fading rates of stabilized line stimuli were measured following prolonged adaptation to nonstabilized grating patterns in various orientations. Results indicated that some orientation-specific effects are sensitive to small variations of orientation around an optimal orientation, as well as to stimuli rotated 90 deg from the optimal orientation. These data were interpreted in terms of interactions among populations of orientation-specific mechanisms in the human visual system. (Author)

A72-33647 * **Effects of voluntary eye movement and convergence on the binocular appreciation of depth.** J. M. Foley (California, University, Santa Barbara, Calif.) and W. Richards (MIT, Cambridge, Mass.). *Perception and Psychophysics*, vol. 11, June 1972, p. 423-427. 16 refs. Contract No. F44620-69-C-0108; Grants No. NIH-MH-05673; No. NIH-EY-00666; No. NsG-496.

Scaling techniques were employed to establish the relation between perceived distance ratio and physical distance ratio. Measurements were made both with and without free eye movement and under two states of convergence. The results were confirmed using a matching technique. With free eye movement, the perceived ratio is a monotonic increasing function of the physical ratio. Without eye movement, the perceived ratio generally increases, then decreases, as the physical ratio increases. For a given physical ratio, perceived distance ratio is less in the absence of voluntary eye movements. Convergence produces depth micropsia when eye movements are permitted, but not in their absence. (Author)

A72-33648 * **Concurrent variation of response bias and sensitivity in an operant-psychophysical test.** M. Terman and J. S. Terman (Northeastern University, Boston, Mass.). *Perception and Psychophysics*, vol. 11, June 1972, p. 428-432. 15 refs. Grants No. PHS-MH-17892-01; No. NGR-22-011-070.

The yes-no signal detection procedure was applied to a single-response operant paradigm in which rats discriminated between a standard auditory intensity and attenuated comparison values. The payoff matrix was symmetrical (with reinforcing brain stimulation for correct detections and brief time-out for errors), but signal probability and intensity differences were varied to generate a family of isobias and isosensitivity functions. The d' parameter remained fairly constant across a wide range of bias levels. Isobias functions deviated from a strict matching strategy as discrimination difficulty increased, although an orderly relation was maintained between signal probability value and the degree and direction of response bias. (Author)

A72-33649 * **The power law for the perception of rotation by airline pilots.** B. Clark (San Jose State College, San Jose, Calif.)

and J. D. Stewart (NASA, Ames Research Center, Moffett Field, Calif.). *Perception and Psychophysics*, vol. 11, June 1972, p. 433-436. 15 refs. Grant No. NGL-05-046-002.

The purpose of this study was to determine the power laws for the perception of rotation about the three major body axes. Eighteen airline pilots made magnitude estimates of 5-sec pulses of nine angular accelerations having a range of acceleration x time of 10-150 deg/sec. The results showed that (1) the power law with an exponent of 1.4 describes the subjective motion of these pilots for all three major body axes, (2) the power law also describes the perception of motion for individual pilots with a substantial range of exponents, (3) there were significant correlations among the exponents for the three body axes, and (4) the data suggest that the power law over the wide range used may be more complex than implied by a formula with a single exponent. (Author)

A72-33673 * **Isolation and characterization of ultraviolet light-sensitive mutants of the blue-green alga *Anacystis nidulans*.** Y. Asato (NASA, Ames Research Center, Moffett Field, Calif.). *Journal of Bacteriology*, vol. 110, June 1972, p. 1058-1064. 20 refs.

Three independently isolated ultraviolet light sensitive (uvs) mutants of *Anacystis nidulans* were characterized. Strain uvs-1 showed the highest sensitivity to UV by its greatly reduced photoreactivation capacity following irradiation. Pretreatment with caffeine suppressed the dark-survival curve of strain uvs-1, thus indicating the presence of excision enzymes involved in dark repair. Under 'black' and 'white' illumination, strain uvs-1 shows photorecovery properties comparable with wild-type cultures. Results indicate that strains uvs-1, uvs-35, and uvs-88 are probably genetically distinct UV-sensitive mutants. D.F.L.

A72-33754 **Nonionizing electromagnetic wave effects in biological materials and systems.** C. C. Johnson and A. W. Guy (Washington, University, Seattle, Wash.). *IEEE, Proceedings*, vol. 60, June 1972, p. 692-718. 149 refs. Research supported by the University of Washington; Grants No. NIH-8-R01-RL00528-02; No. NIH-GM-16436; No. NIH-GM-16000.

Consideration of the problem of microwave penetration into the body with resultant internal power absorption from both the theoretical and experimental viewpoints. The results are discussed in terms of therapeutic warming of tissues and possible hazards caused by internal 'hot spots.' The absorption and scattering effects of light in biological tissues are reviewed. Molecular absorption peaks in the optical spectrum are useful for making molecular concentration measurements by spectroscopy. Much of the related work in the literature is summarized, some new results are presented, and several useful applications of wave energy and medical instruments are discussed. (Author)

A72-33772 * **Sporostatic and sporocidal properties of aqueous formaldehyde.** R. Trujillo and T. J. David (Sandia Laboratories, Albuquerque, N. Mex.). *Applied Microbiology*, vol. 23, Mar. 1972, p. 618-622. 6 refs. Contract No. W-12853.

Aqueous formaldehyde is shown to exert both sporostatic and sporocidal effects on *Bacillus subtilis* spores. The sporostatic effect is a result of the reversible inhibition of spore germination occasioned by aqueous formaldehyde; the sporocidal effect is due to the temperature-dependent inactivation of these spores in aqueous formaldehyde. The physicochemical state of formaldehyde in solution provides a framework with which to interpret both the sporostatic and sporocidal properties of aqueous formaldehyde. (Author)

A72-33773 * **Preference for locus of punishment in a response sequence.** J. F. Dardano (Johns Hopkins University,

Baltimore, Md.). *Journal of the Experimental Analysis of Behavior*, vol. 17, Mar. 1972, p. 261-268. 12 refs. Grants No. NSG-189-61; No. NGR-21-001-069.

Study of differences in the aversiveness of response-dependent shock when scheduled on the first, middle or final response of a sequence of 70 responses of food-deprived pigeons, using a procedure to identify relative preferences. The preferred shock schedule and the strength of the preference were found to vary among the pigeons.

M.V.E.

A72-33796 Man-machine system experiments. H. Mcl. Parsons. Research supported by the U.S. Air Force. Baltimore, Md., Johns Hopkins Press, 1972. 639 p. 588 refs. \$17.50.

A systematical analysis is presented of the methodological problems that result from experimentation on air defense systems, air traffic control systems, logistics organizations, space flight, battlefield operations, police dispatching, and even communications between heads of state. Experimental results are included concerning system procedures, training methods, team composition, organizational adaptation, complex decisionmaking, man-machine capabilities, and many aspects of design including degrees of computer automation. Man-machine system experiments and laboratories are considered.

G.R.

A72-33865 Modeling of an operator's performance in a short-term visual information processing task. H. A. Sholl (Connecticut, University, Storrs, Conn.). *IEEE Transactions on Systems, Man, and Cybernetics*, vol. SMC-2, July 1972, p. 352-362. 49 refs. Contract No. N00140-69-044.

A predictive model is presented that represents the human as an information processor by mathematically simulating the results of past psychological research in choice reaction time, memory storage/retrieval, and perceptual information processing. Both discrimination and identification tasks are characterized by ideal decisions with additive Gaussian noise. In an information processing task both presented and stored information are processed using a sequential dimensional procedure to identify a presented stimulus. This technique is shown to produce a logarithmic variation in response time as a function of the number of stimuli being presented. The model's simulation of a three-dimensional visual identification task was compared with the experimental results of three subjects. The equipment used consisted of a computer-controlled discrete dot display; the dimensions used were horizontal and vertical extent and the percentage of dots present in a given area. It was found that the simulation reflected the subjects' behavior in both decision accuracy and response time for different sets of a priori probabilities. (Author)

A72-33866 * An auditory display in a dual-axis tracking task. P. B. Mirchandani (MIT, Cambridge, Mass.). *IEEE Transactions on Systems, Man, and Cybernetics*, vol. SMC-2, July 1972, p. 375-380. 16 refs. Grant No. NGL-22-009-025.

Results of a study in which subjects were presented concurrently with the primary task of controlling a second-order plant and the secondary task of controlling a first-order plant. The plant errors for the two tasks were shown on separate visual displays. An auditory display, whose output varied in frequency and volume with the error, was used to supplement the secondary task in half of the runs. To study the effects of the auditory display, two performance measures were obtained: (1) the integral of the squared error (ISE) and (2) the describing functions of the human operator. Statistical analysis of the ISE measures indicated that when the secondary task was supplemented with an auditory display, there was a significant improvement in performance on the secondary task. The performance on the primary task improved on the average, but not significantly. The variances of the ISE values decreased for both the tasks, indicating a more consistent behavior with the auditory

display. The describing function analysis showed that supplementing the secondary task with the auditory display increased the low frequency gain of the human operator for this task. The describing functions for the primary task did not show any apparent changes.

(Author)

A72-33868 * Escape conditioning and low-frequency whole-body vibration - The effects of frequency, amplitude, and controls for noise and activation. E. L. Wike and S. S. Wike (Kansas, University, Lawrence, Kan.). *Psychonomic Science*, vol. 27, May 10, 1972, p. 161-164. 6 refs. NASA-supported research.

Seven experiments are reported on low-frequency whole-body vibration and rats' escape conditioning in a modified Skinner box. In the first three studies, conditioning was observed but was independent of frequency. In experiment four, the number of escape responses was directly related to vibration amplitude. Experiment five was a control for vibration noise and noise termination; experiments six and seven studied vibration-induced activation. Noise termination did not produce conditioning. In experiment six, subjects made more responses when responding led to termination than when it did not. In experiment seven, subjects preferred a bar which terminated vibration to one which did not.

(Author)

A72-33970 Psychophysical evidence for lateral inhibition in hearing. T. Houtgast (Nederlandse Centrale Organisatie TNO, Instituut voor Zintuigfysiologie RVO-TNO, Soesterberg, Netherlands). *Acoustical Society of America, Journal*, vol. 51, June 1972, pt. 2, p. 1885-1894. 12 refs.

Demonstration that the threshold of a test tone presented simultaneously with a masker does not reflect clear lateral-inhibition effects since the inhibition affects both the test tone and the masker. Two different methods, in which the test tone and the masker were presented successively, give clear psychophysical evidence of lateral inhibition in hearing. Firstly, the threshold curve of short test-tone bursts presented in the gaps between repeated masker bursts (noise with a steep negative or positive gradient at a particular frequency) shows marked edge effects. Secondly, the results of psychophysical measurements on two-tone suppression indicate that the nervous activity due to one frequency component may be suppressed by another component. The effect at the edges of the frequency spectrum are comparable with visual Mach bands, and the interaction of two tones is suggestive of the two-tone inhibition found in auditory-nerve fibers.

(Author)

A72-33971 # A hybrid-computer model of the cochlear partition. A. E. Hubbard and C. D. Geisler (Wisconsin, University, Madison, Wis.). *Acoustical Society of America, Journal*, vol. 51, June 1972, pt. 2, p. 1895-1903. 18 refs. Grant No. NIH-NS-06225.

Results of a hybrid-computer simulation of the Peterson-Bogert model of the cochlea. The present simulation is shown to be a good representation of the original model except near 10 kHz. The output of the model at one point has many similarities to recent experimental data. In particular, the low-frequency slope of the amplitude function is +6dB/oct, and the high-frequency slope is steeply negative. The phase function shows a break from linearity near the resonance frequency and approaches +90 deg at low frequencies. Quantitative discrepancies between model and experimental data exist, but they could be appreciably reduced by changes in parameter values. Incorporating nonlinear membrane damping in the simulation produces nonlinear effects similar to those observed in the cochlea. With increasing intensity, the displacement peak becomes relatively reduced and occurs at a somewhat lower frequency.

(Author)

A72-33972 # Masking with continuous and gated sinusoids. B. Leshowitz and E. Cudahy (Arizona State University, Tempe,

Ariz.). *Acoustical Society of America, Journal*, vol. 51, June 1972, pt. 2, p. 1921-1929. 10 refs. Research supported by the Arizona State University and NIH.

Investigation of the detection of a 5-msec tonal signal presented at various delays after the onset of a 500-msec tonal masker in several transient-masking experiments. Changes in the amount of masking were measured as a function of the delay between onset of the signal and the onset of the longer-duration masker. In agreement with previous investigations of transient masking, there was a large decrease in masked threshold, 26 dB under some conditions, with an increase in signal delay. A 'transient overshoot' at masker termination was also noted. These data are consistent with a short-time energy-sensing model of detection. In a second transient-masking study, the masking produced by a gated sinusoid in the presence of a continuous tonal pedestal was investigated. The pedestal results indicate that a simple, linear, time-invariant, energy-detection scheme cannot account for the results of two-tone masking experiments.

(Author)

A72-34008 **Serial electrocardiographic changes in myocardial infarction.** S. Tominaga (Maryland, University, Baltimore, Md.), T. Strasser (World Health Organization, Geneva, Switzerland), and H. Blackburn (Minnesota, University, Minneapolis, Minn.). *American Journal of Cardiology*, vol. 29, June 1972, p. 767-781. 16 refs. Grants No. NIH-HE-11898; No. NIH-HE-08888; No. NIH-HE-06314; No. NIH-HE-04997-11.

Study of the extent to which measured findings in single and serial electrocardiograms can detect and describe the survivors of cardiologist-diagnosed clinical coronary events, and of the degree to which such events are differentiated from changes in healthy men. A clinically practical approach is sought to criteria for serial change and an attempt is made to find, using computer analysis, the best diagnostic discriminants from multiple and combined criteria. Finally, the relative contribution of serial electrocardiographic change to the diagnosis of coronary events is elucidated. O.H.

A72-34095 **Effects of hypoxia on voluntary response time to peripheral stimuli during central target monitoring.** J. L. Kobrick (U.S. Army, Research Institute of Environmental Medicine, Natick, Mass.). *Ergonomics*, vol. 15, Mar. 1972, p. 147-156.

Response times (RTs) of 10 Ss to the randomly occurring flashes of a centrally located stimulus light were obtained concomitantly with separate RTs to the randomly-ordered flashes of 48 other stimulus lights distributed peripherally throughout the visual field. Responses were obtained during separate 3-1/2 hour exposures to each of four hypoxic conditions (sea level, 13,000, 15,000, 17,000 ft). Analysis of variance of the results indicated systematic increases in RT and variability (SD) due to hypoxia, stimulus peripheralization, and their interaction which resembled the results of a previous study in which no central stimulus was used; however, the present RTs were smaller. The data indicate that, although the central task was more demanding, it acted to maintain alertness and thus reduce the hypoxic decrements in RT shown previously.

(Author)

A72-34096 **Simple decision making at high altitude.** R. L. Cahoon (U.S. Army, Research Institute of Environmental Medicine, Natick, Mass.). *Ergonomics*, vol. 15, Mar. 1972, p. 157-163. 7 refs.

Eight volunteer military subjects were exposed to 428.8 mm Hg atmospheric pressure (15,000 ft) for 48 hours, during which they performed four card-sorting tasks: (1) sorting 96 blank cards into two bins alternately, (2) sorting 96 blank cards into 16 bins sequentially, (3) sorting 96 cards into two bins according to color of central figure, (4) sorting 96 cards into 16 bins according to color, shape, size of central figure and presence or absence of a black dot. These tasks were performed after 3 hours, 20 hours, 24 hours, and

45 hours of exposure. The results were as follows: (1) cognitive tasks (tasks 3 and 4) showed a greater decrement at 15,000 ft in speed and accuracy than psychomotor tasks (tasks 1 and 2); (2) complex decision making tasks were more affected than simple tasks; (3) speed was generally sacrificed to maintain accuracy; (4) the greatest decrement on all tasks occurred at the 3-hour test period, after which performance improved. (Author)

A72-34149 **Diagnostic errors regarding patients of draft age (Diagnostische Irrtümer bei Patienten im wehrpflichtigen Alter).** K. Schmahl (Bundeswehrkrankenhaus, Detmold, West Germany). *Wehrmedizinische Monatsschrift*, vol. 16, June 1972, p. 166-176. 32 refs. In German.

The inherent factors, both in the doctor and his methods of examination and in the type of disease or in the patient, which can lead to diagnostic misinterpretation are described, and in particular the problem of detection of premorbid and submorbid conditions and their occasionally difficult differentiation from disturbances of psychosomatic states. Because of the considerable sociological consequences an early diagnosis at a youthful age is particularly worth attempting and effective. If in the individual case a demarcation of the 'still normal' from the 'already pathological' raises difficult problems, it should be possible in the majority of cases, through the correct interpretation of the cardinal symptoms and proper institution of tolerance tests and probe tests, to arrive at a well-founded diagnosis. Finally, problems of misdiagnosis are illustrated and critically evaluated with reference to 8 of our own clinical observations in patients liable to military service. (Author)

vessel surgery. This study resulted in cap. electrode, and preamplifier improvements. Children were used to test the sleep analyzer and medical console write out units. From these data, an automatic voltage control circuit for the analyzer was developed. A special circuitry for obviating the possibility of incorrect sleep staging due to the presence of a movement artifact was also developed as a result of the study. Author

STAR ENTRIES

N72-24056*# Southwest Research Inst., San Antonio, Tex.
AEROSPACE TECHNOLOGY AND HOSPITAL SYSTEMS
[1972] 90 p refs Sponsored by NASA
(NASA-CR-126664) Avail: NTIS HC \$6.50 CSCL 06E

The use of aerospace medical techniques to improve the quality of earth health care systems is discussed. Data are focused on physiological measurements and monitoring, medical information management, clean room technology, and reliability and quality assurance for hospital equipment. E.H.W.

N72-24060# National Defence Research Organization TNO, Soesterberg (Netherlands). Inst for Perception.
SIGNAL DETECTION, CRITERION VARIABILITY AND THE NUMBER OF RESPONSE CATEGORIES

W. H. Janssen 1972 16 p refs
(IZF-1972-5; TDCK-59570) Avail: NTIS HC \$3.00

An attempt was made to evaluate the effects of criterion variance on estimates of sensitivity parameters made from rating data. A movement detection task was employed to this purpose. The results show that the slope of the ROC-curve depends on the magnitude of criterion variability. This means that estimates of signal detection theory parameters are not independent of the psychophysical procedure employed. Author

N72-24061# National Defence Research Organization TNO, Soesterberg (Netherlands).

LITERATURE REVIEW OF HUMAN OCULAR ABSORPTION IN THE VISIBLE

Dirk vanNorden 1972 15 p refs
(IZF-1972-8; TDCK-59635) Avail: NTIS HC \$3.00

All major studies on human ocular absorption (the macula not included) are gathered. From every paper important data like wavelength interval, age, and a figure of the ocular absorption curve are copied. After a discussion on the age effect a curve is proposed which represents the absorption of the average 30 year old observer. Author

N72-24062# National Defence Research Organization TNO, Soesterberg (Netherlands). Inst. for Perception.
A TEST OF LUCE'S TWO-STATE THEORY OF PSYCHOPHYSICAL DETECTION

W. H. Janssen 1971 17 p refs
(IZF-1971-16; TDCK-58339) Avail: NTIS HC \$3.00

An experiment is discussed in which a prediction was tested from Luce's two-state theory in its most extended form. This prediction specifies upper and lower bounds upon the ratio of a posteriori probabilities in detection tasks in which the observer is allowed to give responses on a rating scale. In this experiment the signal was a 1000 cps pure sinusoid presented on a continuous background of white Gaussian noise. The results contradicted theoretical predictions; 11 out of 18 a posteriori ratios violated the limits that were predicted. An ad hoc attempt to revise the theory was undertaken. Author

N72-24063*# Techtran Corp., Glen Burnie, Md.
RESPIRATION IN AN ATMOSPHERE UNDER HIGH PRESSURE

G. V. Troshikhin Washington NASA May 1972 10 p refs
Transl. into ENGLISH from Fiziol. Zh. SSSR (USSR), v. 57, no. 12, 1971 p 1808-1812 Presented at Symp. entitled, "Function of External Respiration in an Altered Gas Medium," Leningrad, 22 Jan. 1971
(Contract NASw-2037)
(NASA-TT-F-14258) Avail: NTIS HC \$3.00 CSCL 06P

The electrical activity of the external intercostal muscle and the time of the respiratory cycle were investigated in adult Wistar rats during exposure to various gas mixtures at increased pressure. Increased density of inspired gas mixture, due either to an increase in external respiration or physical characteristics of the inert gas, used for dilution of the oxygen, produces an increase in the amplitude of the electrical pulses in the respiratory volleys and the time of the respiratory cycle. A reaction of this kind in a dense medium is the consequence of

N72-24057*# Little (Arthur D.), Inc., Cambridge, Mass.
BIOLOGICAL CYCLING OF ATMOSPHERIC TRACE GASES
Final Report

Dian R. Hitchcock and Alfred E. Wechsler Mar. 1972 419 p refs
(Contract NASw-2128)
(NASA-CR-126663) Avail: NTIS HC \$23.00 CSCL 06A

A detailed critical review was conducted of present knowledge of the influence of biological processes on the cycling of selected atmospheric gas constituents--methane, carbon monoxide, and gaseous compounds of nitrogen (nitrous oxide, ammonia, nitric oxide, and nitrogen dioxide) and sulfur (hydrogen sulfide and sulfur dioxide). The identification was included of biological and other sources of each gas, a survey of abundance measurements reported in the literature, and a review of the atmospheric fate of each constituent. Information is provided on which to base conclusions regarding the importance of biological processes on the atmospheric distribution and surface-atmosphere exchange of each constituent, and a basis for estimating the adequacy of present knowledge of these factors. A preliminary analysis was conducted of the feasibility of monitoring the biologically influenced temporal and spatial variations in abundance of these gases in the atmosphere from satellites. Author

N72-24058# Advisory Group for Aerospace Research and Development, Paris (France).

AEROMEDICAL HANDBOOK FOR AIRCREW

T. G. Dobie Mar. 1972 226 p
(AGARD-AG-154) Avail: NTIS HC \$13.50

An aeromedical handbook, designed to provide information on the various aspects of aviation medicine that affect aircrew tasks, is presented. Data cover mental and physical health, effects of noise, survival measures, high altitude breathing, preventive medicine, and various other protective measures necessary for a safe flight. E.H.W.

N72-24059*# Baylor Univ., Houston, Tex. Coll. of Medicine.
OPERATIONAL TESTING OF SYSTEM FOR AUTOMATIC SLEEP ANALYSIS Final Report

Peter Kellaway 13 Apr. 1972 12 p ref
(Contract NAS9-11127)

(NASA-CR-115576) Avail: NTIS HC \$3.00 CSCL 06P

Tables on the performance, under operational conditions, of an automatic sleep monitoring system are presented. Data are recorded from patients who were undergoing heart and great

an increase in the resistance to respiration and a rise in the load on the respiratory musculature. The paper also considers the mechanism of the increase in resistance to respiration in a pressurized atmosphere. Author

N72-24064*# Techtran Corp., Glen Burnie, Md.
CHANGE IN RESPIRATION WITH INCREASING HYPERCAPNIA

V. P. Zagryadskiy Washington NASA May 1972 6 p refs
Transl. into ENGLISH from Fiziol. Zh. SSSR (USSR), v. 57, no. 12, 1971 p 1820-1822
(Contract NASw-2037)
(NASA-TT-F-14259) Avail: NTIS HC \$3.00 CSCL 06P

An analysis is presented of the changes in the indices of external respiration in man with concentrations of carbon dioxide increasing at various rates in the inspired air. It was found that as the rate of accumulation of CO₂ in the inspired air decreased, the compensatory mechanisms of external respiration were able to adapt more fully and the individual was able to better tolerate an increase of up to 6% in the concentration of carbon dioxide. Author

N72-24065*# National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.

SONIC BOOM EFFECT ON FISH: OBSERVATIONS
Max E. Wilkins May 1972 9 p refs
(NASA-TM-X-62163) Avail: NTIS HC \$3.00 CSCL 06C

Motion pictures of fish in a small tank at the time a bullet traveling 1200 m/sec passes a few centimeters above indicate that fish sense the passage of the shock wave but suffer no ill effects. The pressure rise at the bow shock wave was 0.26 atm or 275 times that associated with a strong sonic boom, for example, from the proposed supersonic transport. Author

N72-24066# Joint Publications Research Service, Arlington, Va.
REPETITION RATE OF RANGING SIGNALS OF DOLPHINS AS A FUNCTION OF DISTANCE TO TARGET

V. P. Morozov, A. I. Akopian, V. I. Burdin, K. A. Zaytseva, and Yu. A. Sokovykh 17 Apr. 1972 11 p refs
Transl. into ENGLISH from Biofizika (Moscow), v. 17, no. 1, 1972 p 139-144
(JPRS-55729) Avail: NTIS HC \$3.00

The results are given of an experimental study on the patterns of change in the repetition rate of ranging signals of a dolphin in the process of active ranging to a target (fish). It was established that the repetition rate of ranging signals during movement of the animal toward the fish varies within a certain range, at the same time retaining high values $T_{sub 0} = 2 \sup L/c$, where L is the distance from the dolphin to the target, c is the speed of propagation of sound in the water. The collected data make it possible to assume that the dolphin emits each successive ranging pulse only some time (averaging 20 msec) after the echo from the preceding pulse is received. Author

N72-24067# Joint Publications Research Service, Arlington, Va.
THE EFFECT OF LASER BEAMS ON THE TUNICS OF THE EYE

S. P. Berezina 13 Apr. 1972 6 p refs
Transl. into ENGLISH from Biol. Nauki (Moscow), no. 11, 1971 p 46-49
(JPRS-55701) Avail: NTIS HC \$3.00

Experimental data are submitted on the nature of the effect of ruby and neodymium lasers on the tunics of the eye. Information is given on transmissibility of different eye tissues. The results of these experiments are important to gain understanding of extensiveness of lesions within the eye. Author

N72-24068*# Techtran Corp., Glen Burnie, Md.
EXTRATERRESTRIAL LIFE AND ITS DETECTION METHODS

A. A. Imshenetskiy, ed. Washington NASA May 1972 262 p refs
Transl. into ENGLISH of the book "Zhizn'ne Zemli i

Metody yeye Obnaruzheniya" Moscow, Nauka press, 1970
(Contract NASw-2037)

(NASA-TT-F-710) Avail: NTIS HC \$3.00 CSCL 06C

A collection devoted to problems of space evolution, as well as the possibilities of export and import of life in space is presented. A critical evaluation is included of several of the methods which exist at the present time for detecting life outside the earth and the possibility of survival of lower organisms in experimental conditions simulating those in outer space. Author

N72-24069*# Scientific Translation Service, Santa Barbara, Calif.

EXPERIMENTAL VERIFICATION OF THE ABILITY OF QUAIL EMBRYOS TO ASSIMILATE ATMOSPHERIC NITROGEN

I. B. Zbarskiy, K. A. Perevoshchikova, G. I. Gintsburg, V. L. Kretovich, N. P. Lvov, B. I. Mazurin, Ye. N. Mishustin, L. L. Shanin, V. I. Vinogradov, V. L. Talroze et al Washington NASA May 1972 23 p refs
Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Biol. (USSR), no. 4, 1971 p 538-550
(Contract NASw-2035)
(NASA-TT-F-14273) Avail: NTIS HC \$3.25 CSCL 06C

In conjunction with other publications which indicate that molecular nitrogen is assimilated by animals and higher plants from the atmosphere, an experimental examination of this problem was conducted using quail eggs which were studied without incubation and (together with the young quail) after incubation in an atmosphere containing nitrogen enriched with the N-15 isotope and in ordinary air. The investigation of the quantitative content of nitrogen by the Kjeldahl semimicro method and the determination of the isotopic nitrogen content by means of a high sensitivity mass spectrometer indicates that atmospheric nitrogen is not assimilated by the developing embryo. The statistical analysis of the results indicates a slight tendency toward a decrease in total nitrogen content in the egg during incubation, which is in agreement with the liberation of a small quantity of volatile nitrogen compounds by the developing egg. Author

N72-24070*# California Univ., Berkeley, Space Sciences Lab.
CONSTITUENCY AND ORIGINS OF CYCLIC GROWTH LAYERS IN PELECYPOD SHELLS, PART 1 Final Report

William B. N. Berry Apr. 1972 267 p refs
(Grant NGR-05-003-067)
(NASA-CR-126672: SSL-Ser-13-Issue-36) Avail: NTIS HC \$15.50 CSCL 06C

Growth layers occurring in shells of 98 species of pelecypods were examined microscopically in thin section and as natural and etched surfaces. Study began with shells of eleven species known from life history investigations to have annual cycles of growth. Internal microstructural features of the annual layers in these shells provided criteria for recognition of similar, apparently annual shell increments in eighty-six of eighty-seven other species. All of the specimens feature growth laminae, commonly on the order of 50 microns in thickness. The specimens from shallow marine environments show either a clustering of growth laminae related to the formation of concentric ridges or minor growth bands on the external shell surface. Based on observations of the number of growth laminae and clusters per annual-growth layer, it was hypothesized that the subannual increments may be related to daily and fortnightly (and in some cases monthly) cycles in the environment. Possible applications of the paleogrowth method in the fields of paleoecology and paleoclimatology are discussed. Author

N72-24071*# Scientific Translation Service, Santa Barbara, Calif.

STIMULATION OF EMBRYONIC RAT CELLS IN CULTURE BY A PROTEIN FRACTION ISOLATED FROM FETAL CALF SERUM. 1: ELECTROPHYSIOLOGICAL MEASUREMENTS AT THE CELL SURFACE MEMBRANES

D. F. Huelser and W. Frank Washington NASA Jun. 1972 10 p refs Transl. into ENGLISH from Z. Naturforsch. (Tubingen), Part B, v. 26b, 1971 p 1045-1048 (Contract NASw-2035) (NASA-TT-F-14306) Avail: NTIS HC \$3.00 CSCL 06C

Normal embryonic rat cells incubated in serum free medium accumulate in G sub 1 phase of the cell cycle. It is demonstrated that the surface membrane potential difference (PD) decreases immediately after changing serum free medium against culture medium containing either calf serum or the isolated serum protein; the original PD is restored 2 to 3 hours later. Serum protein without growth stimulating activity does not affect the PD. A permanent rat cell line which grows independently of serum was also tested. The PD of these cells is not significantly influenced by calf serum. Author

N72-24072*# Scientific Translation Service, Santa Barbara, Calif.

MALIGNANT TUMORS AND MICROORGANISMS

D. Gericke Washington NASA Jun. 1972 12 p refs Transl. into ENGLISH from Fortschr. Med. (Munich), v. 89, no. 1, 1971 p 32-35 (Contract NASw-2035) (NASA-TT-F-14302) Avail: NTIS HC \$3.00 CSCL 06E

An attempt was made to determine the extent of interactions between microorganisms and malignant tumors. Microplasmas, the smallest microorganisms in nature, together with a carcinogenic, are capable of producing leukemia in mice. The immunological situation of a tumor carrier can be influenced favorably by application of vaccines, such as for example BCG, or of preparations made from microorganisms. Finally, the dissolution of the tumor tissue, called oncolysis, by clostridia is described. Author

N72-24073*# Stanford Research Inst., Menlo Park, Calif.
EFFECTS OF AIRCRAFT NOISES ON THE SLEEP OF WOMEN Final Report, 2 Feb. - 31 Oct. 1971
Jerome S. Lukas and Mary Ellen Dobbs Washington NASA Jun. 1972 39 p refs (Contract NAS1-10528; SRI Proj. 1072) (NASA-CR-2041) Avail: NTIS HC \$3.00 CSCL 06P

The electroencephalographic and behavioral responses during sleep of eight women subjects, aged 29 to 49 years, to subsonic jet flyover noise and simulated sonic booms were tested over 14 consecutive nights. Stimulus intensities were 101, 113, and 119 PNdB (as if measured out-of-doors) for the subsonic jet flyover and 0.67, 2.50, and 5.0 psf (as if measured out-of-doors) for the simulated sonic booms. It was found that the women were awakened, on the average, by approximately 42 percent of the flyover noises and by approximately 15 percent of the simulated sonic booms. Comparison of the results of this study with those of a similar study using men as subjects revealed that women were awakened more frequently by the subsonic jet flyover noise than were the men, while men were awakened more frequently by the simulated sonic boom. Author

N72-24074# Royal Aircraft Establishment, Farnborough (England).

THE EFFECT OF RANDOM VIBRATIONS OF A LIMITED FREQUENCY BAND COMPARED WITH SINUSOIDAL VIBRATIONS ON HUMAN BEINGS

H. Dupuis, E. Hartung, and L. Louda Apr. 1972 54 p refs Transl. into ENGLISH from "Vergleich Regelloser Schwingungen eines Bergrenzten Frequenzbereiches mit Sinusfoermigen Schwingungen Hinsichtlich der Einwirkung auf den Menschen", Max-Planck Inst. for Agr. Work and Tech., Bad Kreuznach (RAE-Lib-Trans-1603; BR28903) Avail: NTIS HC \$4.75

Work aimed at finding out whether or not the methods of subjective evaluation established for sinusoidal vibration could be extended to mixtures of sinusoidal vibrations and random vibrations is outlined. Four main experiments are covered (1) detection levels and tolerance limits for sinusoidal vibration, (2) detection levels for one vibration component in a mixture of two sinusoidal vibrations, (3) tolerance limits for a mixture of two

sinusoidal vibrations and (4) estimated intensity of a stochastic vibration compared with a simple sinusoidal vibration. Author

N72-24075*# Techtran Corp., Glen Burnie, Md.
REVIEW OF THE WORK OF THE LABORATORY OF M. I. VOLSKIY ON THE ASSIMILATION OF ATMOSPHERIC NITROGEN BY HIGHER ORGANISMS

Ye. N. Mishustin Washington NASA May 1972 21 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Biol. (Moscow), no. 4, 1971 p 647-655 (Contract NASw-2037) (NASA-TT-F-14274) Avail: NTIS HC \$3.25 CSCL 06C

A critical review is presented of works published by the M. I. Volskiy Laboratory and by others on the assimilation of nitrogen by the higher organisms of man, animals, and plants. M. I. Volskiy tries to prove that all organisms fix molecular nitrogen, regardless of symbiosis with microorganisms. Critical analysis reveals, however, that such statement is unfounded. Volskiy's experiments were not reproducible. M. I. Volskiy does not use the literature objectively and ignores materials that are contradictory to his views. Existing evidence proves that only lower life forms are capable of fixing nitrogen. Author

N72-24076*# California Univ., Berkeley. Lawrence Radiation Lab.

LIGHT FLASH PHENOMENON SEEN BY ASTRONAUTS

T. F. Budinger (Calif. Univ., Berkeley. Lawrence Berkeley Lab.), C. A. Tobias (Calif. Univ., Berkeley. Lawrence Berkeley Lab.), J. T. Lyman (Calif. Univ., Berkeley. Lawrence Radiation Lab.), P. K. Chapman (Wash. Univ., Seattle), L. S. Pinsky, H. Bichsel, J. D. Denney (Wash. Univ., Seattle), and W. B. Nelp (Wash. Univ., Seattle) 1971 45 p refs Presented at ESRO Colloq. on Space Biol. Related to the Post-Apollo Program, Paris, 15-17 Mar. 1971 Prepared in cooperation with Calif. Univ., Berkeley. Lawrence Berkeley Lab. and Wash. Univ., Seattle (Contracts W-7405-eng-48; AT(45-1)-2225; Grant CA-12-446) (NASA-TM-X-68419; LBL-31) Avail: NTIS HC \$4.25 CSCL 06P

The results from experiments conducted to characterize and elucidate light flashes seen by astronauts on Apollo 11, 12, 13, and 14 during translunar or transearth orbit are presented. The data show cosmic nuclei interacting with the visual apparatus causes the light flash phenomenon. The data also suggest that slow protons and helium ions with a stopping power greater than 10 KeV/micron will cause light flashes and streaks in the partially dark adapted eye. The effects of galactic cosmic nuclei interacting with man during long term missions are discussed. E.H.W.

N72-24077# Medical Biological Lab. RVO-TNO, Rijswijk (Netherlands).

AN IRRADIATION FACILITY WITH LIGHT AT WAVELENGTHS BETWEEN 250 AND 650 nm

D. N. vanHoytema Jan. 1972 27 p refs In DUTCH; ENGLISH summary (MBL-1972-1; TDCK-59610) Avail: NTIS HC \$3.25

An apparatus was constructed with which biological materials can be irradiated with light at various wavelengths and with a high intensity, making use of a 100 W superhigh pressure mercury lamp and a Beckman prism monochromator. The intensity of the monochromatic light is measured with a UV-sensitive photomultiplier. The equipment is calibrated by means of the uranyl oxalate actinometer system (+ or - 3 %). At lambda = 313.0 nm with a slitwidth of 2.0 mm (half-intensity band width 20 nm) the dose rate is 10.2 erg/sq mm sec. Author

N72-24078# Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).

LOWER CARBONIFEROUS SPORES FROM THE BONA-PARTE GULF BASIN, WESTERN AUSTRALIA AND

NORTHERN TERRITORY

Geoffrey Playford 1971 111 p refs
(Bull-115) Avail: NTIS HC \$7.75

Well preserved assemblages of plant microfossils have been recovered from Lower Carboniferous sediments, principally or entirely marine in origin and Visean in age, encountered in four boreholes in the landward Bonaparte Gulf Basin of Western Australia and Northern Territory. The 55 species of plant microfossils recognized are distributed among 32 genera of trilete sporae dispersae, including one new genus, *Exallospora*, which is instituted for the reception of distally annulate cingulate forms having typically verrucate sculptural elevations. Twenty-two species are referable (six tentatively so) to previously established taxa. The palynological flora is dominated by the pan-Australian, Famennian to mid-Carboniferous species *Granulatisporites frustulentus* Balme P. Hassell, which accounts for 44-83 percent of the spore populations. Certain spore forms, either the same as or closely similar to species known from Northern Hemisphere Lower Carboniferous sediments, lend confirmation to the Visean age previously adduced from the contained fauna. The palynological flora were compared with few currently known from the Australian Carboniferous System, and with those documented from relatively numerous Northern Hemisphere sequences of Lower Carboniferous age. Author

N72-24079# Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).

LATE UPPER CAMBRIAN TRILOBITES FROM THE GOLA BEDS, WESTERN QUEENSLAND

J. H. Shergold 1971 133 p refs
(Bull-112) Avail: NTIS HC \$8.75

The trilobite fauna of the Gola Beds, an informally designated stratigraphical unit of late Upper Cambrian age outcropping along the Momedah anticline in the Boulia area, western Queensland, are described. On the basis of their trilobites the Gola Beds are provisionally considered correlatives of the late Franconian to early Trempealeau interval of North America, and of the Fengshanian of north China, Korea, and Manchuria. Of the 19 genera described, 10 are new; and of the 25 species, 21 are described for the first time and four are left under open nomenclature owing to lack of material. Although the fauna is largely new, about one-third of it has affinity with species previously described from North America, notably the pseudagnostinids, richardsonellinids, and the ptychoprioids *Dellea*(?) and *Lorretta*. A further third has affinity with east Asian species in this case the *Kaolishaniidae*, *Saukiidae*, and *Shumardiidae*. Only some agnostids show much affinity with trilobites from South America, Europe, and the USSR. Author

N72-24080# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Bad Godesberg (West Germany). Inst. fuer Flugmedizin.

DECREASES IN PSYCHOMOTOR PERFORMANCE DUE TO OXYGEN-DEFICIENCY IN THE RANGE BETWEEN THE THRESHOLDS OF REACTION AND IMPAIRMENT

H. D. Eichel 1972 64 p refs In GERMAN; ENGLISH summary
(DLR-FB-72-02) Avail: NTIS HC \$5.25; DFVLR Porz-Wahn: 16,90DM

The psychomotor performance of 12 subjects was tested for 5 hours at normal atmospheric conditions and in a low pressure chamber at altitudes of 2000, 3000 and 4000 m INA. At the same time pulse rate, respiratory volume and O₂-uptake were measured. At the threshold of reaction (2000 m), no decrease in psychomotor performance was found, at an altitude of 3000 m, however, a noticeable impairment was observed, which could be compensated only temporarily within the 5 hours of experimental time. At the threshold of impairment (4000 m) finally, a considerable decrease in psychomotor performance was found. Obviously the duration of the exposure was the most important factor, which may explain contradictory results of former literature, where performance decrements were found at altitudes not lower than 4000 m. The resting values of the physiological parameters showed the well known changes with increasing altitudes. Their responses to the psychomotor performance test,

however, did not differ significantly under all experimental conditions. Therefore, they do not reflect the observed impairments of psychomotor performance. For practical purposes it may be concluded from these results, that the normally used cabin pressure does not affect the performance of air crews, whereas further decreases in cabin pressure to 3000 or 4000 m for longer time periods may be critical with respect to a higher risk in flight safety. Author

N72-24081# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica.

THE USE OF BIOMEDICAL PROGRAMS PACKAGES

C. Sandi (IBM, Italy) 23 Jun. 1971 49 p In ITALIAN; ENGLISH summary Presented at 3D Programming Course on the Appl. of Elec. Computers in Biol. and Med., Rome, 30 Nov. 1970 - 7 Mar. 1971

(ISS-71/14) Avail: NTIS HC \$4.50

The course concerning computer programming in the biomedical field is reported. Topics discussed include: statistical methods, probability functions, interdependence of variables, regression analysis, matrices, and analysis of variances. An example of the application of computer techniques to the influence of vaccination on the distribution of illness is included. Transl. by F.O.S.

N72-24082# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica.

AUTOMATIC RECORDING OF PSYCHIATRIC DATA

D. Giucci, P. Pancheri (Rome Univ.), L. Pastena (Rome Univ.), and D. Veggetti 9 Jun. 1971 49 p refs In ITALIAN; ENGLISH summary

(ISS-71/12) Avail: NTIS HC \$4.50

A program for the thorough arrangement of automatic recording of psychiatric data is illustrated. Such a program is compiled in FORTRAN 4 language for IBM 7040 computer and allows four different proceedings on the data: data transfer from punched cards onto tape-record; new data recording; their elimination, when necessary; and duplication of tape records. The use of the program is illustrated and explanations of the relative outputs are given. Author

N72-24083# Naval Air Development Center, Johnsville, Pa. Crew Systems Dept.

HYPOTHERMIA IN CATS DURING PHYSICAL RESTRAINT

Russell D. Squires, Frank H. Jacobson, and George E. Bergey 29 Oct. 1971 25 p refs

(ZR110101)

(AD-735883; NADC-CS-7117) Avail: NTIS CSCL 06/19

The hypothermia which sometimes occurred in cats during physical restraint was on the average accompanied by decreased heat production and by increased heat loss. These changes were facultative rather than obligatory correlates of physical restraint and/or the unfamiliar surroundings in which the restraint took place. The decreased heat production was due to a temporary attenuation or loss of the increase in oxygen consumption rate which follows a decrease in medial preoptic and anterior hypothalamic temperature, and the increased heat loss appeared to be largely due to temporary hyperventilation. It was suggested that an emotional response to the stress of physical restraint induced a reversible change (S) within the medial preoptic region and the anterior hypothalamus which somehow temporarily modified the normal medial preoptic and anterior hypothalamic thermoregulatory response to a decline in core temperature. Author (GRA)

N72-24084# Johns Hopkins Univ., Baltimore, Md. Dept. of Psychology.

EVOLUTION OF PSYCHOLOGICAL FRAMES OF REFERENCE

Final Report, 1 Sep. 1966 - 31 Aug. 1971
William Bevan and Howard E. Egeth Jan. 1972 14 p refs
(Contract N00014-67-A-0163-0001; NR197011)

(AD-736382; TR-69) Avail: NTIS CSCL 05/10

The framework for much of the research has been the theory of adaptation level. In the area of perception, this research has shown the importance of context in metacontrast suppression, binocular rivalry, lightness scaling, size judgment, lightness judgment, Gestalt organization, and multidimensional stimuli classification. Some effort was made to extend the analysis of context effects to memory. In general, this involved the analysis of relations among the stimuli used in learning and memory tasks. Thematic relevance of stimuli was studied in free recall and paired-associates learning. Other studies investigated memory as a function of the abstractness and variability of stimuli. Finally, some experiments on visual search were conducted to determine the conditions under which the elements in visual displays were processed serially or in parallel. Author (GRA)

N72-24085# Massachusetts Inst. of Tech., Cambridge.
FACTORS AFFECTING DEPTH PERCEPTION Annual Report

Whitman A. Richards Dec. 1971 19 p refs
(Contract F44620-69-C-0108; AF Proj. 9777)
(AD-736955; AFOSR-72-0335TR) Avail: NTIS CSCL 06/16

The report describes ongoing work on certain factors that affect depth perception. Of particular interest is that a sizeable portion (30%) of the population are unable to make full use of the binocular parallax cue for judging the distance of objects. These individuals are said to be stereonormal. Work over the past year has shown that these individuals localize objects in space in a manner different from other individuals who possess the full stereoscopic capability. A considerable effort has been spent in developing a simple, portable test for diagnosing the presence of stereonormalities. Tests based upon random dot patterns appear to be satisfactory. One important distinction that emerges concerns two separate systems for stereopsis in the normal observer: one sensitive to positional changes in depth, and a second parallel system that requires object motion. GRA

N72-24086# RAND Corp., Santa Monica, Calif.
BIOMEDICAL DATA PROCESSING
E. C. DeLand Oct. 1971 70 p refs
(AD-737676; P-4718) Avail: NTIS CSCL 06/5

The tasks involved in insinuating computer-based technology into the practice of medicine have proved for a variety of reasons considerably more difficult than was first assumed. Clearly, though, certain signs of progress are at hand, and these are explored. The computer is increasingly being used in data handling and automation tasks related to routine activities of health care. Gradually, as we learn how to control costs and to adapt the hardware and software systems to the more complicated and subtle medical care environments, their utility will expand. The state-of-the-art of the utilization of computer technology in medical services is reviewed. GRA

N72-24087*# Systems Technology, Inc., Hawthorne, Calif.
**PILOT DYNAMICS FOR INSTRUMENT APPROACH TASKS:
FULL PANEL MULTILoop AND FLIGHT DIRECTOR
OPERATIONS**

David H. Weir and Duane T. McRuer Washington NASA May 1972 107 p refs
(Contract NAS2-5690)
(NASA-CR-2019) Avail: NTIS HC \$3.00 CSCL 05H

Measurements and interpretations of single and multiloop pilot response properties during simulated instrument approach are presented. Pilot subjects flew Category 2-like ILS approaches in a fixed base DC-8 simulator. A conventional instrument panel and controls were used, with simulated vertical gust and glide slope beam bend forcing functions. Reduced and interpreted pilot describing functions and remnant are given for pitch attitude, flight director, and multiloop (longitudinal) control tasks. The response data are correlated with simultaneously recorded eye scanning statistics, previously reported in NASA CR-1535. The resulting combined response and scanning data and their

interpretations provide a basis for validating and extending the theory of manual control displays. Author

N72-24088*# Baylor Univ., Houston, Tex.
ANALYSIS OF BIOELECTRIC RECORDS AND FABRICATION OF PHOTOTYPE SLEEP ANALYSIS EQUIPMENT Final Report

Peter Kellaway 25 Feb. 1972 18 p refs
(Contract NAS9-11120)
(NASA-CR-115551) Avail: NTIS HC \$3.00 CSCL 06B

A computer-analysis technique was used to evaluate the changes in the waking EEG's of 5 normal subjects which occurred during the oral administration of flurazepam hydrochloride (Dalmane). While the subjects were receiving the drug, there was an increase in the amount of beta (14-38 c/sec) activity in fronto-central EEG leads in all 5 subjects. This increase in beta activity was characterized by a highly consistent increase in the number of waves that occurred during an EEG recording interval of fixed duration and by a less consistent increase in average wave amplitude. There was no detectable change in mean EEG wavelength (frequency) within the beta frequency range. The EEG patterns reverted to their baseline condition during 2-3 weeks after withdrawal of the drug. Analysis of the alpha, theta and delta components of the EEG indicated no changes during or following administration of the drug. This study clearly illustrates the usefulness of specific computer-analysis techniques in the characterization and quantification of sleep-promoting drugs upon the EEG of the normal young adults in the waking state. Two preamplifiers and 150 EEG monitoring caps with electrodes were delivered to MSC. Author

N72-24089# National Defence Research Organization TNO, Soesterberg (Netherlands). Inst. for Perception.

THE INVESTIGATION OF A POSSIBLE RELATIONSHIP BETWEEN VESTIBULAR STIMULATION AND SIZE PERCEPTION BY MEANS OF A PARALLEL SWING

F. Philip vanEyl 1971 12 p refs

(IZF-1971-23; TDCK-58928) Avail: NTIS HC \$3.00

Vestibular stimulation was induced by having S travel on a 3.8 second parallel swing. Two luminous disks were fixed to the swing in S's median and horizontal plane and two at angles of 40 and 80 degrees, respectively. One of the two horizontal disks was the comparison stimulus. The diameter of that stimulus was changed in ascending and descending fashion. Each standard stimulus was presented individually for three seconds in a standing-still position, the pushbutton release of the swing terminated the standard stimulus and activated the comparison stimulus for .2 seconds when S had reached his return point or when he had traveled three quarters of the complete swing. Three male S's verbally made bigger and smaller responses to the comparison stimulus with the non-dominant eye covered. For all responses to each condition of six ascending and descending stimuli the points between larger and smaller responses were computed and submitted to an analysis of variance. The results showed significant differences between the 0, 40, and 80-degree conditions ($p < .01$) and a significant interaction between these conditions and S's ($p < .01$). Author

N72-24090# National Defence Research Organization TNO, Soesterberg (Netherlands).

THE INFLUENCE OF CORIOLIS STIMULATION IN DIFFERENT GROUPS OF PERSONNEL OF THE ROYAL AIR FORCE

A. J. Boezeman, A. F. Sanders, and W. A. Wagenaar 1971 19 p refs In DUTCH; ENGLISH summary
(IZF-1971-19; TDCK-58342) Avail: NTIS HC \$3.00

The effect of flying experience in providing the ability to perform coordinated actions while subjected to Coriolis acceleration is discussed. Tests were conducted on three groups of personnel with varying levels of flying experience. Head movements were made during rotation of the centrifuge to elicit Coriolis stimulation and response times of a head movement and

a binary choice task were registered. It was concluded that Coriolis stimulation increases the choice reaction times, but repeated exposure to Coriolis induced a decrease in reaction times. Previous flying experience did not contribute to reduced reaction times. Author

N72-24091# National Defense Research Organization TNO, The Hague (Netherlands). Physics Lab.

PERCEPTIBILITY OF MILITARY TARGETS WITH PASSIVE INFRARED SYSTEMS AS A FUNCTION OF THERMAL AND GEOMETRIC RESOLUTION. PART 1: DEFINITION OF PROBLEM AND DESCRIPTION OF EQUIPMENT

A. N. deJong and A. J. Vialle Aug. 1971 23 p refs (PHL-1971-34; TDCK-58542) Avail: NTIS HC \$3.25

A description is given of a system that is able to degrade pictures in a well defined way. The size of the scanning spot is variable and the amount of noise, added to the signal is changed in relation to the spot size. The aim is to find the optimum spot size, that gives the human observer, who is observing a terrain, the best information score concerning the identification of military targets. The parameters of the systems are particularly adapted to thermal infrared observation and imaging devices.

Author

N72-24092*# Methodist Hospital, Houston, Tex. Neurophysiology Service.

MODIFIED AND IMPROVED SLEEP MONITORING DISPLAY CONSOLE

James D. Frost, Jr. 31 Mar. 1972 10 p (Contract NAS9-12528)

(NASA-CR-115573) Avail: NTIS HC \$3.00 CSCL 06B

An outline is given of a sleep monitoring display console capable of simultaneously displaying: (1) the visible current sleep stage of each subject, (2) a cumulative, numerical display (in hours and minutes) of the total amount of time the subject spends in each stage, and (3) a stepwise, graphic recording of subject's sleep stage versus time. Author

N72-24093*# George Washington Univ., Washington, D.C. THE PUBLIC HEALTH SERVICE GUIDELINES. GOVERNING RESEARCH INVOLVING HUMAN SUBJECTS: AN ANALYSIS OF THE POLICY-MAKING PROCESS

Mark S. Frankel Feb. 1972 69 p refs (Grant NGL-09-010-030)

(NASA-CR-126642; GWPS-Mon-10) Avail: NTIS HC \$5.50 CSCL 05E

The policy making process which led to development of the Public Health Service Guidelines governing research involving human subjects is outlined. Part 1 examines the evolution of PHS Guidelines, tracing (1) evolution of thought and legal interpretation regarding research using human subjects; (2) initial involvement of the Federal government; (3) development of the government's research program; (4) the social-political environment in which formal government policy was developed; and (5) various policy statements issued by the government. Part 2 analyzes the process by which PHS Guidelines were developed and examines the values and other underlying factors which contributed to their development. It was concluded that the evolution of the Guidelines is best understood within the context of a mixed-scanning strategy. In such a strategy, policy makers make fundamental decisions regarding the basic direction of policy and subsequent decisions are made incrementally and within the contexts set by the original fundamental decisions.

Author

N72-24094# Ohio State Univ., Columbus. Aviation Medicine Research Lab.

THE EFFECTS OF ALCOHOL ON PILOT PERFORMANCE DURING INSTRUMENT FLIGHT

Charles E. Billings, Robert L. Wick, Jr., Ralph J. Gerke, and Robert C. Chase Jan. 1972 79 p refs

(Contract DOT-FA68AC-6089-2; FAA Proj. RF-2626)

(FAA-AM-72-4) Avail: NTIS HC \$6.00

Sixteen instrument-rated pilots, eight of whom were very experienced professional aviators, flew Instrument Landing System approaches in a Cessna 172 under simulated instrument flight conditions while sober and while under the influence of 40, 80, and 120 mg% of blood ethyl alcohol. Each pilot flew four approaches to minimums on each of two occasions at each alcohol level. The data collected during these approaches included continuous measurement of aircraft position with respect to localizer and glide path centerlines and airspeed. Note was made of procedural errors committed during the flights. The subjects showed significant and progressive decremental effects of alcohol at all of the levels studied. The more experienced pilots maintained their ability to guide the aircraft better than did the less experienced subjects, particularly at high levels of blood alcohol. Both groups, however, demonstrated progressive increases in the number and seriousness of procedural errors with increasing levels of alcohol. It is concluded that even 40 mg% of blood alcohol exerts decremental effects on performance which are incompatible with flight safety. Author

N72-24095# Civil Aeromedical Inst., Oklahoma City, Okla. EVALUATION OF A FIBERGLASS INSTRUMENT GLARE SHIELD FOR PROTECTION AGAINST HEAD INJURY

E. D. Langston and John J. Swearingen Feb. 1972 13 p refs (FAA Proj. AM-A-71-PRS-47)

(FAA-AM-72-7) Avail: NTIS HC \$3.00

An all fiberglass prototype glare shield was evaluated in terms of head injury protection. In 30-ft./sec. head impacts, the 9 1/2-inch protrusion folded down over the heavy instruments, offering significant improvement in head injury protection when compared to current aircraft instrument panel designs. However, in this particular design the fiberglass broke, allowing the forehead to contact a thin, sharp edge with sufficient force to produce fatal head injuries. Design changes to eliminate this fracture point and incorporation of fiberglass glare shields of similar design in future general aviation aircraft could lead to a significant reduction of head injuries during crash decelerations.

Author

N72-24096# Joint Publications Research Service, Arlington, Va. SPACE BIOLOGY AND MEDICINE, VOLUME 6, NO. 2, 1972

O. Z. Gazenko, ed. 18 May 1972 147 p refs Transl. into ENGLISH of "Kosmicheskaya Biologiya i Meditsina" Moscow, Meditsina Publishing House (JPRS-56030) Avail: NTIS HC \$9.50

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

N72-24097# Joint Publications Research Service, Arlington, Va. PERFORMANCE, METHODS OF EVALUATING IT, AND DRUG STIMULATION

V. S. Shashkov and N. V. Gordeycheva *In its* Space Biol. and Med., Vol. 6, No.2, 1972 18 May 1972 p 1-17 refs

Avail: NTIS HC \$9.50

The methods used to determine the qualitative and quantitative characteristics of man's physical performance are outlined. Data cover onset of fatigue, maximum oxygen consumption, changes in biological rhythms, changes in bioelectrical activity, and biochemical changes in the body. The use of drugs as a means of enhancing performance is also discussed. An extensive bibliography is included. E.H.W.

N72-24098# Joint Publications Research Service, Arlington, Va.
**DYNAMICS OF THE CONTENT OF CARBON MONOXIDE
 IN AN ATMOSPHERE REGENERATED BY CHLORELLA**

A. I. Kazakov, G. I. Meleshko, and Yu. V. Pepelyayev *In its Space Biol. and Med.*, Vol. 6, No. 2, 1972 18 May 1972 p 18-22 refs

Avail: NTIS HC \$9.50

Experimental results indicating that carbon monoxide can be accumulated in the enclosed environment of a Chlorella reactor in a man-Chlorella system and remain at a relatively constant level are presented. The stabilized level of the carbon monoxide content in an enclosed atmosphere may vary. It is likely to be associated with the photosynthetic activity of Chlorella cells, which as was shown previously, may absorb carbon monoxide from the atmosphere. Author

N72-24099# Joint Publications Research Service, Arlington, Va.
**SOME INDICES OF THE GROWTH OF RATS AND THEIR
 SKELETAL MUSCLES DURING PROLONGED RESTRICTION
 OF MOBILITY**

A. M. Potapov *In its Space Biol. and Med.*, Vol. 6, No. 2, 1972 18 May 1972 p 23-30 refs

Avail: NTIS HC \$9.50

The exposure of rats to prolonged hypokinesia for four months resulted in the delayed growth of the animals, their corpses, and skeletal muscles. The inhibitory effect of hypokinesia on the development of the animals and their muscles was most distinct during the second experimental month. The exposure produced a greater effect on the growth of the flexors in the ankle joint than on the extensors. Author

N72-24100# Joint Publications Research Service, Arlington, Va.
**ERYTHROCYTE RESERVE IN HEALTHY AND CHRONICAL-
 LY IRRADIATED DOGS**

A. V. Ilyukhin, L. L. Semashko, A. G. Izergina, and B. A. Markelov *In its Space Biol. and Med.*, Vol. 6, No. 2, 1972 18 May 1972 p 31-36 refs

Avail: NTIS HC \$9.50

Experimental data are given which help to quantize the level at which the erythrocyte level of healthy and irradiated dogs is mobilized after a physical load. After running for 15 minutes on a treadmill at a speed of 5.2 km/ hour the healthy dogs released into the bloodstream 2.5 + or - 0.9% of the red blood cells of the total number of cells circulating in the blood. The most distinct index showing the state of the erythrocyte reserve is the reticulocytosis which develops in response to a given physical load. On the basis of data in the literature and experimental findings it was suggested that the erythrocyte reserve originates in the bone marrow. No significant differences in the quantitative reserve of erythrocytes in healthy and irradiated dogs was found. The animals were irradiated in total doses of 370, 565, 670, and 770 rad for 24, 36, 42 and 51 months respectively. Author

N72-24101# Joint Publications Research Service, Arlington, Va.
**STATE OF NATURAL IMMUNITY OF DOGS DURING
 CHRONIC GAMMA IRRADIATION UNDER THE INFLU-
 ENCE OF AMITETRAVITE**

S. I. Palmina, V. A. Zuyeva, N. I. Gvozdeva, M. F. Sbitneva, A. A. Akhunov, and E. S. Zubenkova *In its Space Biol. and Med.*, Vol. 6, No. 2, 1972 18 May 1972 p 37-45 refs

Avail: NTIS HC \$9.50

The effect of amitetravite, a biological protectant, on the state of natural immunity was investigated in experiments on dogs exposed to three year chronic gamma irradiation simulating the dose characteristics of a spaceflight environment. Long term irradiation of dogs with low Co-60 gamma ray dosages induced wavelike changes in the natural immunity of the test animals. Regular administration of amitetravite produced a normalizing effect on the state of skin autoflora, favored a relative stability of the indices of blood phagocytic activity, and restrained the development of autoimmune reactions. Author

N72-24102# Joint Publications Research Service, Arlington, Va.
**EFFECT OF SYNTHETIC CARBOHYDRATES ON RAT LIVER
 LYSOSOMES**

G. F. Shemanova, Yu. Ye. Sinyak, and V. I. Gorshkova *In its Space Biol. and Med.*, Vol. 6, No. 2, 1972 18 May 1972 p 46-50 refs

Avail: NTIS HC \$9.50

The effect of synthetic carbohydrates on rat liver lysosomes was examined. Since the carbohydrates were purified from contaminants they lost their toxicity for lysosomes. Author

N72-24103# Joint Publications Research Service, Arlington, Va.
**CARDIAC ACTIVITY CHANGES IN DOGS DURING ACUTE
 OVERHEATING AND THE PROGNOSTIC IMPORTANCE
 OF ELECTROCARDIOGRAPHIC DATA**

B. M. Fedorov, E. A. Musinov, V. V. Zhuravlev, and V. P. Krotov *In its Space Biol. and Med.*, Vol. 6, No. 2, 1972 18 May 1972 p 51-59 refs

Avail: NTIS HC \$9.50

Anesthetized dogs were exposed to acute overheating and their cardiovascular changes were examined in comparison with respiratory variations. The prognostic significance of the ECG ventricular spikes was noted during the period preceding the development of heat induced collapse. The changes in the voltage of the ECG waves during acute overheating were shown to be associated with several factors, the most important of which were adrenergic effects during early heating and hypoxia during late heating periods. Also described are the periods of overheating and the cardiac arrhythmias. The cardiovascular disturbances accompanying hyperthermia are discussed. Author

N72-24104# Joint Publications Research Service, Arlington, Va.
**CARDIAC ELECTRIC ACTIVITY ACCOMPANYING
 DIFFERENT DEGREES OF DECOMPRESSION OF THE
 LOWER HALF OF THE BODY**

V. G. Voloshin and L. Ya. Divina *In its Space Biol. and Med.*, Vol. 6, No. 2, 1972 18 May 1972 p 60-67 refs

Avail: NTIS HC \$9.50

A study was made of cardiac electric activity during applications of negative pressure of -40 and -80 mm Hg to the lower half of the body. The examinations revealed a significant increase in the heart rate, an increase in the R amplitude, and a decrease in the T amplitude, as well as displacement of the heart electric axis toward the vertical, related to the degree of decompression. During the first minutes of exposure changes in the R and T voltage and the electric position of the heart developed simultaneously but later occurred independently: the R variations were most distinct, T changes were least pronounced. These changes seemed to be associated not only with an impeded venous return to the heart and its reduced blood filling, but also with a redistribution of the specific weight of components of the cardiac autonomic innervation, the sympathetic innervation being predominant. Author

N72-24105# Joint Publications Research Service, Arlington, Va.
**ULTRASONIC DOPPLER CARDIOGRAPHY IN A MEDICAL
 MONITORING SYSTEM**

A. N. Kozlov *In its Space Biol. and Med.*, Vol. 6, No. 2, 1972 18 May 1972 p 68-73 refs

Avail: NTIS HC \$9.50

Due to its high information content, stability and comfortable conditions for signal monitoring, ultrasonic Doppler cardiography seems to be promising when used in medical evaluations of enclosed men. Use of narrow band filters, threshold limitations, and selection of the proper site for fixation of sensors make it possible to isolate a single complex from the ultrasonic Doppler cardiographic signal during every cardiac cycle for determining the heart rate in the medical monitoring system. Author

N72-24106# Joint Publications Research Service, Arlington, Va.
**VASCULAR TONE IN DIFFERENT PARTS OF THE BODY
 DURING PROLONGED RESTRICTION OF MUSCULAR**

ACTIVITY

N. Ye. Panferova *In its Space Biol. and Med.*, Vol. 6, No. 2, 1972 18 May 1972 p 74-79 refs

Avail: NTIS HC \$9.50

During a 120-day bedrest experiment four test subjects were examined for arterial tone by determining pulse wave propagation and venous tone by the use of occlusion plethysmography and skin temperature measurements. The above indices recorded for different body areas varied differently. The tone of veins and arteries in the legs, including skin arterioles, increased. The tone of head and hand veins remained unchanged. The tone of head and foot arteries decreased. The tone of large vessels of the elastic type, aorta, carotid artery, and arm artery, did not change. It is probable that variation in vascular tone is one of the mechanisms (supplementing endocrine regulation) which is responsible for regulating circulating blood volume during hypodynamia. Author

N72-24107# Joint Publications Research Service, Arlington, Va. INCREASING THE FUNCTIONAL CAPACITY OF THE HUMAN CARDIOVASCULAR SYSTEM BY THE REGULATED COOLING METHOD

A. A. Stikharev *In its Space Biol. and Med.*, Vol. 6, No. 2, 1972 18 May 1972 p 80-88 refs

Avail: NTIS HC \$9.50

Hemodynamic changes were investigated in four volunteer test subjects during cooling experiments at -20 deg for 20, 40, 60, 90 or 120 minutes. The heat deficit was 0.9, 1.3, 1.6, 2.0 and 2.4 Cal/kg respectively. In the experiments the pulse rate decreased and the maximum, minimum and pulse pressures increased. The Kvaas tolerance coefficient decreased. The ECG revealed changes typical of cholinergic reactions. Change from a horizontal to a vertical position brought about a lesser heart rate increase and a smaller change in the minimum and pulse pressures in the test subjects than in the controls. The level of cardiovascular response at first increased linearly with the heat deficit; however, in the fourth and fifth experimental runs it was very close to that in the third run. After warming the cardiovascular function reached the pretest values in all 5 experimental runs. Author

N72-24108# Joint Publications Research Service, Arlington, Va. ROLE OF HIGHER AUTONOMIC CENTERS IN THE MECHANISMS OF VESTIBULAR-AUTONOMIC REFLEXES

M. D. Yemelyanov and A. N. Razumeyev *In its Space Biol. and Med.*, Vol. 6, No. 2, 1972 18 May 1972 p 89-97 refs

Avail: NTIS HC \$9.50

Experimental data, describing the functional relationship between the vestibular system and the respiratory and vasomotor centers which were accumulated during adequate (swinging) and electric stimulation of the labyrinth are presented. The study revealed the relationships between the responses of neurons and the functional state of the centers. Also discussed are the mechanisms of vestibular-autonomic reactions with respect to peculiarities in the cerebellar function. Author

N72-24109# Joint Publications Research Service, Arlington, Va. CHANGE IN REFLEX REACTION OF HUMAN MUSCLES DURING ADEQUATE VESTIBULAR STIMULATION

Ya. I. Paltsev and A. M. Elner *In its Space Biol. and Med.*, Vol. 6, No. 2, 1972 18 May 1972 p 98-105 refs

Avail: NTIS HC \$9.50

Experimental data on changes in the reflex excitability of human leg muscles in response to adequate vestibular stimulation (body rotation in the sagittal plane with an angular acceleration) are examined. Functional changes in the segmentary apparatus developed up to 15 to 20 msec after the onset of rotation. Variations in reflex excitability of different muscles in response to the same vestibular stimulation (direction of body rotation) were dissimilar. Changes in reflex excitability of the same muscle were also different in response to various vestibular stimuli. It is

concluded that the vestibular apparatus may perform a coordinating function not only during quasistatic control of movements, but also during dynamic control. It is therefore believed that even short, latent muscular spinal reactions which appear in response to body movements may be governed by the vestibular apparatus. Author

N72-24110# Joint Publications Research Service, Arlington, Va. STUDY OF WATER-MINERAL METABOLISM DURING RESTRICTED MOTOR ACTIVITY

V. P. Krotov *In its Space Biol. and Med.*, Vol. 6, No. 2, 1972 18 May 1972 p 106-118 refs

Avail: NTIS HC \$9.50

On the first day of hypokinesia plasma liquefaction was noted, accompanied by a decrease in the hematocrit index and the hemoglobin concentration. The plasma volume as calculated by the Strauss method was found to increase by 5.1%. During the three subsequent weeks of hypokinesia fluid redistributions occurred between the plasma and red blood cells. The potassium and sodium concentration in the plasma decreased with lengthening of hypokinesia. The pattern of changes in the plasma calcium concentration correlated with the variations in total blood serum protein. A study of variations in potassium and sodium content in the femur extensor and the back long muscle revealed no significant discrepancies in the changes in electrolyte content. The fluid redistribution in rabbits exposed to hypokinesia was studied by the indicator dilution method. The data obtained show the lack of dehydration of animals during their exposure to hypokinesia. Author

N72-24111# Joint Publications Research Service, Arlington, Va. DIURNAL PERIODICITY OF THE HUMAN RESPIRATION RATE IN EXPERIMENTS WITH AN INVERSION OF THE WORK AND REST SCHEDULE

A. A. Lugovoy *In its Space Biol. and Med.*, Vol. 6, No. 2, 1972 18 May 1972 p 119-128 refs

Avail: NTIS HC \$9.50

Experiments were carried out on eight male test subjects who lived for 25 to 45 days in isolation chambers with controlled comfortable atmospheres. Exposure to an inverted (12-hour shift) work-rest cycle, the operation of ecological time sensors being excluded, brought about a gradual rearrangement of the diurnal rhythm of the respiration rate in accordance with the altered cycle. A study of the different patterns of adjustment to the new cycle revealed that the rearrangement developed the faster the greater was the sleep deficit during the transition. Endogenous and exogenous components of the diurnal rhythm of the respiration rate were detected. The endogenous component, which is related to the body's biological clock, is characterized by inertia, a relatively low rate of restructuring, whereas the exogenous component is dependent on the diurnal variations in human psychophysiological activity and changes simultaneously with changes in man's work-rest cycles. Author

N72-24112# Joint Publications Research Service, Arlington, Va. PULSE RATE ADAPTATION DURING CHANGE IN THE SLEEP-WAKEFULNESS RHYTHM

S. I. Stepanova *In its Space Biol. and Med.*, Vol. 6, No. 2, 1972 18 May 1972 p 129-135 ref

Avail: NTIS HC \$9.50

Data are given to demonstrate that during habituation to a new work-rest cycle the diurnal heart rate rhythm develops gradually. An impression of adaptation of the frequency of cardiac contractions to an unusual life schedule may be given in those cases when the curve of its diurnal variation is constructed by combining indices obtained in two different body positions: lying and sitting up. Comparison of the indices registered around-the-clock in the same position will make it possible to determine the true times of pulse rate adaptation to a new sleep-wakefulness rhythm. Author

N72-24113# Joint Publications Research Service, Arlington, Va.
**PECULIARITIES IN TIME PERCEPTION IN SIMULATED
 AND REAL FLIGHT**

S. S. Almyashev, Ye. A. Derevyanko, and V. F. Zhernavkov *In its*
Space Biol. and Med., Vol. 6, No. 2, 1972 18 May 1972
 p 136-140 refs
 Avail: NTIS HC \$9.50

Experimental data accumulated concerning the peculiarities of time perception during real and simulated flights are presented. The level of distortion and the accuracy in reproducing stipulated time periods can be attributed to the different degree of nervous and emotional stress of the pilot (space pilot). This in turn depends on the complexity and the hazard of the task to be performed, that is, on flight conditions. During a real flight under normal meteorological conditions, as well as during a simulated flight, the stipulated time intervals are reproduced in an extended form. This is due to the presence of working dominant foci in the cortex of the large hemispheres. During flights in a complicated environment and at extremely low altitudes in a turbulent atmosphere the processes in the brain cortex are depressed by a generalized excitation induced by emotional stress. This results in shortening of the reproduced time intervals. Author

N72-24114# Joint Publications Research Service, Arlington, Va.
**NEW METHOD FOR IMPLANTING ELECTRODES IN
 CHRONIC EXPERIMENTS**

N. T. Svistunov *In its* Space Biol. and Med., Vol. 6, No. 2, 1972
 18 May 1972 p 141-143 refs
 Avail: NTIS HC \$9.50

An electrode design and a method for implanting it into animal tissue are outlined. The electrode is a spiral with an emanating straight line lead in a silicone tube. It is suggested that such a design will prevent the breaking away of the electrode during chronic experiments. The device is also designed to cut down interelectrode resistance and conducting disruptions. E.H.W.

N72-24115# Civil Aeromedical Inst., Oklahoma City, Okla.
**MULTIPLE TASK PERFORMANCE AS A PREDICTOR OF
 THE POTENTIAL OF AIR TRAFFIC CONTROLLER
 TRAINEES**

W. Dean Chiles, Alan E. Jennings, and Georgetta West Jan.
 1972 33 p refs
 (FAA-AM-72-5) Avail: NTIS HC \$3.75

Two hundred and twenty-nine Air Traffic Controller trainees were tested on the CAMI Multiple Task Performance Battery. The battery provides objective measures of monitoring, arithmetical skill, visual discrimination, and group problem solving. The criterion of trainee potential was based on ratings from FAA Academy instructors in courses being attended by the trainees. Five studies were conducted, the first one being in the nature of a pilot study for checking out procedures. The second study yielded a validity coefficient of .54. The third study yielded a coefficient of .53. The fourth study found no predictive power for the MTPB. The fifth study produced a coefficient of .24 for one method of computing the performance index and .46 for a second method. For each study, the coefficient is based on one hour of testing with about 50 minutes of preceding instruction and practice. It is concluded that the MTPB-approach to selection offers promise as a screening device for Air Traffic Control Specialist applicants, but further research is required to establish this as a fact and to determine its utility in terms of cost-effectiveness. Author

N72-24116*# National Aeronautics and Space Administration,
 Ames Research Center, Moffett Field, Calif.
**DETERMINATION OF PILOT AND VEHICLE DESCRIBING
 FUNCTIONS FROM THE GEMINI 10 MISSION**

Frederick G. Edwards Washington May 1972 37 p refs
 (NASA-TN-D-6803; A-3877) Avail: NTIS HC \$3.00 CSCL 05E

Three types of manual control maneuvers conducted during the Gemini-10 mission have been analyzed in order to measure and document the describing function of the pilot, the vehicle

and the pilot-vehicle combination during an actual space mission. Measurements made from the data records of the reentry maneuver (a single axis control task) indicate that the pilot's control behavior changes during critical portions of the reentry. Measurements made of the deorbit maneuver and of a terminal phase initiation maneuver (three axis tasks) show that the pilot assigns priorities to the separate axes and controls them differently. His control technique is also influenced by the magnitude of the thrust disturbance present during the maneuvers. The results for all three types of maneuvers show that the pilot adapts to the nonlinear spacecraft control system in such a way that the combined pilot-vehicle dynamics take the form of the linear crossover model. Author

N72-24117# Joint Publications Research Service, Arlington, Va.
BIONICS

G. V. Logvinovich, ed. 15 May 1972 211 p refs Transl. into ENGLISH of Bionika (Kiev), no. 5, 1971 p 1-136 (JPRS-55982) Avail: NTIS HC \$12.75

Applications of the characteristics of biological systems to mechanical systems are considered. Emphasis is placed on the velocity and hydrodynamic features of swimming vertebrates.

N72-24123# Joint Publications Research Service, Arlington, Va.
**ROLE OF PECULIARITIES IN EXTERNAL STRUCTURE IN
 THE HYDRODYNAMICS OF HIGH-SPEED FISH**

G. F. Kobets and M. L. Komarova *In its* Bionics 15 May 1972
 p 157-167 refs
 Avail: NTIS HC \$12.75

Hypotheses are considered concerning the hydrodynamic characteristics of fish capable of attaining a high velocity, such as tunas, sharks, and representatives of the family Xiphiidae (swordfish, marlin, sailfish). Body configurations for these fish and the influence of surface peculiarities on hydrodynamic resistance are discussed. The role of a mucous layer directly in contact with the water was investigated, in relation to friction. The chemical composition of mucous and eye fluid of tunas was also studied. K.P.D.

N72-24126# Joint Publications Research Service, Arlington, Va.
CYBERNETICS AND COMPUTER TECHNOLOGY

9 May 1972 69 p refs Transl. into ENGLISH from Kibernetika Vychislitel'naya Tekhn. (Kiev), no. 7, 1970 p 6-58 (JPRS-55937) Avail: NTIS HC \$5.50

Selected articles are presented dealing with problems in cybernetics and the approaches taken towards their solution by the use of modern computer technology.

N72-24127# Joint Publications Research Service, Arlington, Va.
SOME PROBLEMS IN NEUROBIONICS

S. Ya. Zaslavskiy, K. A. Ivanov-Muromskiy, and V. Yu. Meytus *In its* Cybernetics and Computer Technol. 9 May 1972 p 1-13 refs
 Avail: NTIS HC \$5.50

Approaches to the problem of creating technical devices capable of behaving like the brain are considered. Two methods of solution are discussed and the procedures involved in each are outlined. Basically, the first method consists of the technical realization of certain characteristics of the nervous system in general and of the brain in particular; the second involves a description of the processes going on in the brain on the information level. Various investigations conducted by researchers in the field are summarized to illustrate the relationship of these individual approaches to the two general methods discussed. D.L.G.

N72-24129# Joint Publications Research Service, Arlington, Va.
**PROBLEM OF MODELING PERCEPTION OF DISTANCE
 FROM VISIBLE BRIGHTNESS OF LANDMARKS**

Ya. Ya. Belik *In its Cybernetics and Computer Technol.* 9 May 1972 p 26-31 refs
 Avail: NTIS HC \$5.50

The construction is considered of mathematical models for perception of distance by operators of moving man-machine systems. The proposed models are based on the visible brightness of landmarks and take into account two specific types of landmarks: reflectors and radiators. The first type includes all landmarks from whose surfaces electromagnetic waves in the visible portion of the spectrum are reflected. The second type radiate electromagnetic waves and become natural landmarks for the operator when the surface flux of visible light radiation exceeds some threshold value. The derivation of equations used in the models is shown and a connection is established between the visible brightness of plane landmarks and observation conditions. D.L.G.

N72-24130# Joint Publications Research Service, Arlington, Va.
EXPERIMENTS IN CLASSIFICATION AND FORMATION OF CONCEPTS

V. P. Gladun, Ye. P. Popuriy, and Z. L. Rabinovich *In its Cybernetics and Computer Technol.* 9 May 1972 p 32-37 refs

Avail: NTIS HC \$5.50

Experiments in the classification and formation of concepts were conducted in connection with the construction of a model of the brain as a learning system. The model is a programmed, growing network of neuron-like elements realizing reception, processing, and memorization of signals arriving from the outside medium, and the control of activity determined in the outside medium. The classification and formation of concepts were chosen, from among a number of similar problems, for clarifying the possibilities of the developed model. Author

N72-24131# Joint Publications Research Service, Arlington, Va.
INVESTIGATING THE LANGUAGE AND INTELLECT OF DOLPHINS

I. M. Kreyn *In its Cybernetics and Computer Technol.* 9 May 1972 p 38-44 refs

Avail: NTIS HC \$5.50

The results of various research projects are reviewed concerning the complex structure and size of the dolphin brain. The question is considered as to whether it is possible to communicate with the dolphin, using as a basis information obtained on its collective capacity for mutual assistance, its alertness, learning capacity, and its tendency to associate with man. Particular emphasis is placed on experimental observations regarding the differences in the whistling of a single animal, the number of whistles per minute, their intensity, the continuity of one whistle, and sudden interruptions in whistling. After analyzing the results of experiments conducted on the subject it is concluded that the findings are subject to differences in interpretation and have not produced any significant results. However, a few of the approaches taken appear to hold out some promise for the eventual solution of the problem and are suggested as the direction in which future research should take. D.L.G.

N72-24132# Joint Publications Research Service, Arlington, Va.
STRUCTURE AND MODELING OF ROBOTS

V. Yu. Maytus *In its Cybernetics and Computer Technol.* 9 May 1972 p 45-57 refs

Avail: NTIS HC \$5.50

The design is considered of devices that might successfully compete with man in the solution of intellectual problems. The approach taken is one of designing the individual elements of the integrated system and then attempting to combine these elements into a finalized system called a robot. Initial consideration is given to the various levels of the robot's description which include: algorithmic, the level of structural systems, the level of the principles on which individual stages of behavior are based, and the level of a combination of the specified structure of the robot and the formalized principles of behavior. Fundamental problems involved in attempts to approximate a mathematical

system to real technical conditions are examined. A structural block scheme is developed for representation of the robot. Improving the accuracy of this scheme and describing its blocks in the form of algorithms are proposed as the means of obtaining a mathematical model of the robot and the eventual realization of a technical model. D.L.G.

N72-24133# Joint Publications Research Service, Arlington, Va.
A METHOD FOR CONTROLLING THE HUMAN OPERATOR
 A. S. Osenniy and V. D. Romanov *In its Cybernetics and Computer Technol.* 9 May 1972 p 58-62 refs

Avail: NTIS HC \$5.50

Electrophysiological indices are considered as a means of controlling the activity of the many structures in the human organism. A method is proposed for current statistical analysis of EEG from the numerical characteristics of the energy spectrum. The method permits the detection of fine changes in the spectral makeup of the EEG and is based on the possibility of describing every distribution of its moments. A system was developed for automatically measuring estimates of the energy spectrum numerical characteristics. The system consists of an analog computer for transformation of the analyzed process and a digital recording device for measuring and recording the data. Experimental results are presented which were obtained in using the method to detect EEG reactions of the effects of weak specific and nonspecific stimuli on the human operator. D.L.G.

N72-24134# Joint Publications Research Service, Arlington, Va.
ADAPTIVE HUMAN OPERATOR MODEL IN ONE PURSUIT TRACKING PROBLEM

V. A. Yakubovich and A. V. Timofeyev *In its Cybernetics and Computer Technol.* 9 May 1972 p 63-66 refs

Avail: NTIS HC \$5.50

A mathematical description is developed for the operation of an adaptive system which models the activity of the human operator in a pursuit tracking situation. The approach taken is one in which the human operator is considered to be a system consisting of input sensors (visual), an adaptive regulator (brain), and an executing instrument (muscles of the hand). The mathematical description is accomplished by determining the transfer functions involved and deriving the necessary equations to synthesize the human operator model. The formulation of these equations is shown and includes specifications of a sensor equation, a motor equation, and an equation of motion for the target. D.L.G.

N72-24135# Toronto Univ. (Ontario). Inst. for Aerospace Studies.

A COMPARISON OF PILOT DESCRIBING FUNCTION MEASUREMENT TECHNIQUES

C. E. Frostell Oct. 1971 60 p refs

(UTIAS-TN-167) Avail: NTIS HC \$5.00

The techniques used to calculate human pilot describing functions are assessed. The study considers data analysis methods based on: (1) cross power spectral density of pilot input, output and error; (2) cross power spectral density of pilot output and error; (3) Fourier transform of pilot output and error. Taped records of human pilot performance from previous investigations in a compensatory control task with random input signals of continuous power spectra were on hand and provided a pilot data base. The same data were used to exercise each method, permitting direct comparison of the results. Data are presented as amplitude and phase plots of measured describing functions using an average of a reasonably large amount of data as well as single experimental runs. Author

N72-24136# Mauch Labs., Inc., Dayton, Ohio.
EXPERIMENTAL SPACE WORKER'S GARMENT AND HELMET ASSEMBLY

A. L. Marcum and H. A. Mauch Wright-Patterson AFB, Ohio
AMRL Mar. 1972 23 p refs
(Contract AF 33(657)-8095; AF Proj. 6301)
(AD-738088; AMRL-TDR-64-37-Rev) Avail: NTIS CSCL
06/17

A new technique for pressurization and thermal control in a space worker's garment has been investigated. The goal was to design and fabricate complete coveralls and helmet that would consider the space environment and achieve physiological protection with exceptional reliability and a minimum of complementary systems. The coveralls utilize mechanical confined within a restraining garment. Thermal equilibrium is to be achieved by allowing natural physiological processes to control the evaporation of perspiration into the vacuum of space.

Author (GRA)

N72-24137# Naval Training Device Center, Orlando, Fla.
**PROCEEDINGS OF THE 5TH NAVAL TRAINING DEVICE
CENTER AND INDUSTRY CONFERENCE**
17 Feb. 1972 332 p refs Conf. held at Orlando, Fla.,
15-17 Feb. 1972
(AD-737226; NAVTRADEVEN-1H-206) Avail: NTIS CSCL
05/9

The report consists of a compilation of papers on a variety of technical and training subjects relating to training device technology and training methodology. These papers were presented at the Fifth Naval Training Device Center and Industry Conference held at the Contemporary Hotel, Walt Disney World, Orlando, Florida, February 15-17, 1972. The conference theme 'Twenty-five Years of Training Simulation--Springboard for the Future,' provided a common ground for the exchange of new ideas and discussion of mutual problems. This fifth conference is part of a continuing program to encourage and develop better liaison between the Naval Training Device Center and the training simulation industry.

Author (GRA)

N72-24138# Naval Underwater Systems Center, Newport, R.I.
**PATTERN RECOGNITION: PERCEPTION OF BINARY
SEQUENCES**
Jerry C. Lamb, K. E. Williams, and K. Kaufman 20 Dec. 1971
17 p refs
(AD-737201; NUSC-4231) Avail: NTIS CSCL 05/10

The experiment described in this report investigates the structure of binary sequences, their effect on pattern perception, and the effect of the number of stimuli in the pattern. Binary sequences (X's and O's) of lengths 6, 8, and 10 were presented tachistoscopically to subjects, who were required to reproduce the stimulus. The results indicate that the recall performance is directly related to the number of runs in the stimulus. The patterns of recall suggest a two-stage scanning process.

Author (GRA)

N72-24139# Westinghouse Electric Corp., Pittsburgh, Pa.
THERMOELECTRIC HEATING AND VENTILATING SYSTEM
Final Report, Oct. 1969 - Aug. 1971
A. M. Bernard Nov. 1971 35 p ref
(Contract DAAG17-70-C-0044; DA Proj. 1J0-62110-AJ-33)
(AD-737720; USA-NLABS-TR-72-26-CE) Avail: NTIS CSCL
06/17

Modifications and improvements incorporated into a thermoelectric heating and ventilating system are described. The thermoelectric heating and ventilating system is designed to provide a flow of temperature regulated air for use in heating or ventilating a specially designed military clothing ensemble. The system weighs ten pounds un fueled and required 0.26 pounds of fuel for each hour of operation. Eighteen c.f.m. of air S.T.P. conditions at four inches water column pressure is delivered for use in keeping an individual in thermal balance when operating in extreme environments (-40F to +110F) or when exposed to hazards. The electrical power required to obtain the flow of air is supplied by a thermoelectric generator which converts thermal energy directly into electrical energy. The thermal energy is derived from the combustion of liquid military fuels; leaded gasoline, kerosene, JP-4 and diesel fuels.

Author (GRA)

N72-24140# Boeing Co., Seattle, Wash. Aerospace Group.
**TARGET BACKGROUND SCALING AND ITS IMPACT ON
THE PREDICTION OF AIRCREW TARGET ACQUISITION
PERFORMANCE** Final Report, 1 Jan. - 31 Oct. 1971
Lawrence P. Zaitzeff Dec. 1971 118 p refs
(Contract N00014-71-C-0194; NR Proj. 196-099)
(AD-737693; D180-14156-1) Avail: NTIS CSCL 17/8

The purpose of this study was to establish a preliminary target-background metric to be used in the prediction of dynamic visual aircrew target acquisition performance. This was accomplished by relating 14 physical and psychophysical characteristics of ten operational target-background encounters to observed air-to-ground cumulative target acquisition probability. The target acquisition performance on these targets had been previously validated by large-scale field tests conducted by Joint Task Force Two (JTF-2).

Author (GRA)

N72-24141# Civil Aeromedical Inst., Oklahoma City, Okla.
**DISCRIMINATION OF SHORT-DURATION (TWO PULSE)
FLASHES AS A FUNCTION OF SIGNAL LUMINANCE
AND METHOD OF MEASUREMENT**
Henry W. Mertens and Mark F. Lewis Nov. 1971 8 p refs
Sponsored by FAA
(AD-737872; FAA-AM-71-42) Avail: NTIS CSCL 05/5

The recent introduction of strobe lights for anticollision purposes raises the possibility of using temporal patterns of short duration flashes as information carrying signals. The current experiments are concerned with the detection of the minimum duration dark interval between signal light pulses as a function of signal luminance and the psychophysical method of measurement. Experiment I tested the theory of signal detectability (TSD) prediction that observer sensitivity is independent of the psychophysical method used in measurement. Discrimination of a constant duration stimulus (three msec) and a variable duration test stimulus (seven to 32 msec) was measured with a two-alternative Forced-Choice (FC) procedure and a Yes-No procedure. Sensitivity was comparable under the two psychophysical procedures, thus supporting the application of TSD to the sensory processes involved in discrimination of two-pulse stimuli. Experiment II measured discrimination with the FC procedure at three luminance levels: 31.8, 318, and 3183 candelas per square meter. Discriminability increased with luminance. Thus, pulses separated by a dark interval short enough so that only a single flash is seen over the entire scotopic intensity range may, however, be seen at photopic intensities as two pulses, or appear to flicker, or otherwise appear to be of different character.

Author (GRA)

N72-24142# Bunker-Ramo Corp., Westlake Village, Calif.
**DEVELOPMENT OF A HUMAN PERFORMANCE RELIABILITY
DATA SYSTEM: PHASE 1** Final Report
David Meister and Robert G. Mills (AMRL) Wright-Patterson
AFB, Ohio AMRL Dec. 1971 163 p refs
(Contract F33615-70-C-1518; AF Proj. 7134)
(AD-738322; AMRL-TR-71-87) Avail: NTIS CSCL 05/10

The human performance reliability (HPR) data system developed consists of assumptions, goals and definitions, a structure for classifying data elements, procedures for developing a data bank, and procedures for retrieving HPR data from that bank. The heart of the HPR system is a taxonomic structure for classifying both general behavioral and man-machine specific studies. Studies are classified in terms of the behavioral function performed, the stimuli presented and the equipment used to respond, environmental, subject and task characteristics. The end product of the classification is a descriptor used to retrieve data. Data are retrieved by first encoding a question asked of the HPR system, i.e. by translating the question into descriptor categories. The system then operates on the basis of AND/OR logic to sort progressively through the various categories to achieve the closest possible match with the entry descriptor. Thus, the precise answer to the question asked can be retrieved, assuming that the data bank contains appropriate data.

Author (GRA)

N72-25029*# Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.

THE DEVELOPMENT OF SPECTRO-SIGNATURE INDICATORS OF ROOT DISEASE Annual Progress Report

John F. Wear 30 Sep. 1968 33 p refs

(NASA Order W-12996)

(NASA-CR-126719) Avail: NTIS HC \$3.75 CSCL 02F

The development and testing of airborne sensors that might be effective in discriminating root rot of infected trees from healthy ones are outlined. The sensing device is composed of a thermal infrared radiometer and an instant replay video scan system.

Author

N72-25030*# Techtran Corp., Glen Burnie, Md.
LUNG VENTILATION AND GAS EXCHANGE OF A MAN BREATHING DIFFERENT GAS MIXTURES WHILE SWIMMING UNDER WATER

V. I. Kebkalo and V. P. Ponomarev Washington NASA May 1972 13 p refs Transl. into ENGLISH from Fiziol. Zh. SSSR (USSR), v. 57, no. 12, Dec. 1971 p 1802-1807

(Contract NASw-2037)

(NASA-TT-F-14260) Avail: NTIS HC \$3.00 CSCL 06S

Eight healthy men, 19 to 26 years of age, were trained in aqualung swimming, from a distance of 500 meters at maximum speed and at a depth of about 2 meters. For breathing they used air and normoxic mixtures of argon and helium. The respiratory minute volume, oxygen consumption and carbon dioxide discharge increased when shifting to breathing of a less dense mixture. At the peak work load, the resistance to breathing increased in direct relation to the density of the mixture. The respiratory minute volume increased, in inverse proportion to the mixture density. The consumption of oxygen and the discharge of carbon dioxide while breathing air and the argon-oxygen mixture were practically the same, and during breathing of the helium-oxygen mixture they increased significantly.

Author

N72-25031# Advisory Group for Aerospace Research and Development, Paris (France).

THE DISORIENTATION INCIDENT, PART 1

A. J. Benson, ed. (Royal Air Force Inst. of Aviation Med.) Mar. 1972 134 p refs Presented at Aerospace Med. Panel Specialist Meeting, Luchon, France, 28 Sep. 1971

(AGARD-CP-95-Pt-1) Avail: NTIS HC \$8.75

The proceedings of a conference on spatial disorientation are presented. The subjects discussed are: (1) description and analysis of disorientation incidents, (2) orientation error accidents, (3) training procedures, and (4) laboratory studies. The presentations were given in 16 reports. The principal findings and recommendations are summarized in a technical evaluation report.

N72-25032*# San Jose State Coll., Calif.
DISORIENTATION INCIDENTS REPORT BY MILITARY PILOTS ACROSS 14 YEARS OF FLIGHT

Brant Clark In AGARD The Disorientation Incident, Part 1 Mar. 1972 7 p refs

(Grant NGL-05-046-002)

(NASA-CR-126786) Avail: NTIS HC \$3.00 CSCL 06S

The historical background of spatial disorientation problems among flying personnel is discussed. Recent incidents involving disorientation in flight were compared with incidents reported 14 years earlier. The incidents were very similar for various types of aircraft. The findings suggest that disorientation is currently experienced in a wide variety of flight operations and will continue to be experienced by flying personnel as an uncorrectable flight hazard.

Author

N72-25033# Royal Air Force, Farnborough (England).
A REVIEW OF UNITED KINGDOM (RAF AND ARMY) STATISTICS ON SPATIAL DISORIENTATION IN FLIGHT

1960 - 1970

R. G. Lofting In AGARD The Disorientation Incident, Part 1 Mar. 1972 5 p r

Avail: NTIS HC \$8.75

An analysis of spatial disorientation incidents among pilots of the Royal Air Force is presented. Subjects discussed are: (1) disorientation statistics, (2) aircraft types involved in disorientation occurrences, (3) classification of disorientation accidents, (4) classification of disorientation occurrences, and (5) relevant aircraft design features leading to disorientation.

Author

N72-25034# Naval Aerospace Medical Research Lab., Pensacola, Fla.

ORIENTATION ERROR ACCIDENTS IN ARMY AVIATION AIRCRAFT

W. Carroll Hixson, Jorma I. Niven, and Emil Spezia (Army Board for Aviation Accident Res.) In AGARD The Disorientation Incident, Part 1 Mar. 1972 16 p refs

Avail: NTIS HC \$8.75

To initiate the action necessary to establish the magnitude of the orientation-error problem in Army aviation, an interservice research program was organized under the joint sponsorship of the U. S. Army Aeromedical Research Laboratory, the U. S. Army Board for Aviation Accident Research, and the Naval Aerospace Medical Research Laboratory. The first step was the construction of an operational definition of an orientation-error accident. The assimilation of data pertaining to the incidence and cause of such accidents and their actual and relative costs in terms of fatalities, injuries, and aircraft damage was then set as the working objective of the program. Accordingly, the decision was made to implement a five-year longitudinal study of all major and minor orientation-error accidents involving Army aviation flight operations beginning with July 1966. Incidence and cost data are presented for all Army aviation major and minor orientation-error accidents detected in the search of the accident files for the period July 1966 to July 1967. Separate and totaled statistical data are provided for fixed wing and rotary wing aircraft as well as for accidents occurring in Vietnam and those occurring elsewhere.

Author

N72-25035# Bureau of Medicine and Surgery, Washington, D.C.

DISORIENTATION, FACT AND FANCY

Paul E. Tyler and Paul A. Furr In AGARD The Disorientation Incident, Part 1 Mar. 1972 6 p refs

Avail: NTIS HC \$8.75

The experiences of 2,000 naval aviators with disorientation during various flight conditions are presented. An analysis of all naval flight accidents for calendar year 1969 in which a disorientation incident contributed to the accident was made. It is shown that the majority of accidents coded as related to disorientation were erroneously coded. It was concluded that approximately 96 percent of aviators experience disorientation at some time, but that this disorientation contributes to a very small percentage of the accidents.

Author

N72-25036# Naval Air Station, Norfolk, Va. Safety Center.
PSYCHOPHYSIOLOGICAL AND ENVIRONMENTAL FACTORS AFFECTING DISORIENTATIONS IN NAVAL AIRCRAFT ACCIDENTS

Earl H. Ninow, William F. Cunningham, and Frederick A. Radcliffe In AGARD The Disorientation Incident, Part 1 Mar. 1972 4 p refs

Avail: NTIS HC \$8.75

Psychophysiological and environmental factors, 12 in number, which most affect disorientation related mishaps are presented. These factors are listed in order of number of occurrence and it is indicated that often multiple factors are coded in conjunction with disorientation. Examples of disorientation related mishaps are presented to demonstrate psychophysiological and environmental factor involvement. A graph comparing attack and fighter pilot flight exposure to disorientation mishaps is charted

to demonstrate the effect of experience upon control of disorientation. The chart indicates that flight experience does play a role in deterring of disorientation mishaps. Author

N72-25037# Naval Air Development Center, Johnsville, Pa. Crew Systems Dept.

DISORIENTING EFFECTS OF AIRCRAFT CATAPULT LAUNCHINGS

Malcolm M. Cohen, Richard J. Crosbie, and Laurence H. Blackburn *In* AGARD *The Disorientation Incident*, Part 1 Mar. 1972 6 p refs
Avail: NTIS HC \$8.75

A human centrifuge facility was used to simulate the acceleration profiles encountered in aircraft catapult launchings. Twelve subjects attempted to keep a continuously moving target at subjective eye level before, during, and after exposure to simulated catapult launch accelerations. Results demonstrated that subjective eye level was changed by exposure to the accelerative forces. The change in subjective eye level persisted, in some cases, for as long as three minutes after the simulated launch sequence was completed. The results are discussed in terms of the effects of rotated acceleration vectors on human spatial orientation, and the data are related to certain types of aircraft losses that have been reported following catapult launchings at night. Author

N72-25038# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

EFFECTS OF ACOUSTIC STIMULI ON THE VESTIBULAR SYSTEM

C. Stanley Harris *In* AGARD *The Disorientation Incident*, Part 1 Mar. 1972 11 p refs
(AMRL-TR-71-58) Avail: NTIS HC \$8.75

The effects of noise intensity on the human vestibular system with resultant disorientation, nausea, and dizziness are discussed. The response of human subjects to acoustic stimuli was measured using nystagmography, vertical perception, and a rail test of human equilibrium. Decrements in performance of 20 to 35 percent were obtained in high intensity noise of 140 decibels even when subjects wore ear protectors. Sound levels as low as 100 decibels were found to produce an adverse effect on task performance. It was also determined that noise levels affect human equilibrium at levels below those which will damage hearing. Author

N72-25039# Institute of Aviation Medicine, Fuerstenfeldbruck (West Germany).

ALCOHOL INDUCED POSTROTATORY FIXATIONAL NYSTAGMUS. A TRAINING FILM ON A SIMPLE METHOD OF DETECTING SLIGHT ALCOHOLIC INTOXICATIONS IN PILOTS

G. Froehlich *In* AGARD *The Disorientation Incident*, Part 1 Mar. 1972 3 p refs
Avail: NTIS HC \$8.75

A method for detecting moderate alcoholic intoxication in human subjects is presented. The method is based on observation of inability of intoxicated subject to suppress postrotatory fixational nystagmus. The subject, in a standing position, is turned around his vertical axis five times within ten seconds with his eyes open in a normally illuminated room. When the subject is stopped and asked to fix his vision on the examiner's finger held about 25 centimeters in front of his eyes, the intoxicated subject will be unable to fixate. The method involved was demonstrated by a motion picture. Author

N72-25040# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

ANALYSIS OF THE VESTIBULO-OCULAR COUNTERROLL REFLEX IN PRIMATES

A. M. Junker, C. R. Replogle, K. A. Smiles, R. D. Brown, and R. H. Wheeler (AF Inst. of Technol.) *In* AGARD *The Disorientation Incident*, Part 1 Mar. 1972 10 p refs

(AMRL-TR-71-59) Avail: NTIS HC \$8.75

The vestibulo-ocular reflex manifest by counterroll was used to determine the response dynamics of the vestibular system and alterations in these dynamics subsequent to +Gx acceleration exposure. Six rhesus monkeys were tested before and after acceleration exposure to determine if significant changes had occurred in the vestibulo-ocular counterroll reflex. The tests consisted of constant speed rotation, pendular oscillations and multiple sine wave oscillations about the subject's cyclopean axis. Ocular counterroll was recorded using a linear resolver mechanically fixed to the monkey's eyeball. There is no significant decrease in the system gain with inputs up to 1 Hz. The observed phase lag can be accounted for by a time delay of approximately 0.2 seconds, and there is no significant response alteration caused by acceleration loading up to 75 +Gx. Author

N72-25041# Advisory Group for Aerospace Research and Development, Paris (France).

TWO SPECIFIC KINDS OF DISORIENTATION INCIDENTS: JET UPSET AND GIANT HAND

R. Malcolm and K. E. Money *In its* *The Disorientation Incident*, Part 1 Mar. 1972 4 p refs
Avail: NTIS HC \$8.75

In certain circumstances (instrument flying conditions and severe turbulence), an inappropriate pilot input to aircraft controls leads to a dangerous nose down attitude of the aircraft. There have been something in excess of 26 of these jet upsets. In similar circumstances, there have been a few reports of what can be called the Giant Hand phenomenon, in which the pilot reports that the aircraft controls are forced into an extreme position and held there as if by a giant hand. Precipitating circumstances and underlying mechanisms of these two kinds of incidents are discussed, and some unpublished experimental observations are presented. Author

N72-25042# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).

SPATIAL DISORIENTATION AND THE BREAK-OFF PHENOMENA

A. J. Benson *In* AGARD *The Disorientation Incident*, Part 1 Mar. 1972 11 p refs
Avail: NTIS HC \$8.75

Reports of aircraft pilots concerning occurrence of disorientation with subsequent feelings of unreality and detachment are analyzed. It was determined that the reactions occurred during monotonous phases of flight in conditions where external visual orientation cues were restricted. Evidence is presented which suggests the spatial disorientation occurring as a concomitant of break-off was caused by minor degrees of vestibular asymmetry. The high incidence of anxiety reactions supports the view that in susceptible individuals break-off can be both a precipitant and a manifestation of anxiety neurosis. Author

N72-25043# Naval Submarine Medical Center, Groton, Conn. Research Lab.

VERTIGO IN DIVERS

C. F. Gell *In* AGARD *The Disorientation Incident*, Part 1 Mar. 1972 4 p refs
Avail: NTIS HC \$8.75

The occurrence of vertigo in hyperbaric atmospheres and with underwater divers is discussed. Theories are presented to explain the etiology of these events. Some of the theories are: (1) barotrauma, (2) damage from the formation of bubbles, (3) hyperemia and hemorrhage, (4) unusual displacement of the stapes, (5) caloric stimulation, (6) slow movement of the ear drum and ossicles causing eddy currents, (7) performance of the valsalva maneuver, and (8) disturbed labyrinthian function. Author

N72-25044# Naval Aerospace Medical Research Lab., Pensacola, Fla.

THEORY OF DEVELOPMENT OF REACTIONS TO WHOLE

BODY MOTION CONSIDERED IN RELATION TO SELECTION, ASSIGNMENT, AND TRAINING OF FLIGHT PERSONNEL

Fred E. Guedry, Jr. *In* AGARD The Disorientation Incident, Part 1 Mar. 1972 17 p refs
 Avail: NTIS HC \$8.75

A speculative theory, dealing with the development of reactions to whole-body motion, is outlined. Functional aspects of reactions at several stages of maturation are considered in relation to conditioning mechanisms which are, in turn, related to individual differences in development of motion reactivity, personality, and cognitive function. Unnatural feedback resulting from passive motion is discussed in relation to different control tasks performed in different job assignments and in relation to individual differences in reactions to motion. Adaptation to the unnatural whole-body movement of flight is considered in this context and in relation to experiments illustrating that substantial changes in reactions to motion can be accomplished through habituation. Aviator selection tests, personality tests, flight aptitude tests, and several categories of training are considered in relation to the theoretical constructs. Author

N72-25045# Civil Aeromedical Inst., Oklahoma City, Okla. Psychology Lab.

PRACTICAL TECHNIQUES FOR DISORIENTATION FAMILIARIZATION AND THE INFLUENCE OF VISUAL REFERENCE AND ALCOHOL ON DISORIENTATION-RELATED RESPONSES

William E. Collins *In* AGARD The Disorientation Incident, Part 1 Mar. 1972 10 p refs
 Avail: NTIS

Techniques and procedures for providing on-the-ground familiarization of aviation personnel with the effects of disorientation are discussed. The procedures are relatively inexpensive, effective for both participants and observers, and are readily accepted by aviators as pertinent to the aviation situation. The extent to which disorientation is affected by the type of visual information available to the pilot is examined under normal conditions and when alcohol is involved. Ways of demonstrating the deleterious effects of alcohol are described. Author

N72-25046# Royal Air Force Central Medical Establishment, London (England).

THE DISORIENTATION ACCIDENT: PHILOSOPHY OF INSTRUMENT FLYING TRAINING

T. G. Dobie *In* AGARD The Disorientation Incident, Part 1 Mar. 1972 4 p refs
 Avail: NTIS HC \$8.75

Patterns of disorientation occurrences in the United Kingdom RAF and Army for the period 1960-1970 are examined in order to formulate possible explanations and recommendations concerning, in particular, the philosophy of instrument flight training. The aircraft types most commonly involved and the circumstances confirm the likelihood of sensory incongruity being a contributory factor in the majority of cases. The underlying differences between primary and secondary disorientation are discussed. The predominant emphasis both in aeromedical indoctrination and instrument flying practice is concerned with preventing primary spatial disorientation, but insufficient effort is made towards ensuring that primary disorientation when it occurs, does not develop into the dangerous secondary stage. The various methods of simulation of instrument flying are examined. Author

N72-25047# Advisory Group for Aerospace Research and Development, Paris (France).

CLINICAL EVALUATION AND TREATMENT OF DISORIENTATION IN AIRCREW

P. J. O'Connor *In* *its* The Disorientation Incident, Part 1 Mar. 1972 6 p
 Avail: NTIS HC \$8.75

The clinical evaluation and medical treatment of disorientation

problems in flying personnel are discussed. It was determined that disorientation occurs most frequently in ages between 30 and 50. The symptoms were divided into: (1) increased sensory input, (2) decreased sensory input, and (3) disturbed central thought processes. Treatment was by explanation and reassurance with the addition of rehabilitation flying and treatment of associated psychiatric disorders. Of the 90 cases treated, 54 returned to full flying duty. Author

N72-25048# Advisory Group for Aerospace Research and Development, Paris (France).

IMPROVED AND SIMPLIFIED METHODS FOR THE CLINICAL EVALUATION OF AIRCREW, PART 2

Heinz S. Fuchs, ed. (AF Hospital Inspection System, West Germany) Mar. 1972 81 p refs Mostly in ENGLISH; partly in FRENCH Presented at the Aerospace Med. Panel Specialist Meeting, Luchon, France, 29-30 Sep. 1971 (AGARD-CP-95-Pt-2) Avail: NTIS HC \$6.25

Practical aeromedical requirements are discussed in the areas of cardiorespiratory assessment, anthropometric methods, biochemical analyses, X-ray examinations, and special visual investigation methods.

N72-25049# Beach Army Hospital, Fort Wolters, Tex. **MEDICAL ELIMINATION OF STUDENTS UNDERGOING PRIMARY FLIGHT TRAINING**

Guthrie L. Turner, Jr. and Eric E. Lindstrom *In* AGARD Improved and Simplified Methods for the Clin. Evaluation of Aircrew, Part 2 Mar. 1972 5 p refs
 Avail: NTIS HC \$6.25

A group of 5,278 student aviators were processed for primary helicopter training. All had undergone the initial Class 1 or 1A flight physical examination for flying and were found qualified. Students eliminated during calendar year 1970 from all causes totaled 1,410. Of this number 168 were eliminated for medical causes. Eye defects; ear, nose and throat defects; and neuropsychiatric abnormalities accounted for 53.8% of the medical eliminations. Of the 168 student aviators eliminated, 87 had medical defects that were probably detectable on the initial flight physical. Author

N72-25050# Institute of Aviation Medicine, Fuerstenfeldbruck (West Germany).

WHAT IS THE MEANING OF THE MASTER-STEP-TEST IN EXAMINATIONS TO DETERMINE THE FITNESS FOR MILITARY FLYING DUTY

H. W. Kirchhoff and A. Dietz *In* AGARD Improved and Simplified Methods for the Clin. Evaluation of Aircrew, Part 2 Mar. 1972 3 p
 Avail: NTIS HC \$6.25

Long term examinations by means of an ECG were conducted on approximately 1000 pilots between 18 and 50 years of age. For the period of the past 14 years, at least 8 ECG's were obtained for each pilot. The examinations revealed the following results: (1) Abnormal or conspicuous ECG alterations are found to a small extent in tests at rest and in master tests. (2) The number of conspicuous ECG findings increases with age. It became evident that special examinations, such as ergometer or hypoxia ECG, more frequently indicate abnormal ECG alterations than the routine procedures. Use of the master test is recommended only in routine examinations from the 35th year of age on. Author

N72-25051# Institute of Aviation Medicine, Fuerstenfeldbruck (West Germany).

USE OF LONGTERM ECG IN AVIATION MEDICINE

A. Dietz and H. W. Kirchhoff *In* AGARD Improved and Simplified Methods for the Clin. Evaluation of Aircrew, Part 2 Mar. 1972 6 p refs
 Avail: NTIS HC \$6.25

A one-channel portable tape recording system for long term ECG recording is described. The possibilities of application of

such a system in the examination and assessment of flying personnel is considered. Topics discussed include: (1) supplementation of ECG diagnostics in examinations to determine fitness for military flying duty, (2) longitudinal observations for scientific clarification of certain ECG alterations, (3) inflight ECG examinations, and (4) heart rate registration during special examinations in aviation psychology, and training effects on heart rate. Author

N72-25052# Institute of Aviation Medicine, Fuerstenfeldbruck (West Germany).

THE AUTOMATIC ANALYSIS OF THE ECG AT REST, DURING AND AFTER EXERCISE WITH TWO DIFFERENT COMPUTER SYSTEMS

J. Zipfel, J. D. Meyer-Erkelenz, C. V. Kirschbaum, and H. W. Kirchhoff *In* AGARD Improved and Simplified Methods for the Clin. Evaluation of Aircrew, Part 2 Mar. 1972 5 p

Avail: NTIS HC \$6.25

The quality of various lead systems and computer programs for ECG diagnosis is considered. For the evaluation of the standard leads, the Minnesota system can be used. The program of Arvedson was used for the Frank system, which is particularly suitable for computer. The ECG was recorded at rest and during exercise to detect the beginning of coronary artery disease. The quantified ergometer work load was used as exercise. Attention was directed towards the evaluation of ST-T changes. The results were compared with the diagnosis of a cardiology team for the two computers. It is concluded that at rest and in the postexercise period, the use of both computer systems is justified. Author

N72-25053# School of Aerospace Medicine, Brooks AFB, Tex. **EXTENDED ELECTROCARDIOGRAPHIC MONITORING WITH EMPHASIS ON COMPUTER ANALYSIS OF THE RECORDS**

William H. Walter, III, Eric D. Grassman, Edward J. Engelken, and Malcolm C. Lancaster *In* AGARD Improved and Simplified Methods for the Clin. Evaluation of Aircrew, Part 2 Mar. 1972 5 p refs

Avail: NTIS HC \$6.25

The use of continuous 6 to 8 hour tape-recorded electrocardiograms in the evaluation of patients with known or suspected cardiac disorders proved to be of value. All of the present commercially available equipment requires that a physician personally review each 6 to 8 hour tape. These tapes may be scanned at 36 to 60 times real time, and suspicious portions may be reproduced in equivalent real time. In an effort to accurately detect, count, and classify atypical ventricular depolarization complexes, an analog computer program was developed. Author

N72-25054# Royal Air Force Hospital, Wegberg (West Germany). **PROBLEMS IN THE CLINICAL ASSESSMENT OF RAISED ARTERIAL BLOOD PRESSURE IN AIRCREW**

J. N. C. Cooke *In* AGARD Improved and Simplified Methods for the Clin. Evaluation of Aircrew, Part 2 Mar. 1972 3 p refs

Avail: NTIS HC \$6.25

The further assessment of apparently raised blood pressure levels found on routine examination of aircrew members is considered. The initial problem is posed by difficulties in establishing definite limits of normalcy and in fixing any level of blood pressure that divides health from disease. In the Royal Air Force, a consultant physician makes an initial clinical assessment and decides if there is a requirement for detailed investigation. This investigation consists of a standardized comprehensive search for possible causes for a rise in blood pressure and for associated pathological conditions. After this investigation a number of subjects remain whose fitness for further flying must be judged upon their blood pressure alone. These figures are subject to great variability, compounded by known factors of anxiety, tension, observer error, and environmental influences. Some of these problems might be reduced by repeated recordings under standardized conditions and the use of automatic cuff

recorders in the hope that comparisons over varying time intervals may show up clear trends of improvement or deterioration in an individual. Final disposal still depends largely on the statistical evidence for increased mortality and morbidity associated with raised blood pressure levels and the resultant need to institute treatment. Author

N72-25055# Institute of Aviation Medicine, Fuerstenfeldbruck (West Germany).

A SIMPLIFIED AND IMPROVED METHOD FOR OPERATIONAL ANTHROPOMETRIC PROGRAMMES c05

H. J. Grunhofer *In* AGARD Improved and Simplified Methods for the Clin. Evaluation of Aircrew, Part 2 Mar. 1972 8 p

Avail: NTIS HC \$6.25

The operational significance of antropometric data is demonstrated by an example of consequences following the introduction of an ejection seat in an aircraft. Several simplified measuring devices and techniques are discussed. A device for the application of anthropometric data and for medical re-evaluation of pilots with possible functional impairments is discussed. Author

N72-25056# Centre Principal d'Expertises Medicales du Personnel Navigant, Paris (France).

RADIOLOGICAL EXAMINATION OF THE SPINE AND THE COMBAT PILOT'S CAPABILITY FOR DUTY [EXAMEN RADIOLOGIQUE DU RACHIS ET APTITUDE A L'EMPLOI DE PILOTE DE COMBAT]

R. P. Delahaye, G. Gueffier, and P. J. Metges *In* AGARD Improved and Simplified Methods for the Clin. Evaluation of Aircrew, Part 2 Mar. 1972 10 p refs *In* FRENCH

Avail: NTIS HC \$6.25

The radiological examination of the spine during entrance fitness examinations of flying personnel is discussed. The limiting scoliotic angle for combat flight was determined to be 10 degrees, beyond which there is danger of injury in the case of ejection from the aircraft. Transl. by K.P.D.

N72-25057*# National Aeronautics and Space Administration, Washington, D.C.

A SIMPLIFIED SPACE TECHNOLOGY METHOD FOR CLINICAL AIRCREW MEASUREMENT OF FUNCTIONAL RESPIRATORY VALUES

Walton L. Jones and B. M. Bushman (Perkin-Elmer Corp., Pomona, Calif.) *In* AGARD Improved and Simplified Methods for the Clin. Evaluation of Aircrew, Part 2 Mar. 1972 11 p

(NASA-TM-X-68370) Avail: NTIS HC \$3.00 CSCL 06E

A versatile, rapid, reliable respiratory gas analyzer based on mass spectrometer principles was developed for air crew pulmonary function measurement. The instrument can provide a continuous and simultaneous analysis of up to eight gases useful in pulmonary function evaluation. The principal gases include oxygen, carbon dioxide, nitrogen, and water vapor. The instrument is suited to air crew and space cabin applications because: (1) The quantity of gas diverted to the mass spectrometer is a negligible fraction of the expired gas. (2) The time response of the mass spectrometer is fast relative to the breath cycle time. (3) The mass spectrometer is capable of accurate partial pressure measurements. (4) The size, weight, and power requirements are compatible with most in-flight applications. (5) Simplicity and reliability of operation are stressed. Author

N72-25058# Royal Air Force, Farnborough (England). Central Medical Establishment.

IMPROVED METHODS OF CLINICAL ELECTRODIAGNOSIS IN PROGNOSIS OF LOWER MOTOR NEURONE LESIONS

C. B. Wynn-Parry *In* AGARD Improved and Simplified Methods for the Clin. Evaluation of Aircrew, Part 2 Mar. 1972 4 p refs

Avail: NTIS HC \$6.25

Techniques in electromyography are discussed in connection with the diagnosis of lower motor neurons lesions. Various lesions and their symptoms are considered. K.P.D.

N72-25059# Centre Principal d'Expertises Medicales du Personnel Navigant, Paris (France).

INTEREST IN MEASURING RESISTANCE TO VERTIGO AMONG FLYING PERSONNEL [INTERET DE LA MESURE DE LA RESISTANCE A L'EBLOUISSEMENT CHEZ LES MEMBRES DU PERSONNEL NAVIGANT]

J. P. Chevaleraud and G. Perdriel *In* AGARD Improved and Simplified Methods for the Clin. Evaluation of Aircrew, Part 2 Mar. 1972 3 p *In* FRENCH

Avail: NTIS HC \$6.25

A simple method is presented which permits the evaluation of aptitude for regaining visual function while being subjected to vertigo. The orientation of the subject and authorization for revocation of flight activities when an ocular affection is involved are considered. Transl. by K.P.D.

N72-25060# Institute of Aviation Medicine, Fuerstenfeldbruck (West Germany).

ALCOHOL INDUCED POSTROTATORY FIXATIONAL NYSTAGMUS, A TRAINING FILM ON A SIMPLE METHOD OF DETECTING SLIGHT ALCOHOLIC INTOXICATIONS IN PILOTS

G. Froehlich *In* AGARD Improved and Simplified Methods for the Clin. Evaluation of Aircrew, Part 2 Mar. 1972 11 p refs

Avail: NTIS HC \$6.25

A film showing the practical procedure and its nystagmographical correlates is discussed. With this test, the flight surgeon has at his disposal a reliable and simple method to detect and thus eliminate from duty flying pilots in an acute state of alcohol intoxication or with a marked hangover from the night before. Author

N72-25061*# IIT Research Inst., Chicago, Ill.

STUDY OF THE EFFECT OF SPACE CABIN ENVIRONMENT ON SUSCEPTIBILITY TO DISEASE Final Report, 27 Jun. 1967 - 31 Jan. 1972

24 Apr. 1972 96 p refs

(Contract NAS9-7180)

(NASA-CR-115641; IITRI-L6046-55) Avail: NTIS HC \$7.00 CSCL 06S

Decreased resistance to infections initiated by respiratory challenge with *Klebsiella pneumoniae* or influenza virus was observed in mice maintained in a simulated space cabin environment represented by 98% oxygen atmosphere and 27,000 ft altitude (5 psi). The reduced resistance was manifested by increased mortality rates as compared to those seen in mice maintained at ground level condition. However, an adaptation to the stress appeared to be present in mice exposed to the space cabin environment for extended time period, i.e. 36 days, and then challenged with the influenza virus. Reduced resistance was not observed when *Salmonella typhimurium* was used as the challenge agent. Histopathologic examination of lungs of mice indicated that the severity of damage appeared to be related to the duration of exposure to the simulated space cabin environment. Author

N72-25062*# National Aeronautics and Space Administration, Washington, D.C.

ANIMAL ORIENTATION AND NAVIGATION

Sidney R. Galler, ed., Klaus Schmidt-Koenig, ed., George J. Jacobs, ed., and Richard E. Belleville, ed. 1972 586 p refs Proc. of a Symp. held at Wallops Station, Va., 9-13 Sep. 1970; Sponsored by NASA, the Smithsonian Institution, and the Am. Inst. of Biol. Sci.

(NASA-SP-262; LC-75-611767) Avail: NTIS; SOD \$5.75 CSCL 09F

The proceedings of a conference on animal orientation and navigation are presented. The discussions were divided into two areas: the use of electronic equipment to study the migratory habits of birds and animals, and explanations of the behavioral characteristics of a variety of non-human creatures. The sessions considered the following topics: (1) radar and radio tracking of birds and animals, (2) bird migration and homing, (3) biological aspects of animal sensors for homing and navigation, and (4) possible applications of biological sensor knowledge to the solution of navigation problems.

N72-25066*# Catholic Univ. of America, Washington, D.C.

RECENT STATISTICAL METHODS FOR ORIENTATION DATA

Edward Batschelet *In* NASA, Washington Animal Orientation and Navigation 1972 p 61-91 refs

Avail: NTIS; SOD \$5.75 CSCL 06C

The application of statistical methods for determining the areas of animal orientation and navigation are discussed. The method employed is limited to the two-dimensional case. Various tests for determining the validity of the statistical analysis are presented. Mathematical models are included to support the theoretical considerations and tables of data are developed to show the value of information obtained by statistical analysis. P.N.F.

N72-25067*# American Inst. of Biological Sciences, Washington, D.C.

STATE OF THE ART: A REVIEW

John H. Busser *In* NASA, Washington Animal Orientation and Navigation 1972 p 93-96

Avail: NTIS; SOD \$5.75 CSCL 06C

Electronic devices and instruments currently used to track animals in order to determine their migratory and navigational behavior are discussed. Passive and active transducers in use for this purpose are described. The characteristics of the data received by the transducers and the equipment used to process the data are explained. P.N.F.

N72-25070*# Clemson Univ., S.C.

FLIGHT DIRECTIONS OF PASSERINE MIGRANTS IN DAYLIGHT AND DARKNESS: A RADAR AND DIRECT VISUAL STUDY

Sidney A. Gauthreaux, Jr. *In* NASA, Washington Animal Orientation and Navigation 1972 p 129-137 refs

(Grant AF-AFOSR-1879-70)

Avail: NTIS; SOD \$5.75 CSCL 06C

The application of radar and visual techniques to determine the migratory habits of passerine birds during daylight and darkness is discussed. The effects of wind on the direction of migration are examined. Scatter diagrams of daytime and nocturnal migration track directions correlated with wind direction are presented. It is concluded that migratory birds will fly at altitudes where wind direction and migratory direction are nearly the same. The effects of cloud cover and solar obscuration are considered negligible. P.N.F.

N72-25073*# Rockefeller Univ., New York.

NOCTURNAL BIRD MIGRATION IN OPAQUE CLOUDS

Donald R. Griffin *In* NASA, Washington Animal Orientation and Navigation 1972 p 169-188 refs

(Grant NSF GB-7155)

Avail: NTIS; SOD \$5.75 CSCL 06C

The use of a tracking radar to measure the flight paths of migrating birds on nights with opaque clouds is discussed. The effects of wind and lack of visual references are examined. The limitations of the radar observations are described, and samples of tracks obtained during radar observations are included. It is concluded that nonvisual mechanisms of orientation make it

possible for birds to migrate in opaque clouds, but the exact nature of the sensory information cannot be determined by radar observations. Author

N72-25074*# Cornell Univ., Ithaca, N.Y.
THE ONTOGENETIC DEVELOPMENT OF ORIENTATION CAPABILITIES

Stephen T. Emlen *In* NASA, Washington Animal Orientation and Navigation 1972 p 191-210 refs
16-04)

Avail: NTIS; SOD \$5.75 CSCL 06C

The effects of celestial references on the navigation ability of birds are discussed. Tests were conducted in a planetarium with indigo bunnings to determine the amount of stellar pattern which could be removed before disorientation occurred. It was determined that young birds have a predisposition to respond to the apparent rotational motion of the night sky. It was concluded that the peak in responsiveness to rotational information is presented during the first summer of life, prior to the first migration season. Author

N72-25075*# Max-Planck-Institut fuer Verhaltensphysiologie, Seewiesen uber Starnberg (West Germany).

AN APPROACH TOWARD AN ANALYSIS OF THE PATTERN RECOGNITION INVOLVED IN THE STELLAR ORIENTATION OF BIRDS

Hans G. Wallraff *In* NASA, Washington Animal Orientation and Navigation 1972 p 211-222 refs

Avail: NTIS; SOD \$5.75 CSCL 06C

A conditioning method was used to investigate the orientational responses of ducks as affected by manipulations of the stellar patterns in a planetarium. Under simulated natural skies it was possible to train a bird to a particular direction successively under all positions of the rotating sphere at a constant latitude. The responses were independent of the phase relationships between local time, season, and appearance of the sky provided the bird had been trained under the particular sector of the sphere some time before. Author

N72-25076*# Illinois Natural History Survey, Urbana.
POSSIBLE STEPS IN THE EVOLUTIONARY DEVELOPMENT OF BIRD NAVIGATION

Frank C. Bellrose *In* NASA, Washington Animal Orientation and Navigation 1972 p 223-257 refs

Avail: NTIS; SOD \$5.75 CSCL 06C

Hypotheses are presented to explain the evolutionary development of navigational ability in migratory birds. Areas of discussion to describe the possible techniques are: (1) sun compass, (2) bicoordinate navigation, (3) star compass, (4) wind cues, (5) earth magnetic field, and (6) landscape features. It is concluded that landscape is the single most important cue for orientation of nonmigratory birds. The long range migratory birds appear to use a combination of cues with the relative importance of the cue dependent upon the species of the bird involved. Author

N72-25077*# Swiss National Foundation for Scientific Research, Meikirch.

TOPOGRAPHY AND PIGEON ORIENTATION

Gerhart Wagner *In* NASA, Washington Animal Orientation and Navigation 1972 p 259-273 refs

Avail: NTIS; SOD \$5.75 CSCL 06C

Two types of homing experiments with pigeons to determine the influence of topographical features on the orientation behavior of the birds are discussed. The releases and following were conducted by ground experiments in which the birds are tracked by visual observation at points of topographical interest and the helicopter method by which the birds are tracked throughout the entire flight. The ground experiments showed a strong influence of topographical features on initial orientation. The helicopter experiments showed that the ground experiments do not provide adequate information on the manner in which homing occurs. Author

N72-25078*# Gottingen Univ. (West Germany).
NEW EXPERIMENTS ON THE EFFECT OF CLOCK SHIFTS ON HOMING IN PIGEONS

Klaus Schmidt-Koenig (Duke Univ.) *In* NASA, Washington Animal Orientation and Navigation 1972 p 275-282 refs

(Grants NGR-34-001-019; NSF GB-2952)

Avail: NTIS; SOD \$5.75 CSCL 06C

The effect of clock shifts as an experimental tool for predictably interfering with the homing ability of birds is discussed. Clock shifts introduce specific errors in the birds' sun azimuth compass, resulting in corresponding errors during initial orientation and possibly during orientation enroute. The effects of 6 hour and 12 hour clock shifts resulted in a 90 degree deviation and a 180 degree deviation from the initial orientation, respectively. The method for conducting the clock shift experiments and results obtained from previous experiments are described. Author

N72-25079*# State Univ. of New York, Stony Brook.
THE NAVIGATION OF HOMING PIGEONS: DO THEY USE SUN NAVIGATION?

Charles Walcott *In* NASA, Washington Animal Orientation and Navigation 1972 p 283-292 refs
(Grant NSF GB-6777)

Avail: NTIS; SOD \$5.75 CSCL 06C

Experiments to determine the dependence of homing pigeons on the sun as a navigational cue are discussed. Various methods were employed to interrupt the circadian rhythms of the pigeons prior to release. It was determined that the sun may serve as a compass, but that topographic features are more important for navigation. The effects of a magnetic field produced by electric equipment carried by the bird were also investigated. It was concluded that magnetic fields may have a small effect on the homing ability. The exact nature of the homing pigeon's navigational ability is still unknown after years of elaborate experimentation. Author

N72-25080*# Duke Univ., Durham, N.C.
SOME ASPECTS OF THE USE OF VISUAL CUES IN DIRECTIONAL TRAINING OF HOMING PIGEONS

Dennis L. McDonald *In* NASA, Washington Animal Orientation and Navigation 1972 p 293-304 refs

(Grants NGR-34-001-019; Contract Nonr-1181; Grants MH-04453; HD-02319)

Avail: NTIS; SOD \$5.75 CSCL 06C

An investigation, aimed at determining how accurately homing pigeons can measure the position of a light source and what cues are used in making these measurements, is presented. Author

N72-25081*# Harvard Univ., Cambridge, Mass.

BIOLOGY CAN USE TRAINED ANIMALS

Richard J. Herrnstein *In* NASA, Washington Animal Orientation and Navigation 1972 p 305-319 refs Sponsored by, NASA and Natl. Inst. of Mental Health.

Avail: NTIS; SOD \$5.75 CSCL 06C

The use of trained animals to solve complicated biological problems related to psychology is discussed. Data cover sensory and motor capacity. Several examples and experiments are described. E.H.W.

N72-25082*# Max-Planck-Institut fuer Verhaltensphysiologie, Seewiesen uber Starnberg (West Germany).

ENDOGENOUS TIMING FACTORS IN BIRD MIGRATION
Eberhard G. Gwinner *In* NASA, Washington Animal Orientation and Navigation 1972 p 321-338 refs

(Grant NSF GB-5969X)

Avail: NTIS; SOD \$5.75 CSCL 06C

Several species of warbler birds were observed in an effort

to determine what initiates and terminates migration. Environmental and endogenous timing mechanisms were analyzed. The results indicate that endogenous stimuli are dominant factors for bird migration especially for long distances. It was concluded that environmental factors act as an assist mechanism. E.H.W.

N72-25083*# Washington Univ., St. Louis, Mo.
**NEUROPHYSIOLOGICAL ANALYSIS OF ECHOLOCA-
TION IN BATS**

Nobuo Suga *In* NASA, Washington Animal Orientation and Navigation 1972 p 341-353 refs
(Grants NSF GB-13904; FR-504; FR-07054)
Avail: NTIS; SOD \$5.75 CSCL 06C

An analysis of echolocation and signal processing in brown bats is presented. Data cover echo detection, echo ranging, echolocation, and echo analysis. Efforts were also made to identify the part of the brain that carries out the most essential processing function for echolocation. Results indicate the inferior colliculus and the auditory nuclei function together to process this information. E.H.W.

N72-25084*# Yale Univ., New Haven, Conn.
**MIDDLE EAR MUSCLE CONTRACTIONS AND THEIR
RELATION TO PULSE AND ECHO EVOKED POTENTIALS
IN THE BAT**

O. W. Henson, Jr. and Miriam M. Henson *In* NASA, Washington Animal Orientation and Navigation 1972 p 355-363 refs

Avail: NTIS; SOD \$5.75 CSCL 06C

An analysis is made of pulse and echo orientation cries of the Mustache Bat. That bat's cries are characterized by a long, 60 to 30 msec, pure tone component and brief beginning and terminal FM sweeps. In addition to obvious echo overlap and middle ear muscle contractions, the following are examined: (1) characteristics of pulse- and echo-evoked potential under various conditions, (2) evidence of changes in hearing sensitivity during and after pulse emission, and (3) the role of the middle ear muscles in bringing about these changes. E.H.W.

N72-25085*# Johns Hopkins Univ., Baltimore, Md.
**INDIVIDUAL RECOGNITION BETWEEN MOTHER AND
INFANT BATS (MYOTIS)**

Dennis Turner, Anna Shaughnessy, and Edwin Gould *In* NASA, Washington Animal Orientation and Navigation 1972 p 365-371 refs
(Grants NBO-7229-02; FR-5445-09)
Avail: NTIS; SOD \$5.75 CSCL 06C

The recognition process and the basis for that recognition, in brown bats, between mother and infant are analyzed. Two parameters, ultrasonic communication and olfactory stimuli, are investigated. The test animals were not allowed any visual contact. It was concluded that individual recognition between mother and infant occurred. However, it could not be determined if the recognition was based on ultrasonic signals or olfactory stimuli. E.H.W.

N72-25086*# California Univ., San Diego.
**NEUROPHYSIOLOGICAL FINDINGS RELEVANT TO
ECHOLOCA-
TION IN MARINE ANIMALS**

Theodore H. Bullock and Sam H. Ridgway (Naval Undersea Res. and Develop. Center) *In* NASA, Washington Animal Orientation and Navigation 1972 p 373-395 refs

Avail: NTIS; SOD \$5.75 CSCL 06C

A review of echolocation mechanisms in marine mammals, chiefly porpoises, is given. Data cover peripheral auditory and central neurophysiological specializations favorable to the analysis of echolocating clicks and their echoes. Conclusions show (1) signals are received from 50 up to at least 135 kHz, (2) sound is received through the mandible skin, and (3) the midbrain sites are insensitive to low frequencies (below 6 kHz). E.H.W.

N72-25087*# Oceanic Inst., Waimanalo, Hawaii.
**A THEORY FOR THE FUNCTION OF THE SPERMACE-
TI ORGAN OF THE SPERM WHALE (PHYSETER CATODON
L.)**

Kenneth S. Norris (Calif. Univ., Los Angeles) and George W. Harvey *In* NASA, Washington Animal Orientation and Navigation 1972 p 397-417 refs
(Grant NS-05427-07CMS)

(Contrib-74) Avail: NTIS; SOD \$5.75 CSCL 06C

The function of the spermaceti organ of the sperm whale is studied using a model of its acoustic system. Suggested functions of the system include: (1) action as an acoustic resonating and sound focussing chamber to form and process burst-pulsed clicks; (2) use of nasal passages in forehead for repeated recycling of air for phonation during dives and to provide mirrors for sound reflection and signal processing; and (3) use of the entire system to allow sound signal production especially useful for long range echolocation in the deep sea. E.H.W.

N72-25088*# Zurich Univ. (Switzerland).
**VISUAL ORIENTATION PERFORMANCES OF DESERT
ANTS (CATAGLYPHIS BICOLOR) TOWARD ASTRO-
MENOTACTIC DIRECTIONS AND HORIZON LANDMARKS**

Rudiger Wehner *In* NASA, Washington Animal Orientation and Navigation 1972 p 421-436 refs
Avail: NTIS; SOD \$5.75 CSCL 06C

Experimental data, on the visual orientation of desert ants toward astromenotactic courses and horizon landmarks involving the cooperation of different direction finding systems, are given. Attempts were made to: (1) determine if the ants choose a compromise direction between astromenotactic angles and the direction toward horizon landmarks when both angles compete with each other or whether they decide alternatively; (2) analyze adaptations of the visual system to the special demands of direction finding by astromenotactic orientation or pattern recognition; and (3) determine parameters of visual learning behavior. Results show separate orientation mechanisms are responsible for the orientation of the ant toward astromenotactic angles and horizon landmarks. If both systems compete with each other, the ants switch over from one system to the other and do not perform a compromise direction. E.H.W.

N72-25089*# Yale Univ., New Haven, Conn.
VISUAL DIRECTION FINDING BY FISHES
Talbot H. Waterman *In* NASA, Washington Animal Orientation and Navigation 1972 p 437-456 refs

Avail: NTIS; SOD \$5.75 CSCL 06C

The use of visual orientation, in the absence of landmarks, for underwater direction finding exercises by fishes is reviewed. Celestial directional clues observed directly near the water surface or indirectly at an asymptotic depth are suggested as possible orientation aids. E.H.W.

N72-25090*# Texas A&M Univ., College Station.
ORIENTATION THROUGH CHEMO RECEPTION IN FISHES
Herman Kleerekoper *In* NASA, Washington Animal Orientation and Navigation 1972 p 459-468 refs

Avail: NTIS; SOD \$5.75 CSCL 06C

A system designed to acquire and process data describing locomotor behavior of fish is described. Data are recorded in relation to the fish's response to olfactory stimuli. It was concluded that fish orientation is based on rheotaxis or chemotropotaxis. E.H.W.

N72-25091*# Florida Univ., Gainesville.
**THE CASE FOR LONG RANGE CHEMORECEPTIVE
PILOTING IN CHELONIA**

Archie F. Carr, Jr. *In* NASA, Washington Animal Orientation and Navigation 1972 p 469-483 refs

Avail: NTIS; SOD \$5.75 CSCL 06C

The reproductive ecology and migration habits of *Chelonia* are investigated. Efforts were made to determine if the turtle navigates by chemoreception and if sensory responses of the migrating animals could be electronically tracked through telemetry. Efforts were also made to: (1) explain why certain small islands or restricted areas of mainland shore are chosen by *Chelonia* as nesting grounds, even when located a thousand miles or more from the year round feeding grounds of the population; (2) identify guidance mechanisms used by migrants in their periodic open ocean travels; and (3) account for the so called lost year - the virtually complete disappearance of young sea turtles during their first year of life. It was suggested that turtle migration is aided by an olfactory mechanism, sun compass, and ocean currents. The tracking experiment was unsuccessful; the equipment was lost or damaged and stopped functioning after about two hours. E.H.W.

N72-25092*# Wisconsin Univ., Madison.

HOMING ORIENTATION IN SALAMANDERS: A MECHANISM INVOLVING CHEMICAL CUES

Dale M. Madison *In* NASA, Washington Animal Orientation and Navigation 1972 p 485-498 refs

(Contract AT(30-1)-3554; Grants NSF GB-2496; GM-44846)

Avail: NTIS; SOD \$5.75 CSCL 06C

A detailed description is given of experiments made to determine the senses and chemical cues used by salamanders for homing orientation. Sensory impairment and cue manipulative techniques were used in the investigation. All experiments were carried out at night. Results show that sense impaired animals did not home as readily as those who were blind but retained their sensory mechanism. This fact suggests that the olfactory mechanism is necessary for homing in the salamander. It was determined that after the impaired salamander regenerated its sensory mechanism it too returned home. It was concluded that homing ability in salamanders is direction independent, distant dependent, and vision independent. E.H.W.

N72-25093*# Johann-Wolfgang-Goethe-Universitat, Frankfurt am Main (West Germany).

ANEMOMENOTATIC ORIENTATION IN BEETLES AND SCORPIONS

K. Eduard Linsenmair *In* NASA, Washington Animal Orientation and Navigation 1972 p 501-510 refs

Avail: NTIS; SOD \$5.75 CSCL 06C

Orientation, by beetles and scorpions, according to wind direction and force are analyzed. Major efforts were made to determine: (1) which physical qualities of the air current influence anemomenotaxis, (2) which physiological mechanism is responsible for such orientation, (3) which sense organs do beetles and scorpions use to perceive wind directions, and (4) what the biological significance of anemomenotaxis in the beetle and scorpion is. Experimental results show that the trichobothria in scorpions perceives wind direction; in the beetle it is perceived by sense organs excited by pedicellus-flagellum joint movements. A compensation mechanism is suggested as the basis for anemomenotactic orientation. It was also suggested that the biological significance of anemomenotaxis in scorpions is space orientation; while in beetles it was found to be part of the appetitive behavior used to search for olfactory sign stimuli. E.H.W.

N72-25094*# Hokkaido Univ., Sapporo (Japan).

AZIMUTH ORIENTATION OF THE DRAGONFLY (SYMPET- RUM)

Mituhiko Hisada *In* NASA, Washington Animal Orientation and Navigation 1972 p 511-522 refs

Avail: NTIS; SOD \$5.75 CSCL 06C

Evidence is presented of directional orientation by an alighting dragonfly relative to the azimuth of the sun. The effects of wind direction on this orientation are analyzed. It was concluded that wind does not play a major role in orientation but

may have some secondary function in helping greater numbers of dragonflies face windward more often than leeward. A search was made to find the principle sensory receptor for orientation. Two possibilities, the large compound eye and the frontal ocelli, were noted; however, no conclusive evidence could be found. E.H.W.

N72-25095*# Scripps Institution of Oceanography, San Diego, Calif.

WHEN THE BEACHHOPPER LOOKS AT THE MOON: THE MOON COMPASS HYPOTHESIS

James T. Enright *In* NASA, Washington Animal Orientation and Navigation 1972 p 523-555 refs
(Grants NSF GB-2469; NSF GB-5471)

Avail: NTIS; SOD \$5.75 CSCL 06C

The function of moon position for shoreline orientation by talitrids is investigated. Three major results were found: (1) Observed cases of compensation for changes in the direction of the moon are based on physiological rhythm with a period of about 25 hours which can persist for at least several days under constant conditions. (2) The zeitgeber for physiological rhythm may be either moonlight or some other factor associated with the tides. (3) If talitrids are long removed from environmental entrainment, either artificially or naturally, the internal rhythm no longer exerts an appreciable influence on the angle of lunar orientation; in such cases the system deteriorates into constant angle orientation, with an angle which is determined by the beach origin, but may be modified by lighting conditions. E.H.W.

N72-25096*# Johann-Wolfgang-Goethe-Universitat, Frankfurt am Main (West Germany).

MAGNETIC EFFECT ON DANCING BEES

Martin Lindauer and Herman Martin *In* NASA, Washington Animal Orientation and Navigation 1972 p 559-567 refs

Avail: NTIS; SOD \$5.75 CSCL 06C

Bee sensitivity to the earth's magnetic field is studied. Data cover sensitivity range and the use of magnetoreception for orientation purposes. Experimental results indicate bee orientation is aided by gravity fields when the magnetic field is compensated. E.H.W.

N72-25097*# Johann-Wolfgang-Goethe-Universitat, Frankfurt am Main (West Germany).

THE INFLUENCE OF MAGNETIC TOTAL INTENSITY AND INCLINATION ON DIRECTIONS PREFERRED BY MIGRATING EUROPEAN ROBINS (ERITHACUS RUBECULA)

Wolfgang Wiltschko *In* NASA, Washington Animal Orientation and Navigation 1972 p 569-578 refs

Avail: NTIS; SOD \$5.75 CSCL 06C

The directional orientation of migratory European robins in relation to magnetic cues is analyzed. Major efforts were made to determine what information the birds derive from the fields. It was determined that magnetic fields provide: (1) field intensity which determines whether the magnetic field can be used for orientation, (2) a means by which axial direction may be perceived, and (3) a means by which the bird can find the north direction. The north direction is sensed from the angle between gravity and the magnetic field. E.H.W.

N72-25098*# Cornell Univ., Ithaca, N.Y.

EFFECTS OF MAGNETS ON PIGEON HOMING

William T. Keeton *In* NASA, Washington Animal Orientation and Navigation 1972 p 579-594 refs

(Grant NSF GB-13046X)

Avail: NTIS; SOD \$5.75 CSCL 06C

The function of magnets in the navigation system of homing pigeons is investigated. Only experienced pigeons with magnets or brass bars were studied. Data show that on sunny days,

pigeons with the magnets had some difficulty in orientation while those with brass bars had no problems. The same experiment was repeated on cloudy days. These results show that the magnets did not interfere with orientation. This difference suggests that sun and magnetic cues are used interchangeably, but that both together seldom function. E.H.W.

N72-25099*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
APOLLO EXPERIENCE REPORT: PROCESSING OF LUNAR SAMPLES IN A STERILE NITROGEN ATMOSPHERE
 Thomas M. McPherson Washington Jun. 1972 16 p
 (NASA-TN-D-6858; MSC-S-332) Avail: NTIS HC \$3.00 CSCL 03B

A sterile nitrogen atmosphere processing cabinet line was installed in the Lunar Receiving Laboratory to process returned lunar samples with minimum organic contamination. Design and operation of the cabinet line were complicated by the requirement for biological sterilization and isolation, which necessitated extensive filtration, leak-checking, and system sterilization before use. Industrial techniques were applied to lunar sample processing to meet requirements for time-critical experiments while handling a large flow of samples. Author

N72-25100*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
APOLLO EXPERIENCE REPORT: PROTECTION OF LIFE AND HEALTH
 Bennie C. Wooley Washington Jun. 1972 32 p
 (NASA-TN-D-6856; MSC-S-328) Avail: NTIS HC \$3.00 CSCL 06P

The development, implementation, and effectiveness of the Apollo Lunar Quarantine Program and the Flight Crew Health Stabilization Program are discussed as part of the broad program required for the protection of the life and health of U.S. astronauts. Because the goal of the Apollo Program has been the safe transport of men to the moon and back to earth, protection of the astronauts and of the biosphere from potentially harmful lunar contaminants has been required. Also, to ensure mission success, the continuing good health of the astronauts before and during a mission has been necessary. Potential applications of specific aspects of the health and quarantine programs to possible manned missions to other planets are discussed. Author

N72-25101*# Midwest Research Inst., Kansas City, Mo.
BIOMEDICAL APPLICATIONS OF AEROSPACE TECHNOLOGY Final Report, 1 Aug. 1970 - 31 Oct. 1971
 Thomas R. Castles 31 Oct. 1971 175 p
 (Contract NASw-1936; MRI Proj. 3332-E(D))
 (NASA-CR-126773) Avail: NTIS HC \$10.75 CSCL 06E

Aerospace technology transfer to biomedical research problems is discussed, including transfer innovations and potential applications. Statistical analysis of the transfer activities and impact is also presented. J.A.M.

N72-25102*# SysteMed Corp., Newport Beach, Calif.
EFFECT OF 90-DAY CONTINUOUS EXPOSURE TO METHYLISOBUTYLKETONE ON DOGS, MONKEYS AND RATS
 J. D. MacEwen, E. H. Vernot, and C. C. Haun Wright-Patterson AFB, Ohio AMRL Jun. 1971 23 p refs
 (NASA Order T-64130G; Contract F33615-70-C-1046; AF Proj. 6302)
 (NASA-CR-126744; W-71003; AMRL-TR-71-65) Avail: NTIS HC \$3.25 CSCL 06C

Continuous exposure of rats, dogs and monkeys to 410 mg/cu M methylisobutylketone vapor (MIBK) was conducted to evaluate the provisional spacecraft exposure limit of 20 ppm established by the Space Science Board in 1968. The exposure, conducted in a simulated space cabin environment, did not

produce any measurable changes in dogs or monkeys. Rats developed hyaline droplet nephrosis within 2 weeks of exposure which was reversible upon removal from the MIBK even after 90 days. The data obtained indicated that the 60-minute emergency exposure limit of 100 ppm and the 90- and 1000-day provisional limits as established by the Space Science Board contain a wide margin of safety. Author

N72-25103# Civil Aeromedical Inst., Oklahoma City, Okla.
INDEX TO FAA OFFICE OF AVIATION MEDICINE REPORTS: 1961 THROUGH 1971
 J. Robert Dille and Marcia H. Grimm Mar. 1972 29 p refs
 (FAA-AM-72-1) Avail: NTIS HC \$3.50

An index to Office of Aviation Medicine Reports (1964 to 71) and Civil Aeromedical Research Institute Reports (1961 to 63) is presented as a quick reference for those engaged in aviation medicine and related activities. It provides a listing of all FAA aviation medicine reports published from 1961 through 1971 by year, number, author, subject, and title. Author

N72-25104# Civil Aeromedical Inst., Oklahoma City, Okla.
ATTRITION FROM ACTIVE AIRMAN STATUS DURING 1970

Charles F. Booze, Jr. Mar. 1972 29 p refs
 (FAA-AM-72-13) Avail: NTIS HC \$3.50

Attrition from an active airman status amounts to approximately 17% annually. Summary data presented have served to quantify, to some extent, the characteristics of airmen medically certified during 1968 subsequently becoming inactive during 1970. The contribution of medical factors to attrition was considered as well as experience, occupation, usage, and geographic characteristics. Population comparisons and prevalence rates are also presented for the various medical factors considered. Disenchantment and/or economic considerations appear to be the most important factors associated with attrition. Medical factors do not contribute substantially to attrition. Author

N72-25105*# Exotech, Inc., Washington, D.C.
EVALUATION OF MICROBIAL RELEASE PROBABILITIES Interim Report
 Apr. 1972 60 p refs
 (Contract NASw-2062)
 (NASA-CR-126846; TR72-12) Avail: NTIS HC \$5.00 CSCL 06M

Work undertaken to improve the estimation of the probability of release of microorganisms from unmanned Martian landing spacecraft is summarized. An analytical model is described for the development of numerical values for release parameters and release mechanisms applicable to flight missions are defined. Laboratory test data are used to evolve parameter values for use by flight projects in estimating numerical values for release probabilities. The analysis treats microbial burden located on spacecraft surfaces, between mated surfaces, and encapsulated within materials. Author

N72-25106# Joint Publications Research Service, Arlington, Va.
PLANT CULTIVATION IN SPACE
 Arnold Miller 30 May 1972 8 p Transl. into ENGLISH from Nauka i Tekhn. (USSR), no. 2, 1972 p 17-23
 (JPRS-56129) Avail: NTIS HC \$3.00

Cultivation of plants in a closed system in space flight is discussed. Weightlessness and radiation effects on plant metabolism are considered. Author

N72-25107# Lockheed Missiles and Space Co., Palo Alto, Calif.
ON THE HYDROLOCATION CAPABILITY OF DOLPHINS
 G. B. Agarkov, B. V. Solukha, and B. G. Khomenko [1971] 7 p refs Transl. into ENGLISH from Bionika (Kiev), no. 5, 1971 p 52-57
 Avail: NTIS HC \$3.00; National Translations Center, John

Crerar Library, Chicago, Ill. 60616

The hydrolocator mechanism of the dolphin is analyzed with an eye toward using some of its elements in technology. The system consists of two parts: the transmitter and the receiver. The transmitter is a system of air saccules, larynx, fatty lens, and a reflector; the receiver is the hearing organ, the mechanoreceptors of the head, the upper jaw, and the lower jaw. The accuracy of locating the direction, image, and range of an object by the dolphin is calculated. Author

N72-25108# Civil Aeromedical Inst., Oklahoma City, Okla.
EFFECTS OF ALCOHOL ON A PROBLEM SOLVING TASK
W. Dean Chiles and Alan E. Jennings Mar. 1972 11 p refs
(FAA-AM-72-11) Avail: NTIS HC \$3.00

Twenty subjects were tested on two separate days on a simple problem solving task. Half of the subjects received alcohol on the first day of testing and half on the second day of testing. A control group of 11 subjects was also tested on two days and they were given a placebo on the first day of testing. All 31 subjects were also serving in a vestibular stimulation experiment. A significant effect was found for alcohol with five of the eleven measures analyzed; four of the measures were time measures and one was an error measure. Analysis of the simple effects indicated that alcohol had a greater effect on the group that had alcohol on the first session than on the group that had alcohol second. There was also suggestive evidence of a residual effect of the vestibular stimulation on the problem solving performance of the control group. In general, the findings provide supportive evidence of the potential deleterious effects of alcohol on a skill of importance to aviation operations. Author

N72-25109# Lovelace Foundation for Medical Education and Research, Albuquerque, N.Mex.
FISSION PRODUCT INHALATION PROGRAM Annual Report, 1 Oct. 1970 - 30 Sep. 1971
R. O. McClellan, ed. and F. C. Rupprecht, ed. Nov. 1971 373 p refs
(Contract AT(29-2)-1013)
(LF-44) Avail: NTIS

Fifty-one papers related to research conducted from October 1970 to October 1971 at the Lovelace Foundation on the biological effects of radioisotope inhalation are presented. A separate abstract was prepared for each of 42 papers. Nine were not within the scope of NASA. These nine include information on the production of laboratory dogs, methods for handling canine blood and tissue samples, chemical studies of lungs, methods for handling laboratory data, and the effects of bronchopulmonary lavage in dogs. NSA

N72-25110# Technology, Inc., Dayton, Ohio.
GROSS BEHAVIOR OF THE BODY'S GLUTEAL REGION Final Report
Robert R. Yeager 30 Dec. 1971 105 p refs
(Contract N00156-71-C-0854)
(AD-737225; TI-415-71-1; NADC-CS-7121) Avail: NTIS CSCL 06/19

A research program was conducted to study the behavior of the human body's gluteal region when the body is restricted to a sitting erect configuration. The specific objective was establishing the force-deflection behavior of the buttock tissue for longitudinal body loads above and below normal body weight. To this end 14 human subjects were tested for thigh bone displacements relative to a seating platform as their bodies were lowered onto the seat. Body loadings in excess of normal weight were then produced by adding a series of weights to the shoulders of each subject. Test results indicate that the buttocks exhibit primarily non-linear hardening behavior. Displacements for relaxed subjects can double those for stiffened subjects. Author (GRA)

N72-25111# IIT Research Inst., Chicago, Ill.
SUSCEPTIBILITY OF CARDIAC PACEMAKERS TO ELF MAGNETIC FIELDS
J. E. Bridges, E. E. Brueschke, M. P. Kaye, D. A. Miller, and C. D.

Port Apr. 1971 130 p refs
(Contract N00039-71-C-0111)
(AD-737237; IITRI-E6185-1) Avail: NTIS CSCL 06/18

In the report it is concluded that the extremely low frequency (ELF) magnetic field levels which interfere with the operation of cardiac pacemakers are much greater than those expected from a conceptual defense SANGUINE communication system. This conclusion is based on an experimental program in which the effect of extremely low frequency (10-100 HZ) magnetic fields on cardiac pacemakers was studied. Objectives of the program were to determine a safe level (threshold) for a magnetic field in this frequency range and to establish a method and criterion for evaluating the interference effects. Examples of electromagnetic fields affecting implanted heart pacemakers are presented. Author (GRA)

N72-25112# Air Force Academy, Colo.
AUDITORY EFFECTS ON SPATIAL ORIENTATION
L. R. Chason, T. P. McFarland, and T. B. Aldrich Nov. 1971 32 p refs
(AD-737351; USAFA-RR-71-10) Avail: NTIS CSCL 06/6

The purpose of this study was to isolate and investigate specialized auditory stimuli with respect to spatial orientation. An evaluation of subject's ability to use frequency specific binaural clues and vision, separately and in combination, in setting the horizontal position of a rod-and-frame device was performed. The data demonstrated that the auditory clues improved performance regardless of the presence of visual stimuli. The combination of auditory and visual clues provided the optimal arrangement. The implications for human factors design in aircraft systems are discussed. Author (GRA)

N72-25113# Naval Submarine Medical Center, Groton, Conn.
REDUCTION IN AUDIOGRAM SHIFTS IN SOLAR WATCHSTANDERS WHEN EXPOSED TO SURFACE SHIP ECHO RANGING
J. Donald Harris 21 May 1971 14 p refs
(AD-737207; NSMRL-MR-71-4;
NAVMED-MF12.524.004-9010D) Avail: NTIS CSCL 06/19

Audiograms collected underway on sonar technicians on USS GATO (SSN 615) during exposure to echo-ranging 19 - 31 January 1971 showed that SPLs in the sonar headsets may be hazardous to hearing. Two of three headsets were modified by NUSC/NLON so as to limit the peak SPLs delivered to the ear. On a cruise 21 - 31 March 1971, during which light to moderately heavy echo-ranging was encountered, 6 men using an unmodified headset, were exposed to SPLs up to 118 dB. In half the 12 ears a temporary hearing loss was found which exceeded a widely-disseminated damage-risk criterion. However, of 6 men who used modified headsets, no average loss whatever was found, and only 1 ear slightly exceeded the criterion. Whether the modification introduced on this occasion was an optimal compromise between protecting the ears vs obtaining all possible information from the sea, is still an open question. Further studies are in progress. Author (GRA)

N72-25114# Naval Submarine Medical Center, Groton, Conn.
THE VISUAL EVOKED RESPONSE AS A MEASURE OF NITROGEN NARCOSIS IN NAVY DIVERS
Jo Ann S. Kinney and Christine L. McKay 24 Apr. 1971 25 p refs
(AD-737208; NSMRL-664; NAVMED-MF12.524.004-9015D)
Avail: NTIS CSCL 06/19

The study assesses the possible use of the visual evoked response as a measure of nitrogen narcosis in divers. Responses to a patterned visual target were recorded from the scalp over the occipital cortex, from divers breathing air in the NAVSUBMEDRSCHLAB's pressure chamber. Records were obtained at the surface, and at 100, 200, and 250 feet. Control dives to 250 ft with the same men breathing helium-oxygen were also performed. The results showed significant decreases in amplitude and regularity of the visual evoked response as a function of depth for divers breathing air but not comparable decrements with helium-oxygen. Author (GRA)

**N72-25115# Naval Submarine Medical Center, Groton, Conn.
THE VISUAL EVOKED CORTICAL RESPONSE AS A
MEASURE OF STRESS IN NAVAL ENVIRONMENTS:
METHODOLOGY AND ANALYSIS. 1: SLOW FLASH
RATES**

Jo Ann S. Kinney, Christine L. McKay, A. Mensch, and S. M. Luria 25 Jun. 1971 33 p refs
(AD-737209; NSMRL-669;
NAVMED-MR005.01.01-0130BOLL-01) Avail: NTIS CSCL
06/19

The emphasis in this report is upon methodology for use in evaluating the visual evoked response (VER), since our primary interest is in using it as a tool in the study of Naval problems. In order to employ the VER to full advantage, techniques have to be evolved to assess the significance of differences among evoked responses; two such methods are assessed in this paper. One of these, a determination of a mean VER, is effective in evaluating the statistical significance of subtle differences among evoked responses. The second technique is designed to isolate differences in underlying processes in the VER by summing responses to one stimulus and subtracting the same number of responses to another. In the course of these investigations, we have found an element in the VER strongly responsive to patterned stimuli and small differences among VER's attributable to hue. The latter are in excellent agreement with psychophysical data on the color response of normal and color defective subjects. Author (GRA)

**N72-25116# Man Factors, Inc., San Diego, Calif.
EXPERIMENTAL STUDY OF DIVER PERFORMANCE IN
MANUAL AND MENTAL TASKS AT 66 FEET**

Irving Streimer, D. P. W. Turner, P. Pryor, and Kent Volkmer
Sep. 1971 106 p refs
(Contract N00014-70-C-0189; NR Proj. 196-070)
(AD-737376; MFI-71-115) Avail: NTIS CSCL 06/19

Certain human performance characteristics developed during the execution of relatively complex work at a depth of 66 feet were studied. The tasks examined were: (1) A complex maintenance task involving the disassembly and reassembly of a water filtration unit. (2) A mental task involving the processes of numerical reasoning, digit memory span and pattern perception. The principal findings may be summarized as follows: (1) Irrespective of the task nature, energy expenditure rates during manual work remain remarkably constant. (2) Differences in task nature or difficulty are manifested by changes in productivity while energy expenditure rates remain constant. (3) Breathing gas consumption rates vary as a function of depth. (4) The percentage of oxygen removed from the available oxygen varies as a function of the energy investment level. Author (GRA)

**N72-25117# Texas Christian Univ., Fort Worth. Inst. for the
Study of Cognitive Systems.**

**PROCEEDINGS OF THE MIDWESTERN PSYCHOLOGICAL
ASSOCIATION SYMPOSIUM ON MULTIVARIATE AP-
PROACHES TO PATTERN PERCEPTION**

Selby H. Evans Dec. 1971 146 p refs Symp. held at Detroit,
May 1971

(Contract DAAD05-68-C-0176; DA Proj. 1T0-61102-B-81 A)
(AD-737268; HEL-TM-25-71) Avail: NTIS CSCL 05/10

Contents: Property analyzers in pattern perception; Toward a union of feature analysis and class synthesis approaches to pattern perception; New dimensions in psychophysics--A sure cure for methodological dyspepsia; Discussion. GRA

**N72-25118# Naval Aerospace Medical Research Lab., Pensacola,
Fla.**

THE EFFECTIVENESS OF BENACTYZINE HYDROCHLO-

**RIDE AND OTHER ANTIMOTION SICKNESS DRUGS IN
NEW COMBINATIONS**

D. Charles Wood, and Ashton Graybiel 6 Feb. 1971 9 p refs
(AD-737220; NAMRL-1152;
NAVMED-MF12.524.005-7015BX8X-1) Avail: NTIS CSCL
06/15

Five different drug preparations are compared for their effectiveness in preventing motion sickness with the effectiveness found for the combination of scopolamine 0.6 mg with d-amphetamine 10 mg in previous studies. Promethazine 25 mg plus d-amphetamine 10 mg was essentially equal to the baseline drug in range of effectiveness. Halving the doses of the baseline combination did not provide the protection that it did in an earlier study. Benactyzine 3 mg was only slightly effective and when combined with d-amphetamine 10 mg was only moderately so. Promethazine 25 mg plus ephedrine 25 mg was about one-fourth less effective than the baseline preparation. The unexpected finding of the efficacy of small doses (25 mg) of promethazine plus ephedrine is pointed out, and the benefits from the relatively great reduction in side effects found with this drug combination are stressed. Author (GRA)

**N72-25119* United Aircraft Corp., East Hartford, Conn.
RESTRAINT TORSO FOR A PRESSURIZED SUIT Patent**

Michael A. Marzoni, Jr., inventor (to NASA) Issued 9 May 1972
11 p Filed 20 Dec. 1968 Sponsored by NASA
(NASA-Case-MS-C-12397-1; US-Patent-3,660,851;
US-Patent-Appl-SN-785613; US-Patent-Class-2-2.1;
US-Patent-Class-2-115) Avail: US Patent Office CSCL 06Q

A restraint torso, for a pressurized suit, fabricated from cloth is described. The restraint is fashioned so that mobility will increase and physiological effects to the wearer will decrease. A belt is provided so that together with the cloth design, the torso will be held flat under pressure. Precise cloth patterns and illustrations are included. E.H.W.

**N72-25120* Institute for Research, Houston, Tex.
METHOD OF MAKING A PERSPIRATION RESISTANT
BIOPOTENTIAL ELECTRODE Patent**

Benjamin Mosier and Joe L. Day, inventors (to NASA) Issued
23 May 1971 5 p Filed 9 May 1969 Continuation-in-part of
US Patent Appl. SN-607461, filed 5 Jan. 1967 sponsored by
NASA

(NASA-Case-MS-C-90153-2; US-Patent-3,665,064;
US-Patent-Appl-SN-844225; US-Patent-Class-264-104;
US-Patent-Class-106-209; US-Patent-Class-128-2.1;
US-Patent-Class-128-417; US-Patent-Class-252-514) Avail: US
Patent Office CSCL 06B

The forming technique used to make a biopotential electrode is described. A 5 to 15 percent colloidal material, acting as a screen against undesirable perspiration ions, is added to a conventional biopotential electrode mixture. This colloidal material is selected from various gums, bentonite clay, and a magnesium silicate clay-like material. The mixture is pressed into shape around an electrode wire after being subjected to a partial vacuum. Official Gazette of the U.S. Patent Office

**N72-25121* Northrop Nortronics, Palos Verdes Peninsula,
Calif.**

METHOD OF MAKING DRY ELECTRODES Patent
Frank B. Ramme, inventor (to NASA) Issued 16 May 1972
5 p Filed 7 Oct. 1970

Continuation-in-part of US Patent Appl. SN-760389,
filed Aug. 1968 sponsored by NASA
(NASA-Case-FRC-10029-2; US-Patent-3,662,441;
US-Patent-Appl-SN-78704; US-Patent-Class-29-25.14;
US-Patent-Class-29-25.18; US-Patent-Class-29-630A;
US-Patent-Class-29-482; US-Patent-Class-156-308;
US-Patent-Class-156-264) Avail: US Patent Office CSCL 06D

Dry electrodes are made by mixing silver powder with a cement, diluting the mixture with a suitable solvent for the cement, and applying it in a thin layer to a surface from which it can be removed as a film when dry. Cutting or shaping the dried

film to form the size electrodes is desired. Placing a wire lead on the cut film piece and applying a small amount of solvent to the film surface are reviewed. Pressing a second piece of the dried film to form the electrode of the invention is also performed.

Official Gazette of the U.S. Patent Office

N72-25122* General Electric Co., Philadelphia, Pa.
METHOD FOR MEASURING CUTANEOUS SENSORY PERCEPTION Patent

Robert W. Richardson and David B. Wright, inventors (to NASA) (NASA-Case-MSC-13609-1; US-Patent-3,662,744; US-Patent-Appl-SN-94347; US-Patent-Class-128-2N) Avail: US Patent Office CSCL 06B

The method utilizes an instrument comprised of elongated tubular housing having a sleeve member extending axially. Mounted on the other end of the tubular housing is a vernier counter adjustment. Telescopically positioned within the sleeve is a thin wire-like member or monofilament stimulating element. One end of the monofilament stimulating element extends from the sleeve while the other end is mechanically coupled to the internal operating mechanism of the vernier counter adjustment.

Official Gazette of the U.S. Patent Office

N72-25123 Kansas Univ., Lawrence.
A PULSE MODULATED BIOTELEMETRY SYSTEM FOR MONITORING HEART RATE AND BODY TEMPERATURE IN FREE RANGING VERTEBRATES Ph.D. Thesis

James Donald Pauley 1971 212 p
Avail: Univ. Microfilms Order No. 71-27191

To carry out a study of energy budgeting in free-ranging vertebrates, such as the opossum, raccoon, or marmot, it was necessary to develop a biotelemetry system to obtain heart rate and body temperature as an index of metabolic rate and stored thermal energy. The transmitter for the biotelemetry system consisted of two electrodes placed in the M-X (manubrium-xyphoid) configuration and an electronic package measuring 4 x 5 x 1 cm. The ECG signal picked up by the electrodes was amplified and the QRS complex detected. A sample computer program is presented which tabulates the collected data for a period of up to two weeks and computes and tabulates average heart rates and body temperatures for each hour of the day using the data obtained over the period of data collection. Examples are given for two different female opossums which clearly show diurnal body temperature fluctuations and suggest diurnal heart rate patterns.

Dissert Abstr.

N72-25124*# National Aeronautics and Space Administration, Marshall Space Flight Center, Huntsville, Ala.
UNDERWATER SPACE SUIT PRESSURE CONTROL REGULATOR Patent Application

Billy R. Aldrich, Charles R. Cooper, and John R. Rasquin, inventors (to NASA) Filed 2 Nov. 1971 17 p (NASA-Case-MFS-20332-2; US-Patent-Appl-SN-195061) Avail: NTIS HC \$3.00 CSCL 06K

A device for regulating the pneumatic pressure in a ventilated space suit relative to the pressure imposed on the suit when being worn by a person underwater is described. A box unit located on the chest area of the suit comprises connections for suit air supply and return lines and carries a regulator valve that stabilizes the air pressure differential between the inside and outside of the suit. The valve and suit pressure is controlled by the suit occupant and the valve includes a mechanism for quickly dumping the suit pressure in case of emergency. Pressure monitoring and relief devices are also included in the box unit.

NASA

N72-25125*# Westinghouse Electric Corp., Pittsburgh, Pa.
DEVELOPMENT OF A SOLID ELECTROLYTE CARBON DIOXIDE AND WATER REDUCTION SYSTEM FOR OXYGEN RECOVERY

L. Elikan, J. P. Morris, and C. K. Wu Washington NASA May 1972 182 p refs (Contract NAS1-8896)

(NASA-CR-2014) Avail: NTIS HC \$3.00 CSCL 06K

A 1/4-man solid electrolyte oxygen regeneration system, consisting of an electrolyzer, a carbon deposition reactor, and palladium membranes for separating hydrogen, was operated continuously in a 180-day test. Oxygen recovery from the carbon dioxide-water feed was 95%. One percent of the oxygen was lost to vacuum with the hydrogen off-gas. In a space cabin, the remaining 4% would have been recycled to the cabin and recovered. None of the electrolysis cells used in the 180-day test failed. Electrolysis power rose 20% during the test; the average power was 283.5 watts/man. Crew time was limited to 18 min/day of which 12 min/day was used for removing carbon. The success achieved in operating the system can be attributed to an extensive component development program, which is described. Stability of operation, ease of control, and flexibility in feed composition were demonstrated by the life test.

Author

N72-25126*# Hamilton Standard, Windsor Locks, Conn.
SPACE SHUTTLE ENVIRONMENTAL CONTROL/LIFE SUPPORT SYSTEMS

Washington NASA May 1972 430 p refs (Contract NAS1-10359) (NASA-CR-1981; SVHSER-5851) Avail: NTIS HC \$6.00 CSCL 06K

This study analyzes and defines a baseline Environmental Control/Life Support System (EC/LSS) for a four-man, seven-day orbital shuttle. In addition, the impact of various mission parameters, crew size, mission length, etc. are examined for their influence on the selected system. Pacing technology items are identified to serve as a guide for application of effort to enhance the total system optimization. A fail safe-fail operation philosophy was utilized in designing the system. This has resulted in a system that requires only one daily routine operation. All other critical item malfunctions are automatically resolved by switching to redundant modes of operation. As a result of this study, it is evident that a practical, flexible, simple and long life, EC/LSS can be designed and manufactured for the shuttle orbiter within the time phase required.

Author

N72-25127*# National Aeronautics and Space Administration, Marshall Space Flight Center, Huntsville, Ala.
TILTING TABLE FOR ERGOMETER AND FOR OTHER BIOMEDICAL DEVICES Patent Application

Raymond L. Gause and Raymond A. Spier, inventors (to NASA) Filed 8 May 1972 19 p (NASA-Case-MFS-21010-1; US-Patent-Appl-SN-251609) Avail: NTIS HC \$3.00 CSCL 06B

A device for testing the human body in a variety of positions, ranging from the vertical to the supine, while exercising on an ergometer is described. The device can also be used for angular positioning of other biomedical devices. It includes a floor plate and a hinged plate upon which to fix the ergometer, a back rest and a head rest attached at right angles to the plate and behind the seat of the ergometer, and dual hydraulic cylinders for raising and lowering the hinged plate through 90 degrees. Tests can be made with the subject positioned on the seat of the ergometer, through the various angles, with a substantially normal body attitude relative to the seat and ergometer.

NASA

N72-25128*# Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
A STUDY OF PILOT MODELING IN MULTI-CONTROLLER TASKS Final Report

Richard F. Whitbeck and James R. Knight Mar. 1972 135 p refs (Contract NAS1-10514) (NASA-CR-112048; CAL-IH-3037-J-1) Avail: NTIS HC \$8.75 CSCL 05E

A modeling approach, which utilizes a matrix of transfer functions to describe the human pilot in multiple input, multiple output control situations, is studied. The approach used was to extend a well-established scalar Wiener-Hopf minimization technique to the matrix case and then study, via a series of

experiments, the data requirements when only finite record lengths are available. One of these experiments was a two-controller roll tracking experiment designed to force the pilot to use rudder in order to coordinate and reduce the effects of aileron yaw. One model was computed for the case where the signals used to generate the spectral matrix are error and bank angle while another model was computed for the case where error and yaw angle are the inputs. Several anomalies were observed to be present in the experimental data. These are defined by the descriptive terms roll up, break up, and roll down. Due to these algorithm induced anomalies, the frequency band over which reliable estimates of power spectra can be achieved is considerably less than predicted by the sampling theorem.

Author

N72-25129*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

TEMPERATURE CONTROLLER FOR A FLUID COOLED GARMENT Patent Application

Allan B. Chambers, James R. Blackaby, and John Billingham, inventors (to NASA) Filed 25 Apr. 1972 21 p (NASA-Case-ARC-10599-1; US-Patent-AppI-SN-247481) Avail: NTIS HC \$3.25 CSCL 06G

An automatic temperature controller is described for the fluid inlet to a liquid cooled garment which is worn underneath an air ventilated suit. The inlet coolant temperature is controlled as a function of wearer's evaporative water loss. The water loss rate is obtained by the incremental change in a hygrometer reading of the outlet air stream of the air ventilated garment with respect to a basal outlet air stream hygrometer reading that provides comfort for the wearer in a sedentary mode. F.O.S.

N72-25130# Civil Aeromedical Inst., Oklahoma City, Okla.
PILOT TRACKING PERFORMANCE DURING SUCCESSIVE IN-FLIGHT SIMULATED INSTRUMENT APPROACHES

Paul G. Rasmussen and A. Howard Hasbrook Feb. 1972 22 p refs

(FAA-AM-72-9) Avail: NTIS HC \$3.25

Eight instrument rated pilots with flying experience ranging from 600 to 12,271 hours each flew 10 simulated ILS instrument approaches in a single engine, general aviation aircraft equipped with a primary flight display arranged in a conventional T configuration. Continuous glide slope and localizer tracking performance was recorded during each approach. Approaches were flown consecutively at approximately 10-minute intervals, with a one-minute in-flight rest period prior to each approach. The principal finding was that there were no statistically significant changes in glide slope tracking with respect to accuracy of tracking or consistency of performance as a result of the practice afforded by the ten approaches. Some performance measures did yield statistically significant changes in localizer tracking performance, but these changes were of a small order of magnitude. Results are discussed in terms of the factors operating to limit the precision with which the glide slope and localizer can be tracked. Author

N72-25131# Civil Aeromedical Inst., Oklahoma City, Okla.
PHYSIOLOGICAL EVALUATION OF A MODIFIED JET TRANSPORT PASSENGER OXYGEN MASK

Ernest B. McFadden Mar. 1972 18 p refs (FAA-AM-72-10) Avail: NTIS HC \$3.00

Altitude chamber experiments conducted with human subjects are described. The experiments were conducted with new continuous flow disposable passenger mask applicable for emergency use to maximum altitudes of 41,000 feet. This mask design differs in configuration from the previous omni-directional masks in that the inner face flap or seal is eliminated and the cylindrical shape reduced to a modified cone. The primary goal was to determine if design modification of the mask induced an increase or decrease in physiological efficiency. Of paramount concern was the possibility that modification of the configuration and facial seal might increase the leakage rate of ambient air into the mask, and thereby compromise its ability to provide the level of protection required at the maximum altitude of the

aircraft. The mask was evaluated at altitudes of 14,000, 21,500, 29,000, 35,000 and 40,000 feet. Author

N72-25132# Civil Aeromedical Inst., Oklahoma City, Okla.
THE COLOR-WORD INTERFERENCE TEST AND ITS RELATION TO PERFORMANCE IMPAIRMENT UNDER AUDITORY DISTRACTION

Richard I. Thackray, Karen N. Jones, and Robert M. Touchstone (FAA-AM-72-14) Avail: NTIS HC \$3.00

An examination was made of the relationship between performance on the Stroop color-word interference test (a suggested measure of distraction susceptibility) and impairment under auditory distraction on a task requiring the subject to generate random sequences of letters. Fifty male college students served as subjects. Although there was a significant decrease in randomness as a result of auditory distraction, the correlation between change in randomness and amount of color-word interference was nonsignificant. These findings, along with those of several other studies, suggest that the Stroop test may measure a rather restricted type of perceptual interference essentially unrelated to a possibly more general ability to maintain concentration in the presence of competing (distracting) stimuli. Author

N72-25133*# Vought Missiles and Space Co., Dallas, Tex.
ADVANCED EXTRAVEHICULAR PROTECTIVE SYSTEM (AEPS) STUDY

J. L. Williams, B. W. Webbon, and R. J. Copeland Mar. 1972 149 p refs

(Contract NAS2-6022)

(NASA-CR-114382; T141RP007) Avail: NTIS HC \$9.50 CSCL 06K

A summary is presented of Advanced Extravehicular Protective Systems (AEPS) for the future missions beyond Skylab in earth orbit, on the lunar surface, and on the Martian surface. The study concentrated on the origination of regenerable life support concepts for use in portable extravehicular protective systems, and included evaluation and comparison with expendable systems, and selection of life support subsystems. The study was conducted in two phases. In the first phase, subsystem concepts for performing life support functions in AEPS which are regenerable or partially regenerable were originated, and in addition, expendable subsystems were considered. Parametric data for each subsystem concept were evolved including subsystem weight and volume, power requirement, thermal control requirement; base regeneration equipment weight and volume, requirement. The second phase involved an evaluation of the impact of safety considerations involving redundant and/or backup systems on the selection of the regenerable life support subsystems. In addition, the impact of the space shuttle program on regenerable life support subsystem development was investigated. Author

N72-25134*# Life Systems, Inc., Cleveland, Ohio.
ONE-MAN, SELF-CONTAINED CO2 CONCENTRATING SYSTEM Final Report

R. A. Wynveen, F. H. Schubert, and J. D. Powell Mar. 1972 78 p refs

(Contract NAS2-61118)

(NASA-CR-114426; LSI-ER-131-16) Avail: NTIS HC \$6.00 CSCL 06K

A program to design, fabricate, and test a 1-man, self-contained, electrochemical CO2 concentrating system is described. The system was designed with electronic controls and instrumentation to regulate performance, to analyze and display performance trends, and to detect and isolate faults. Ground support accessories were included to provide power, fluids, and a Parametric Data Display allowing real time indication of operating status in engineering units. Author

N72-25135# Joint Publications Research Service, Arlington, Va.
CYBERNETICS RESEARCH REPORTED
 23 May 1972 74 p refs Transl. into ENGLISH from
 Avtomatyka (Kiev), no. 6, 1971
 (JPRS-56072) Avail: NTIS HC \$5.75

Articles are presented on mathematical modeling, automata theory, speech synthesis by computers, mechanical model of heart and lungs, and logistics curves for prediction purposes.

N72-25140# Joint Publications Research Service, Arlington, Va.
A HYPOTHETICAL HEART-LUNGS MODEL
 R. V. Belyakov *In its* Cybernetics Res. Reported 23 May 1972
 p 46-52 refs
 Avail: NTIS HC \$5.75

A mechanical model of the heart and lungs is described, including an autoperfusion apparatus for separating air and venous blood. The scheme enriches the blood simultaneously with the autoperfusion, and uses for membranes a hypothetical polymer which is deformed by contact with air and blood. The polymer membranes, in accordian-like structure, are in two blocks for antiphasing. Air moves through the odd interstices and blood through the even. Air in one block is expanded and air in the other block is contracted. Air then flows from the first block to the second while the second is being bathed by blood from a bellows. This causes a reversed deformation of the membranes which in turn reverses the flows. N.E.N.

N72-25142*# Technology, Inc., San Antonio, Tex.
KOROTKOV SOUND PROCESSOR Patent Application
 Donald P. Golden, George W. Hoffer, and Roger A. Wolthuis,
 inventors (to NASA) Filed 24 May 1972 22 p
 (Contract NAS9-7675)
 (NASA-Case-MSC-13999-1; US-Patent-Appl-SN-256317) Avail:
 NTIS HC \$3.25 CSCL 06B

A Korotkov sound processor is described which is used in a non-invasive, automatic blood pressure measuring system where the brachial artery is occluded by an inflatable cuff. The Korotkov sound associated with the systolic event is determined when the ratio of the absolute value of a voltage signal, representing Korotkov sounds, in the range of 18 to 26 Hz to a maximum absolute peak value of the unfiltered signals first equals or exceeds a value of 0.45. The Korotkov sound associated with the diastolic event is determined when a ratio of the voltage signal of the Korotkov sounds in the range of 40 to 60 Hz to the absolute peak value of such signals within a single measurement cycle first falls below a value of 0.17. The processor signals the occurrence of the systolic and diastolic events and these signals can be used to control a recorder to record pressure values for these events. NASA

N72-25143*# General Electric Co., Philadelphia, Pa. Missile and Space Div.
PRELIMINARY IMBLS SYSTEMS ARRANGEMENT AND CREW CONSTRAINTS, IMBLS PHASE B-4. APPENDIX 3: DOCUMENTATION FOR SYSTEM DESIGN AND OPERATION Final Project Definition Study
 D. S. Hetzel 16 Nov. 1970 425 p refs
 (Contract NAS9-10741)
 (NASA-CR-115664; GE-70SD5386; Doc-70SD5399) Avail:
 NTIS HC \$23.50 CSCL 05H

The integrated medical behavioral laboratory measurement system is described. The functional arrangements of the consoles, clinical/physiological bay, systems control/behavioral bay, and the analysis bay are discussed along with the restraints on the operator and subject. The design considerations for the clinical, physiological, and behavioral measurements are analyzed. F.O.S.

N72-25144*# Massachusetts Inst. of Tech., Cambridge. Man-Vehicle Lab.
UNIVERSITY ROLE IN ASTRONAUT LIFE SUPPORT SYSTEMS: SPACE POWER SUPPLY SYSTEMS
 Lang Y. Chin Washington NASA Jun. 1972 156 p refs

(Grant NGR-22-009-312)
 (NASA-CR-2061) Avail: NTIS HC \$3.00 CSCL 06K

A brief description is given of the schemes suggested for providing electrical power aboard spacecraft. An attempt was made to list the major advantages and disadvantages of each scheme and to identify the particular areas in which it appears likely further research work may prove fruitful. Special attention was given to those research areas that appear suitable for colleges and university work. Chemical, solar, and nuclear power sources are considered together with the appropriate thermoelectric and turboelectric conversion systems. Author

N72-25145# Human Engineering Labs., Aberdeen Proving Ground, Md.

IMPROVED WEAPON NOISE EXPOSURE CRITERIA
 David C. Hodge Feb. 1972 19 p refs
 (AD-738135; HEL-TN-1-72) Avail: NTIS CSCL 05/5

The state of the art in noise-exposure criteria is reviewed and it is suggested that such criteria are in need of revision and extension to meet future operational requirements of the Army. Further, existing noise criteria, expressed in terms of decibels of hearing loss, should be restated in terms of predictions about the performance of military personnel after they have been exposed to noise. Such restatement in performance terms will significantly improve communication about the risk of noise exposure to people who are in a position to utilize such information but who generally do not comprehend the notation of decibels of hearing loss. Author (GRA)

N72-25800*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AUTOMATED DETECTION OF BACTERIA IN URINE
 Albert J. Fleig, Grace L. Picciolo, Emmett W. Chappelle, and Burton N. Kelbaugh *In its* Significant Accomplishments in Technol., GSFC, 1970 1972 p 188-192

Avail: NTIS HC \$3.00 CSCL 06B

A method for detecting the presence of bacteria in urine was developed which utilizes the bioluminescent reaction of adenosine triphosphate with luciferin and luciferase derived from the tails of fireflies. The method was derived from work on extraterrestrial life detection. A device was developed which completely automates the assay process. K.P.D.

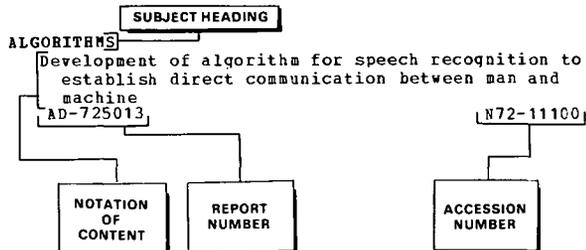
N72-25801*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE HEART SOUND PREPROCESSOR
 Wayne T. Chen *In its* Significant Accomplishments in Technol., GSFC, 1970 1972 p 193-195
 Avail: NTIS HC \$3.00 CSCL 06B

Technology developed for signal and data processing was applied to diagnostic techniques in the area of phonocardiography (pcg), the graphic recording of the sounds of the heart generated by the functioning of the aortic and ventricular valves. The relatively broad bandwidth of the PCG signal (20 to 2000 Hz) was reduced to less than 100 Hz by the use of a heart sound envelope. The process involves full-wave rectification of the PCG signal, envelope detection of the rectified wave, and low pass filtering of the resultant envelope. K.P.D.

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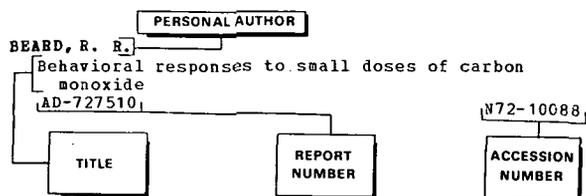
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1. Report No. NASA SP-7011 (106)	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle AEROSPACE MEDICINE AND BIOLOGY A Continuing Bibliography (Supplement 106)		5. Report Date September 1972	
		6. Performing Organization Code	
7. Author(s)		8. Performing Organization Report No.	
		10. Work Unit No.	
9. Performing Organization Name and Address National Aeronautics and Space Administration Washington, D. C. 20546		11. Contract or Grant No.	
		13. Type of Report and Period Covered	
12. Sponsoring Agency Name and Address		14. Sponsoring Agency Code	
		15. Supplementary Notes	
16. Abstract <p style="text-align: center;">This special bibliography lists 323 reports, articles, and other documents introduced into the NASA scientific and technical information system in August 1972.</p>			
17. Key Words (Suggested by Author(s)) Aerospace Medicine Bibliographies Biological Effects		18. Distribution Statement Unclassified - Unlimited	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 106	22. Price* \$3.00 HC

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