NASA SP-7011 (140)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY

WITH INDEXES

(Supplement 140)

APRIL 1975

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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NASA SP-7011 (140)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 140)

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 March 1975 in

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

This Supplement to *Aerospace Medicine and Biology* (NASA SP-7011) lists 306 reports, articles and other documents announced during March 1975 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Reports (IAA)*. The first issue of the bibliography was published in July 1964; since that time, monthly supplements have been issued.

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

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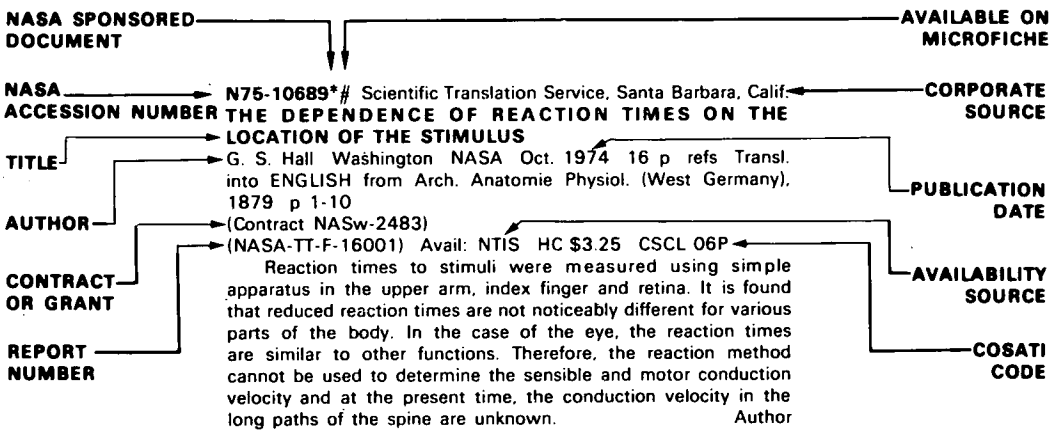

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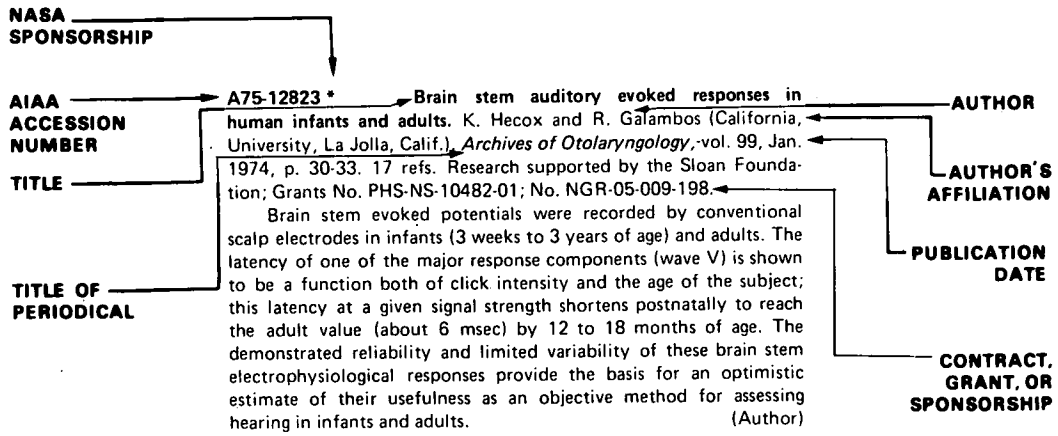

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 140) APRIL 1975

IAA ENTRIES

A75-16670 The perception of eye contact. C. Lord (Harvard University, Cambridge, Mass.) and M. M. Haith (Denver, University, Denver, Colo.). *Perception and Psychophysics,* vol. 16, Dec. 1974, p. 413-416. 11 refs. Grant No. NIH-MH-22020-05.

Subjects made judgments of whether or not they were being looked in the eye as an experimenter fixated several points on and off their faces. Distance between sender and receiver, sex, and whether the sender made a sequence of fixations prior to the terminal fixation were variables of interest. The sender-receiver distance produced less effect than predicted from the hypothesis that receiver judgments were determined solely by the discrepancy between the sender's iris/sclera configuration (ISC) during true eye contact and the current fixation point. There was no stable difference in accuracy as a function of whether the sender's terminal fixation was preceded by other fixations or not. These findings cast doubt on the belief expressed in recent studies that the ISC can be used to accurately discriminate eye gazes from other gazes. (Author)

A75-16671 * Human spatial orientation in the pitch dimension. M. M. Cohen (U.S. Naval Material Command, Naval Air Development Center, Warminster, Pa.) and C. A. Larson (NASA, Washington, D.C.). *Perception and Psychophysics,* vol. 16, Dec. 1974, p. 508-512. 16 refs.

Two experiments were conducted. In Experiment I, each of eight Ss attempted to place himself at 13 different goal orientations between prone and supine. Deviations of achieved body pitch angles from goal orientations were determined. In Experiment II, each of eight Ss attempted to align a visual target with his morphological horizon while he was placed at each of the 13 goal orientations. Changes in settings of the target were examined. Results indicate that Ss underestimate body pitch when they are tilted less than 60 deg backward or forward from the vertical, overestimate body pitch when they are nearly prone, and accurately estimate body pitch when they are nearly supine. In contrast, Ss set the visual target maximally above the morphological horizon when they are tilted 30 deg forward from the vertical. The findings are discussed in terms of common and different physiological mechanism that may underlie judgments of these types. (Author)

A75-16819 * # On the dynamics of chain systems. R. L. Huston and C. E. Passerello (Cincinnati, University, Cincinnati, Ohio). *American Society of Mechanical Engineers, Winter Annual Meeting, New York, N.Y., Nov. 17-22, 1974, Paper 74-WA/Aut-11.* 8 p. 15 refs. Members, $1.00; nonmembers, $3.00. Grant No. NGL-36-004-014.

A computer-oriented method for obtaining dynamical equations of motion for chain systems is presented. A chain system is defined as an arbitrarily assembled set of rigid bodies such that adjoining bodies have at least one common point and such that closed loops are not formed. The equations of motion are developed through the use of Lagrange's form of d'Alembert's principle. The method and procedure is illustrated with an elementary study of a tripod space manipulator. The method is designed for application with systems such as human body models, chains and cables, and dynamic finite-segment models. (Author)

A75-16822 # Comparison of two manipulators using a standard task of varying difficulty. D. E. McGovern (Stanford University, Stanford, Calif.). *American Society of Mechanical Engineers, Winter Annual Meeting, New York, N.Y., Nov. 17-22, 1974, Paper 74-WA/Bio-4.* 7 p. 6 refs. Members, $1.00; nonmembers, $3.00. AEC-supported research.

A simple manipulation task is investigated using two manipulators under manual control. A definition of task difficulty is adopted and shown to be appropriate for six- or seven-degree-of-freedom manipulators. Results are shown which compare the two manipulators of this work with a much simpler manipulator and with a human hand doing comparable manipulation tasks. (Author)

A75-16993 Motion habituation - Inverted self-motion perception and optokinetic after-nystagmus. T. Brandt, J. Dichgans, and W. Büchele (Neurologische Universitäts-Klinik, Freiburg im Breisgau, West Germany). *Experimental Brain Research,* vol. 21, Dec. 12, 1974, p. 337-352. 54 refs. Research supported by the Deutsche Forschungsgemeinschaft.

The oculomotor and perceptual after-effects (AE) of optokinetic motion stimulation as well as the adaptive changes during stimulation were studied. The intensity and duration of optokinetic after-nystagmus (OKAN) and self-motion after-sensation (CV) are a function of stimulus duration. Positive AEs increase with stimulus durations up to 1 min; the negative AEs increase up to the longest stimulus duration tested (15 min) and by antagonizing the positive AEs shorten their duration once stimulus duration exceeds 3 min. Negative AEs are interpreted as the consequence of a central counter-regulation to the actual stimulus effects: motion habituation. During prolonged stimulation, motion habituation causes an apparent decrease in perceived velocity and may result in the sensation of periodic reversals of the direction of perceived self-motion, concurrent with a shift in average eye position towards the direction of the apparent reversal of self-motion. (Author)

A75-16994 Coding of spatial location by single units in the inferior colliculus of the alert cat. G. R. Bock and W. R. Webster (Monash University, Clayton, Australia). *Experimental Brain Research,* vol. 21, Dec. 12, 1974, p. 387-398. 18 refs. Research supported by the Australian Research Grants Committee.

Effects of altering the spatial location of a tonal sound source were studied in single neurons in the inferior colliculus of unanaesthetized, restrained cats. Speaker position was altered by successive 22.5 deg displacements in an arc in the horizontal plane around the animal's head. Thresholds for evoked activity in some units were dependent on sound location, but threshold changes for a 22.5 deg displacement in sound position never exceeded 10 dB. Spike counts of most units changed in a systematic fashion with changes in sound location, the usual pattern of change consisting of a maximum value at some point in the contralateral field and a gradual decline as speaker location was displaced from the most effective position. Discharge patterns of approximately 50% of units were dependent on sound location. The results are compatible with the concept of 'place coding' of spatial location. (Author)

A75-17025 Contribution to the theory of photopic vision - Retinal phenomena (Contribution à la théorie de la vision photopique - Phénomènes rétiniens). H. Calvet. *Sciences et Techniques,* Oct. 15, 1974, p. 13-17. In French.

Principles of thermodynamics are applied to the study of the ultramicroscopic anatomy of the inner eye. Concepts introduced and discussed include: the retina as a three-dimensional sensor, light signals as coherent beams in relation to the dimensions of retinal

pigments, pigment effects topographed by the conjugate antennas effect, visualizing lights, the autotrophic function of hemoglobin and some cytochromes, and reversible structural arrangements during photoptic adaptation. A paleo-ecological diagram is presented which traces the evolution of scotopic vision (primitive system) to photopic vision (secondary system) through the emergence of structures sensitive to the intensity, temperature, and wavelengths of the visible range. P.T.H.

A75-17264 In vivo nuclear fission in the aetiology of decompression sickness. D. N. Walder and A. Evans (Royal Victoria Infirmary, Newcastle-upon-Tyne, England). *Nature,* vol. 252, Dec. 20-27, 1974, p. 696, 697. 28 refs. Research supported by the Medical Research Council.

It is suggested that some gas micronuclei are created in man by spontaneous nuclear fission in vivo. An analysis was made of the stabilities of solutions of two alpha-active radioisotopes in cold, supersaturated water where microbubbles should be created to grow to visible size. Thorium tubes were prepared to distinguish between the effects of the principal mode of radioactive decay for alpha emission and for spontaneous nuclear fission. Experimentation showed a growth to a visible size in cold supersaturated water of nuclear fragments liberated by the spontaneous nuclear fission of the 238U nucleate. T.S.

A75-17326 A simple technique using an optomotor response for visual psychophysical measurements in animals. J. Wallman (Tufts University, Medford, Mass.). *Vision Research,* vol. 15, Jan. 1975, p. 3-8. 7 refs.

A method is described for rapidly determining certain visual parameters in animals. It uses the optokinetic or optomotor responses and involves having the stimulus of interest travel in one direction around the animal, while a standard grating of adjustable contrast travels in the other direction. The amount of contrast of the standard grating necessary to match the stimulus of interest is compared under different stimulus conditions. This method can be applied to measurements of color vision, modulation transfer function, and spectral sensitivity, and readily lends itself to screening large numbers of animals. (Author)

A75-17327 Psychophysical study of simultaneous chromatic contrasts (Etude psychophysique des contrastes chromatiques simultanés). M. Hamrouck (Leuven, Katholieke Universiteit, Louvain, Belgium). *Vision Research,* vol. 15, Jan. 1975, p. 9-21. 22 refs. In French.

The result of a study in which 250 color contrasts were measured with a chromatoscope are discussed. The color contrast, as compared to the physical complementary colors of the inducing color, exhibits a shift that is a function of the hue and of the luminance level of the inducing and induced tests. This modification of the contrast hue by changes in luminance is reminescent of the classical change in hue - without implying that one explains the other. A distinct relationship was observed between induced and inducing color brightnesses, their ratio varying as a function of the inducing hue from very small values to values greater than unity. V.P.

A75-17328 Minimum separable as a function of speed of a moving object. B. Bhatia (Ministry of Defence, Defence Research and Development Organization, New Delhi, India). *Vision Research,* vol. 15, Jan. 1975, p. 23-33. 16 refs.

Values of critical separation at which two white bars on a black background appear as fused were determined at distances of 2 and 5 m at speeds ranging from 20 to 210 cm/sec, and for central as well as peripheral vision, with the eyes fixed. The data fitted a simple expression relating the critical angular separation and angular velocity. (Author)

A75-17329 Rhodopsin cooperativity in visual response. G. W. Robinson (California Institute of Technology, Pasadena, Calif.). *Vision Research,* vol. 15, Jan. 1975, p. 35-48. 59 refs.

A theory of vertebrate scotopic vision is proposed. The essence of the theory is that absorption of one photon in the disk membrane gives rise to transmitter release through cooperativity among a number (10-50, depending on vertebrate species) of unbleached rhodopsin molecules. Conclusions based upon the theory are in good agreement with both psychophysical and electrophysiological threshold experiments carried out in the absence of background illumination. Empirical incorporation of a generalized Weber-Fechner law allows the theory to be applied in the case of certain backgrounds. (Author)

A75-17330 The effect of smooth tracking and saccadic eye movements on the perception of size - The shrinking circle illusion. S. Coren (British Columbia, University, Vancouver, Canada), D. R. Bradley (Bates College, Lewiston, Me.), P. Hoenig (Cornell Medical College, New York, N.Y.), and J. S. Girgus (City College, New York, N.Y.). *Vision Research,* vol. 15, Jan. 1975, p. 49-55. 32 refs.

A75-17331 Accuracy of image stabilization by an optical-electronic feedback system. R. M. Jones and U. Tulunay-Keesey (Wisconsin, University, Madison, Wis.). *Vision Research,* vol. 15, Jan. 1975, p. 57-61. 14 refs. Grant No. NIH-EY-00308.

The performance of an optical-electronic image stabilization system is described. The system uses the contact lens-mirror method for eye movement tracking in connection with a feedback principle for image stabilization. Stabilization accuracy is such that the maximum residual image movement is only 0.2' for one subject, and 0.6' for another. (Author)

A75-17332 Spin-labeled rhodopsin. E. Fujimori (USAF, Space Physics Laboratory, Bedford, Mass.). *Vision Research,* vol. 15, Jan. 1975, p. 63-68. 17 refs.

Iodoacetamide and its spin-labeled derivative in high concentration ranges (.01 to .1 M) react with unexposed SH-groups of rhodopsin in the dark. The spin-labels bound to these SH-groups are moderately immobilized. While rhodopsin is not spin-labeled with the iodoacetamide at a lower concentration (.0005 M) in the dark, photobleached rhodopsin is readily spin-labeled with this concentration. The photo-bound spin-labels are highly immobilized and do not change their mobility after the regeneration of rhodopsin. Urea enhances the dark-bleaching of rhodopsin by iodoacetamide and increases the mobility of the bound spin-labels. The dark-reacting unexposed SH-groups appear to be different from the photo-exposed SH-groups which are not directly involved in the 500-nm chromophore. (Author)

A75-17333 Inhibition of rhodopsin regeneration in the bullfrog eye by metabolic inhibitors. K. O. Ratzlaff (Southern Illinois University, Edwardsville, Ill.). *Vision Research,* vol. 15, Jan. 1975, p. 73-77. 14 refs.

A75-17334 The nature of fusional effort in diplopic regions. M. J. Sullivan and A. E. Kertesz (Northwestern University, Evanston, Ill.). *Vision Research,* vol. 15, Jan. 1975, p. 79-83. 8 refs. Grants No. NIH-EY-1055; No. NIH-GM-874.

A psychophysical measurement of the magnitude and time course of human fusional effort in diplopic regions was carried out. It was found that a fusional effort persisted in diplopia and that its actual magnitude was a function of time. Through careful control of the size and rate of change of stimulus disparities, it was possible to measure the gradual decay of fusional effort in diplopia. Fusional effort was detected in response to stimulus disparities until these disparities were nearly twice as large as the disparity threshold for diplopia. (Author)

A75-17335 **Variation in pupillomotor responsiveness with mean pupil size.** J. Semmlow (Illinois, University, Chicago, Ill.), D. Hansmann, and L. Stark (California, University, Berkeley, Calif.). *Vision Research,* vol. 15, Jan. 1975, p. 85-90. 28 refs.

Quantitative measurements of iris movement have found increasing application in clinical medicine and research. Though in many studies responses of the pupil system are assumed to be linear (often implicitly) this study shows such an assumption can lead to substantial error. In this investigation a technique for obtaining a quantitative description of variation in pupillomotor responsiveness with changes in pupil size is presented along with results obtained for two subjects. The motor operator so defined is termed the 'expansive range nonlinearity' and is shown to affect pupil behavior at all size levels. The implications of this motor phenomenon on quantitative pupil measurements are discussed. (Author)

A75-17336 **Intensity functions of the early receptor potential and of the melanin fast photovoltage in the human eye.** J. Debecker and A. Zanen (Bruxelles, Université Libre, Brussels, Belgium). *Vision Research,* vol. 15, Jan. 1975, p. 101-106. 26 refs. Research supported by the Fonds de la Recherche Scientifique Médicale and Fonds National de la Recherche Scientifique of Belgium.

A75-17337 **Flash bleaching of visual pigments in man investigated by early receptor potential recording.** J. Debecker and A. Zanen (Bruxelles, Université Libre, Brussels, Belgium). *Vision Research,* vol. 15, Jan. 1975, p. 113-116. 21 refs. Research supported by the Fonds de la Recherche Scientifique Médicale and Fonds National de la Recherche Scientifique of Belgium.

A75-17338 **Visual movement aftereffect - Evidence for independent adaptation to moving target and stationary surround.** E. R. Strelow and R. H. Day (Monash University, Clayton, Victoria, Australia). *Vision Research,* vol. 15, Jan. 1975, p. 117-121. 22 refs.

A75-17339 **Suprathreshold intensity-area relationships - A spatial Broca-Sulzer effect.** K. E. Higgins and E. J. Rinalducci (Virginia, University, Charlottesville, Va.). *Vision Research,* vol. 15, Jan. 1975, p. 129-143. 36 refs. Research supported by the American Optometric Association; U.S. Department of Transportation Contract No. CG-83635A; Grant No. NIH-EY-00353.

Three experiments are reported in which a brightness-matching procedure was used to determine the form of the foveal intensity-area relationship at varying suprathreshold levels. First, the nominal degree of spatial summation at the smallest stimulus sizes consistently exceeded that predicted by Ricco's law at all visibility levels. However, further analysis indicated that this 'supersummation' phenomenon is more than likely attributable to calibration errors introduced by diffraction. Second - and more important - at the higher suprathreshold levels, the coefficient of spatial summation becomes negative between 3'-6', indicating that brightness decreased with increasing stimulus size. The third experiment indicated that the form of the suprathreshold intensity-area relationship is, to some extent, dependent upon the size of the standard stimulus used in the brightness-matching task. (Author)

A75-17340 **Light induced change in rod outer segment membrane fluidity.** M. Delmelle and M. Pontus (Liège, Université, Liège, Belgium). *Vision Research,* vol. 15, Jan. 1975, p. 145-147. 12 refs.

The spin probe method was used to study the membranes of rod outer segments (ROS) obtained from cattle retinas. Modifications which appear in the electron spin resonance (ESR) spectra of spin-labeled ROS membrane suspensions following illumination are described. The spin label used was 2,2,6,6 tetramethylpiperidin-1-oxyl (Tempo). The observations indicate that light increases Tempo solubility in ROS membranes as well as the spin label reduction rate. A.T.S.

A75-17341 **Saccadic velocities determined by a new perceptual method.** D. P. Hendry (California, University, Berkeley, Calif.). *Vision Research,* vol. 15, Jan. 1975, p. 149-151. 6 refs.

The described method can provide a subjective measure of the magnitude and velocity of eye-movements. The devices needed are an oscilloscope and a function generator. The method is a variation of an approach first used by Lamanski (1869). The method can be employed in perceptual studies in such a way that it is practically impossible for a subject to produce spurious 'positive' results. G.R.

A75-17367 **Cardiovascular problems posed by weightlessness (Problèmes cardio-vasculaires posés par l'absence de pesanteur).** J. Colin (Armée de l'Air, Services de Santé, Paris, France). *Revue de Médecine Aéronautique et Spatiale,* vol. 13, 3rd Quarter, 1974, p. 183-188. 16 refs. In French.

The present work reviews briefly the main cardiovascular effects observed in astronauts during and after long periods of weightlessness. This includes changes in arterial pressure, electrocardiogram indices, cardiac silhouette, orthostatic tolerance, tolerance to exercise, skeletal bone calcium content, and loss of weight. Some measures for the prevention of adaptation to weightlessness are summarized. P.T.H.

A75-17368 **Difficulties arising in the evaluation of flight personnel on the basis of the leftward deviation of the QRS axis and its relations to the left anterior block concept (Les difficultés posées dans l'expertise du personnel navigant par la déviation a gauche de l'axe de QRS et ses rapports avec le concept d'hemibloc antérieur gauche).** A. Didier (Hôpitaux des Armées, Paris, France), G. Drobinski, R. Carre (Centre Principal d'Expertise Médicale du Personnel Navigant de l'Aéronautique, Paris, France), and F. Plas (Paris VI, Université, Paris, France). *Revue de Médecine Aéronautique et Spatiale,* vol. 13, 3rd Quarter, 1974, p. 189-196. 16 refs. In French.

A75-17369 **Thyroid nodule and crew personnel (Nodule thyroidien et personnel navigant).** H. Lienhart, A. Didier, P. Blanc (Hôpitaux des Armées, Paris, France), and R. Carre (Ministère des Armées, Services de Santé, Paris, France). *Revue de Médecine Aéronautique et Spatiale,* vol. 13, 3rd Quarter, 1974, p. 197-203. 5 refs. In French.

Among twenty-nine cases of civil and military aircrew members or candidates in whom a thyroid nodule was detected during fitness examinations, 14 had hot nodules and 15 had cold ones. The 14 with hot nodules were declared fit without restriction, while of the 15 cases with cold nodules, 14 were treated surgically with histological checking, and one was cancerous and had to be declared definitely unfit. In the case of a cold nodule, in which the risk of the nodule becoming cancerous is greatest, the best approach appears to be to declare the subject fit in this respect under the condition that he be placed under histological surveillance. P.T.H.

A75-17370 **Results of an inquiry concerning the exterior lights of aircraft (Résultats d'une enquête concernant les feux extérieurs d'aéronefs).** J. P. Chevaleraud (Ministère des Armées, Services de Santé, Paris, France), G. Santucci, and G. Gougaud (Centre Principal d'Expertise Médicale du Personnel Navigant de l'Aéronautique, Paris, France). *Revue de Médecine Aéronautique et Spatiale,* vol. 13, 3rd Quarter, 1974, p. 204-207. In French.

The present work summarizes the results of a questionnaire distributed to 148 civil and military pilots which sought their opinion regarding the use, effectiveness, and possible improvement of present systems of position and anticollision lights. Two-thirds of the pilots expressed the desire to have the intensity of anticollision lights increased. Fifty-six pilots were in favor of having red anticollision lights, fifty-five wanted white, and nineteen wanted a combination of red and white. Seventy-three pilots put the optimal flash frequency for flashing lights between 60 and 120 flashes per second. Seventy-eight pilots believed that the position lights gave a satisfactory indication during flight, while sixty-six were of the opposite opinion. P.T.H.

A75-17372 **Influence of an anxiety depressant on the behavior of pilot trainees during training on a flight simulator (Influence d'un anxiolytique sur le comportement d'élèves-pilotes, lors d'entrainement sur simulateur de vol).** F. de Lesdain. *Revue de Médecine Aéronautique et Spatiale,* vol. 13, 3rd Quarter, 1974, p. 215-218. In French.

A75-17373 **Effect of back-stomach accelerations on gestation in rats (Influence des accélérations dos-ventre sur la gestation chez la rate).** R. Angiboust, P. Pesquies (Centre de Recherche de Médecine Aéronautique, Paris, France), A. Gribenski, J. Lannou, and A. Reber (Rouen, Université, Mont-Saint-Aignan, Seine-Maritime, France). *Revue de Médecine Aéronautique et Spatiale,* vol. 13, 3rd Quarter, 1974, p. 219-221. In French.

Rats fecundated at most 12 hours beforehand were subject to an acceleration of 10g for 2.5 minutes by centrifuging, and it was found that no change in the number and distribution of nidations compared with control rats resulted. This preliminary test would seem to indicate that this acceleration does not produce a stress capable of disturbing gestation in rats, and that it would be possible to place recently fecundated rats in orbit without their aborting. P.T.H.

A75-17374 **Effect of sonic boom on man and animals - Review of principal studies carried out in France (Action du bang sonique sur l'homme et les animaux - Revue des principaux travaux effectués en France).** C. Boutelier, J. Demange, and B. Vettes. *Revue de Médecine Aéronautique et Spatiale,* vol. 13, 3rd Quarter, 1974, p. 222-227. 19 refs. In French.

The present work discusses some of the main conclusions drawn from various studies on the effects of sonic boom on hearing and balance, sleep, and the cardiovascular system in man, and on the breeding of certain production animals and some physiological indices of experimental animals. It is shown that the physiological effects of sonic boom in man and animals are not such as to have any serious consequences for the organism, and that the annoyance caused by the boom must be of psychological nature. P.T.H.

A75-17471 **Effect of luminance and contrast on processing large disparities.** W. Richards (MIT, Cambridge, Mass.) and J. M. Foley (California, University, Santa Barbara, Calif.). *Optical Society of America, Journal,* vol. 64, Dec. 1974, p. 1703-1705. 10 refs. Grants No. NIH-EY-00742; No. NIH-EY-00666.

Although reduced luminance impairs the discrimination of small disparity stimuli, large-disparity discrimination may improve. For example, crossed and uncrossed stimulus disparities of 4 deg that are not discriminated at photopic levels may be easily discriminated at mesopic levels near the color threshold. This improvement of stereo processing appears to be dependent upon an effective contrast reduction produced neurally, because a physical reduction of contrast without a change of background luminance may also improve large-disparity stereopsis. (Author)

A75-17472 **Detectability of a luminance increment - Effect of spatial uncertainty.** T. E. Cohn and D. J. Lasley (California, University, Berkeley, Calif.). *Optical Society of America, Journal,* vol. 64, Dec. 1974, p. 1715-1719. 13 refs. Grant No. NIH-FR-7006.

Experiments were conducted to test the effect of stimulus-position uncertainty on luminance-increment detectability in the human fovea. It is demonstrated that the uncertainty of the luminance-increment stimulus spatial location influences the detectability of the stimulus. The slope of the ROC curve on probability paper decreases under conditions of stimulus-position uncertainty. T.S.

A75-17483 **Effects of eye dominance and retinal distance on binocular rivalry.** J. F. Collins and L. K. Blackwell (Missouri, University, Kansas City, Mo.). *Perceptual and Motor Skills,* vol. 39, Oct. 1974, p. 747-754. 11 refs. Research supported by the University of Missouri.

A75-17484 **Task performance after awakenings from different stages of sleep.** D. Koulack and K. J. Schultz (Manitoba, University, Winnipeg, Canada). *Perceptual and Motor Skills,* vol. 39, Oct. 1974, p. 792-794. 8 refs. Medical Research Council of Canada Grant No. MA-3929.

Performance on both a Trail Making test and a vigilance task did not differ as a function of the sleep stage from which S was aroused. However, performance on the vigilance task was poorer after awakenings from rapid eye-movement periods with higher eye-movement density than after awakenings from rapid eye-movement periods with lower eye-movement density. (Author)

A75-17523 # **Characteristics of the regulation of blood supply to the brain (Zakonomernosti reguliatsii krovosnabzheniia golovnogo mozga).** Iu. E. Moskalenko. *Akademiia Nauk SSSR, Vestnik,* Nov. 1974, p. 41-50. In Russian.

A systems approach utilizing mathematical modeling and computer processing and based on input-output considerations, was used to design animal experiments on the mechanisms regulating cerebral blood circulation. In the experiments, various output parameters, such as arterial and venous blood pressure and bioelectrical (EEG) activity, were measured in order to determine the effects of natural and artificial stimuli on the system state and regulation quality at the local and overall levels. Analysis of experimental evidence and mathematical models suggests that the leading role in the regulation of cerebral circulation is played by a neurogenic mechanism, realized through a functionally isolated regulation center. The structural-functional organization of the regulation mechanisms is diagramed, both for overall and for local cerebral circulation. The systems approach is seen to be valuable for analysis, as well as for planning and conducting experiments on cerebral blood circulation. A.T.S.

A75-17572 **Effect of cosmic microwave and gamma irradiation on hematopoiesis.** V. S. Tikhonchuk. *(Kosmicheskie Issledovaniia,* vol. 12, May-June 1974, p. 478-482.) *Cosmic Research,* vol. 12, no. 3, Nov. 1974, p. 439-442. 9 refs. Translation.

A75-17659 # **Difference between the reactions of the cupula-endolymphatic system to a physiological turn of the head under natural conditions and under conditions of rotation (Razlichie reaktsii kupulo-endolimfaticheskoi sistemy na fiziologicheskii povorot golovy v estestvennykh usloviiakh i usloviiakh vrashcheniia).** I. Iu. Sarkisov and A. A. Shipov (Moskovskii Fiziko-Tekhnicheskii Institut, Moscow, USSR). *Akademiia Nauk SSSR, Izvestiia, Seriia Biologicheskaia,* Nov.-Dec. 1974, p. 908-913. 26 refs. In Russian.

The results of a physicomathematical analysis of the differences between the reactions of the cupula-endolymphatic system to a turn of the head under natural conditions and conditions of rotation are discussed. The physiological consequences of such differences are examined, and means of minimizing them are studied. The results obtained hold for systems rotating at low constant rates under terrestrial conditions and under conditions of weightlessness. V.P.

A75-17660 # **24-hour periodicity of alkaline DNAase in animal tissue (Sutochnaia periodichnost' aktivnosti shchelochnoi DNKazy v tkaniakh zhivotnykh).** V. F. Makeeva, G. S. Komolova, I. A. Egorov, Iu. P. Druzhinin, G. N. Podluzhnaia, and E. V. Belikova (Akademiia Nauk SSSR, Institut Biokhimii, Moscow, USSR). *Akademiia Nauk SSSR, Izvestiia, Seriia Biologicheskaia,* Nov.-Dec. 1974, p. 914-916. 19 refs. In Russian.

A75-17665 * **Influences of physical training on the heart of dogs.** H. L. Wyatt (Cedars-Sinai Medical Research Institute, Los Angeles, Calif.) and J. H. Mitchell (Texas, University, Dallas, Tex.). *Circulation Research,* vol. 35, Dec. 1974, p. 883-889. 21 refs. Grants No. PHS-HL-06296; No. NGR-44-012-151.

To investigate the effects of physical training on cardiac dimensions and function, eight dogs were exercised for 12 weeks by treadmill running 1 hour/day, 5 days/week. Five dogs were confined

in cages as controls for an 8-week period. Heart rates were monitored by telemetry during rest and exercise. Maximum QRS spatial magnitudes were calculated from records of McFee lead electrocardiograms. Left ventricular end-diastolic dimensions were determined radiographically by the bead and clip technique. Training produced statistically significant decreases in heart rate at rest and at a standard work load of 6.1 mph on a level treadmill and statistically significant increases in work load at a standard heart rate of 194 beats/min. Improvements were rapid during the first 4 weeks of training but gradual during the remaining 8 weeks. Training caused small but statistically significant increases in left ventricular end-diastolic wall thickness, estimated left ventricular mass, and maximum QRS spatial magnitude. (Author)

A75-17666 Inhibition of the vasodilator effect of hypercapnic acidosis by hypercalcemia in dogs and rats. E. P. Wei, M. D. Thames, H. A. Kontos, and J. L. Patterson, Jr. (Virginia Commonwealth University, Richmond, Va.). *Circulation Research,* vol. 35, Dec. 1974, p. 890-895. 26 refs. Grant No. PHS-HL-11077.

A75-17759 Macroscopic model of the visual system for chromatic flicker fusion. T. Furukawa and W. Iwane (Hokkaido University, Sapporo, Japan). *Electronics and Communications in Japan,* vol. 56, Nov. 1973, p. 122-130. 15 refs. Translation.

A macroscopic model of the visual system is proposed to simulate the results of psychophysical experiments on the critical chromatic flicker fusion frequency (CCFF), which is a measure of the temporal resolution of the visual system for chromaticity variation. The model is based on fundamental assumptions that the brightness and color information are transmitted to the central nervous system (CNS) through respective channels and that the physiological mechanism of chromatic flicker fusion is the same as that of brightness flicker fusion. The model is constructed according to experimental evidence on brightness flicker fusion. As for color vision, the three-component theory is adopted. A new concept on the CCFF is derived from this model, and the possibilities of further analysis of the visual system by means of psychophysical experiment are suggested. (Author)

A75-17788 # Role of diencephalon and trunk structures in regulation of cardiac activity (Rol' promizhnogo mozku ta stovburovikh struktur u reguliatsii diial'nosti sertsia). D. M. Tichina, R. F. Makul'kin, and V. D. Taranenko (Odes'kii Medichnii Institut, Odessa, Ukrainian SSR). *Fiziologichnii Zhurnal,* vol. 20, Nov.-Dec. 1974, p. 799-804. 23 refs. In Ukrainian.

Removal of both large hemispheres in cats resulted in bradycardia during first 24 hours after operation, which turned into tachycardia 2 to 3 days later. After one to two weeks, the rate of cardiac contractions corresponded to that of cats before removal of the hemispheres. Exteroceptic and interoceptic stimuli caused tachycardia. Tachycardia was observed after electric stimulation of the optic thalamus, but after its cessation, a slow pulse of rhythms of cardiac contractions was noted. Stimulation of the midbrain reticular structure produced the opposite responses. P.T.H.

A75-17789 # Characteristics of thermal regulation in man (Osoblivosti termoreguliuvannia u liudini). V. O. Maksimovich and V. I. Ostapenko (Donets'kii Institut Gigieni Pratsi ta Profzakhvoriuvan', Donetsk, Ukrainian SSR). *Fiziologichnii Zhurnal,* vol. 20, Nov.-Dec. 1974, p. 814-817. 13 refs. In Ukrainian.

A model of the thermal regulation circuit in man is proposed, in which the object of control is regarded as an inertial, nonlinear integrating element with ideal, rigid feedback. The object becomes disconnected from the regulator by the action of external temperatures greater than those of the body, and by the action of air humidity preventing perspiration. Under microclimatic conditions keeping closed the thermal regulation circuit, it acts like a static element. P.T.H.

A75-17790 # The effect of helium and nitrogen in cellular respiration (Pro vpliv geliiu i azotu na klitinne dikhannia). A. I. Poliarush (ARPTR Chornomors'kogo Paroplavstva; Akademiia Nauk Ukrains'koi RSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal,* vol. 20, Nov.-Dec. 1974, p. 825-827. 5 refs. In Ukrainian.

It is shown that during the breathing of nitrogen and helium by animals, the activity of the respiratory enzymes (dehydrogenase and cytochrome oxidase) is altered in the fibers of the brain, the heart, the liver, and the cortical layer of the kidneys. In central nervous systems structures, the most sensitive to changes in partial pressure of helium and nitrogen are the enzymes of the brain stem and cortex. The dehydrogenase system proved to be more sensitive to the effect of helium and nitrogen than the enzymes of the aerobic phase. P.T.H.

A75-17791 # Method for automatic processing of the R-R intervals of an ECG with the aid of a small computer (Metodika avtomatichnoi obrobki R-R intervaliv EKG z dopomogoiu maloi EOM). V. V. Sirots'kii and O. P. Vetrov (Akademiia Nauk Ukrains'koi RSR, Laboratoriia Fiziologii Vishchoi Nervovoi Diial'nosti Liudini, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal,* vol. 20, Nov.-Dec. 1974, p. 841-844. 7 refs. In Ukrainian.

A simple scheme is described enabling encoding and direct feeding of ECG R-R intervals into a small computer. This makes it possible to follow continuously the changes in heart rhythm of a man or animal. Delay in obtaining computer-processed data is reduced to a minimum. P.T.H.

A75-17883 Hemodynamic predictors of myocardial oxygen consumption during static and dynamic exercise. R. R. Nelson, F. L. Gobel, C. R. Jorgensen, K. Wang, Y. Wang, and H. L. Taylor (Minnesota, University; U.S. Veterans Administration Hospital, Minneapolis, Minn.). *Circulation,* vol. 50, Dec. 1974, p. 1179-1189. 56 refs. Research supported by the Minnesota Heart Association and Ober Charitable Foundation; Grant No. PHS-5-TOD-HL-06314-12.

Ten normal subjects were used to study the range of the correlation between hemodynamic predictors of myocardial oxygen consumption (MVO2) when blood pressure was the major variable changed. The mean myocardial blood flow (MBF) was found to be the greatest during combined static and dynamic exercise. With the elimination of static or dynamic load the MBF decreased. The combination of static and dynamic loads gave a higher blood pressure, MVO2, and MBF than did dynamic exercise alone. The current data was combined with previous data and 82 determinations of MVO2 and MBF were made in 29 normal subjects during several levels of upright exercise. Results showed (1) MVO2 correlates best with the product of heart rate and blood pressure, and (2) the heart rate alone correlates better with MVO2 than with the tension time index, or the product of the systolic blood pressure, heart rate, and ejection time. T.S.

A75-18024 Failure of the omnicardiogram to predict coronary artery disease in patients with normal resting electrocardiograms. K. Redy, F. Smithline, B. T. Zeman, R. I. Hamby, and I. Hoffman (Long Island Jewish-Hillside Medical Center, New Hyde Park; New York, State University, Stony Brook, N.Y.). *Journal of Electrocardiology,* vol. 8, Jan. 1975, p. 13-16. 5 refs.

A75-18025 The influence of exercise on atrial flutter. A. S. Gooch and D. R. Sumathisena (Deborah Heart and Lung Center, Browns Mills, N.J.). *Journal of Electrocardiology,* vol. 8, Jan. 1975, p. 39-48. 15 refs.

To study the effect of exercise on atrial flutter, the electrocardiogram was recorded continuously before, during and after low level treadmill walking in twenty-two ambulatory patients. Atrial flutter rates increased during exercise testing in four patients. Improved A-V conduction with consequent higher ventricular rates occurred during exercise in thirteen subjects. One patient, with 4:1 conduction at rest, continued with 4:1 block throughout exercise testing, was believed to be over-digitalized. During the recovery

period after exercise, ten patients transiently developed periods of Wenckebach A-V block. Walking exercise induced 1:1 conduction in six patients and was promoted by the following circumstances: (1) atrial rates of 250/min or less; (2) inadequate dosage of digitalis; and (3) the administration of quinidine. (Author)

A75-18095 # **An algorithm for the reduction of data redundancy in comfort conditioning systems (Pro odin algoritm skorochennia nadmirnosti informatsii v sistemakh komfortnogo konditsiiuvannia).** B. M. Chetverukhin, A. V. Primak, and V. M. Poliakov (Akademiia Nauk Ukrains'koi RSR, Institut Tekhnichnoi Teplofiziki; Kiivs'kii Institut Avtomatiki, Kiev, Ukrainian SSR). *Akademiia Nauk Ukrains'koi RSR, Dopovidi, Seriia A - Fiziko-Tekhnichni i Matematichni Nauki,* vol. 36, Nov. 1974, p. 979-981. In Ukrainian.

Estimated expressions are given for determining the mathematical expectation, the variance, and the correlation function of additive unsteady processes of temperature-moisture field variations. The expressions are the basis of a corresponding operational algorithm for a system of microclimate telemetering control in the places undergoing air-conditioning, which provides data contraction in a real-time scale. (Author)

A75-18252 * **Thermal and ionic factors in the ultraviolet photolysis of plant cell membranes.** S. M. Siegel and C. Corn (Hawaii, University, Honolulu, Hawaii). *Physiologia Plantarum,* vol. 31, 1974, p. 267-270. 13 refs. Grant No. NGR-12-001-042.

A75-18315 * # **The oculometer in flight management research.** M. C. Waller and M. A. Wise (NASA, Langley Research Center, Hampton, Va.). *American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 13th, Pasadena, Calif., Jan. 20-22, 1975, Paper 75-107.* 9 p.

An effort is underway at NASA Langley Research Center to understand the pilot as an information processor and decision-maker, and to produce a model of this process. The oculometer, an electro-optical device for tracking a man's eye-point-of-regard in real time, is currently being used to further this effort. The present paper reviews two instrument approach studies in which the oculometer has been used as a research tool. Particular emphasis is placed on data reduction schemes. The results of one simulator study are presented in some detail. (Author)

A75-18316 Investigation of the performance equivalence method for determining training simulator and training methods requirements. W. G. Matheny (Life Sciences, Inc., Hurst, Tex.). *American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 13th, Pasadena, Calif., Jan. 20-22, 1975, Paper 75-108.* 6 p. 5 refs. USAF-supported research.

A75-18425 # **Domestic literature on air, space, and high-altitude biology and medicine: Bibliography. Number 2 (Otechestvennaia literatura po aviatsionnoi kosmicheskoi i vysokogornoi biologii i meditsine: Bibliografiia. Number 2).** A. A. Sergeev. Leningrad, Izdatel'stvo Nauka, 1974. 178 p. 4415 refs. In Russian.

A75-18427 # **Evolution of the biosphere (Evoliutsiia biosfery).** M. M. Kamshilov. Moscow, Izdatel'stvo Nauka, 1974. 255 p. 149 refs. In Russian.

The present work discusses the origin, development, and organization of the biosphere. With a minimum of technical detail, the laws of the evolution of the biosphere are traced and the mutual relations of the biosphere and man's society are described. Facts drawn from the investigations of paleontology, genetics, and molecular biology highlight the discussion. P.T.H.

A75-18501 The origin of life and evolutionary biochemistry. Edited by K. Dose (Mainz, Universität, Mainz, West Germany), S. W. Fox (Miami, University, Coral Gables, Fla.), G. A. Deborin, and T. E. Pavlovskaia (Akademiia Nauk SSSR, Institut Biokhimii, Moscow, USSR). New York, Plenum Press, 1974. 480 p. $35.

Aspects of protein structure and the molecular evolution of biological energy conversion are considered along with condensation reactions of lysine in the presence of polyadenylic acid, phospholipid monolayers as a prototype of biological membranes, amino acids and carbohydrates in Precambrian rocks, and isolated microsystems in evolution. Other subjects discussed include the search for remnants of early evolution in present-day metabolism, sedimentary minerals under reducing conditions, and possible ways of identifying the abiogenesis of biochemically important compounds. G.R.

A75-18502 Phospholipid monolayers - As a prototype of biological membranes. G. A. Deborin and A. D. Sorokina (Akademiia Nauk SSSR, Institut Biokhimii, Moscow, USSR). In: The origin of life and evolutionary biochemistry. New York, Plenum Press, 1974, p. 59-67. 12 refs.

The significance of biological membranes in the organization and evolution of the cell is pointed out. The importance of phospholipid monolayers in this connection is considered. An investigation was conducted of the behavior of nucleoproteins at the liquid-air interface, giving attention to the interaction with a model phospholipid membrane. The interaction of ribosomes and the phospholipid monolayer was evaluated by the changes in the compression isotherm and by electron microscopic observations. G.R.

A75-18503 Peptides and amino acids in the primordial hydrosphere. K. Dose (Mainz, Universität, Mainz, West Germany). In: The origin of life and evolutionary biochemistry. New York, Plenum Press, 1974, p. 69-77. 31 refs.

The concept of the primordial ocean as a 'primeval broth' in which 'protobionts' have evolved is investigated, taking into account data on the formation and decomposition of peptides and amino acids. It is shown that peptides and amino acids could never reach significant concentrations in the ocean. Such molecules and other molecules of biological significance could, however, been concentrated in pools of transient existence. G.R.

A75-18504 The surfaces of coacervate drops and the formation of colonies. T. N. Evreinova, B. L. Allakhverdov, and V. I. Peshenko (Moskovskii Gosudarstvennyi Universitet, Moscow; Akademiia Nauk SSSR, Institut Biofiziki, Pushchino-on-Oka, USSR). In: The origin of life and evolutionary biochemistry. New York, Plenum Press, 1974, p. 89-95. 8 refs.

In studies regarding the origin of life conducted by Oparin (1957), the cooperation of molecules from the water of the primordial ocean in the form of coacervate drops, which were later transformed in probionta, is considered. The investigation reported is concerned with the part played by the surface of the coacervate drops of stable systems and the formation of colonies of such drops. Stable protein-carbohydrate and protein-nucleic acid coacervate systems could be obtained by including in them oxidizing enzymes and their substrates. G.R.

A75-18505 * **Ammonia - Did it have a role in chemical evolution.** J. P. Ferris and D. E. Nicodem (Rensselaer Polytechnic Institute, Troy, N.Y.). In: The origin of life and evolutionary biochemistry. New York, Plenum Press, 1974, p. 107-117. 40 refs. Grant No. NGR-33-018-148.

The significance of ammonia in the chemical evolution related to the origin of life is evaluated. A computer program was employed to calculate the time needed for the decomposition of ammonia by means of a photochemical reaction. Various possible protection mechanisms for ammonia are discussed, giving attention to hydrogen sulfide, hydrogen, ozone, and CO. It is concluded that in the absence of a sufficiently high pressure of hydrogen, any ammonia present in the primitive atmosphere would have been decomposed by photolysis in a million years. G.R.

A75-18506 * Coacervate droplets, proteinoid microspheres, and the genetic apparatus. S. W. Fox (Miami, University, Coral Gables, Fla.). In: The origin of life and evolutionary biochemistry. New York, Plenum Press, 1974, p. 119-132. 53 refs. Grant No. NGR-10-007-008.

Differences between typical coacervate droplets and typical proteinoid microspheres are examined. It is pointed out that coacervate droplets are produced from polymers obtained from contemporary organisms. The microspheres considered are aggregates of proteinoid formed from monomeric amino acids under geologically relevant conditions. Aspects regarding the primordial sequence are discussed along with the origin of the genetic apparatus and the genetic code. G.R.

A75-18508 The iron-sulphur proteins - Evolution of a ubiquitous protein from the origin of life to higher organisms. D. O. Hall, R. Cammack, and K. K. Rao (King's College, London, England). In: The origin of life and evolutionary biochemistry. New York, Plenum Press, 1974, p. 153-168. 42 refs.

Iron-sulfur proteins are a group of metalloproteins containing one or more iron atoms liganded to cysteine sulfurs of the protein chain. It is postulated that one of the molecules which functioned as a catalyst in the electron transfer processes in the primordial organism was a precursor of the present-day ferredoxin molecule. The ferredoxins of anaerobic fermentative bacteria are considered and models of the iron-sulfur proteins are discussed. It is pointed out that the ferredoxins are involved in a diverse range of biochemical reactions from hydrogen, carbon, and nitrogen metabolism to photosynthesis, oxidative phosphorylation, and hydroxylation. G.R.

A75-18509 Evolution and ecology of phosphorus metabolism. M. Halmann (Weizmann Institute of Science, Rehovot, Israel). In: The origin of life and evolutionary biochemistry. New York, Plenum Press, 1974, p. 169-182. 48 refs.

Major difficulties in the formulation of a model of prebiological phosphorylation are related to the problem of concentrating phosphate from very dilute solutions and the thermodynamic problem of activating orthophosphate to form organic phosphates. The cosmic and planetary origin of phosphorus compounds is considered along with the geochemical cycle of phosphorus, the ecology of phosphate turnover by contemporary cells, the role of active and passive phosphate transport, the evolution of phosphate metabolism, and models of prebiological phosphorylation. G.R.

A75-18511 The role of inorganic polyphosphates in chemical and biological evolution. I. S. Kulaev (Academy of Sciences, Institute of Biochemistry and Physiology of Microorganisms, Pushchino, USSR). In: The origin of life and evolutionary biochemistry. New York, Plenum Press, 1974, p. 271-287. 63 refs.

Experiments show that after the cooling of the earth and the formation of the hydrosphere pyrophosphate could have formed in the primordial ocean. Polyphosphates could have participated in the syntheses of various macromolecules which later became components of living cells. A hypothetical scheme is considered concerning the participation of high-molecular polyphosphates, pyrophosphate, and ATP in phosphorylation reactions at different steps of the origin and the evolution of life on the earth. G.R.

A75-18512 * Amino and fatty acids in carbonaceous meteorites. K. A. Kvenvolden (NASA, Ames Research Center, Planetary Biology Div., Moffett Field, Calif.). In: The origin of life and evolutionary biochemistry. New York, Plenum Press, 1974, p. 301-309. 20 refs.

Analyses of two carbonaceous meteorites have provided much of the latest evidence which seems to support Oparin's theory on the origin of life. The meteorites involved are the Murray meteorite, which fell in 1950, and the Murchison meteorite, which fell in 1969. The amino acids in the two meteorites are similar in composition. Eight of the twenty amino acids found belong to amino acids present in proteins. A number of monocarboxylic and dicarboxylic fatty acids were also found in the meteorites. G.R.

A75-18513 * Primitive control of cellular metabolism. M. A. Mitz (NASA, Washington, D.C.). In: The origin of life and evolutionary biochemistry. New York, Plenum Press, 1974, p. 331-338. 13 refs.

It is pointed out that control substances must have existed from the earliest times in the evolution of life and that the same control mechanisms must exist today. The investigation reported is concerned with the concept that carbon dioxide is a primitive regulator of cell function. The effects of carbon dioxide on cellular materials are examined, taking into account questions of solubilization, dissociation, changes of charge, stabilization, structural changes, wettability, the exclusion of other gases, the activation of compounds, changes in plasticity, and changes in membrane permeability. G.R.

A75-18514 On the evolution of macromolecules. H. Mizutani, H. Okihana, M. Hasegawa, T.-A. Yano, and H. Noda (Tokyo, University, Tokyo, Japan). In: The origin of life and evolutionary biochemistry. New York, Plenum Press, 1974, p. 339-354. 33 refs.

The properties of macromolecules are studied from different perspectives such as spontaneous formation, spontaneous phase-separation, and evolutionary characteristics occurring after primary life production. The formation and the characteristics of HCN polymers produced by UV irradiation are discussed from experiments conducted of hydrolyzed methanol-soluble and DMSO-soluble fractions after solvent evaporation. A discussion of the genetic code and the relation of amino acid sequence entropy in protein is included. T.S.

A75-18515 The coacervate-in-coacervate theory of the origin of life. V. J. A. Novak (Ceskoslovenska Akademie Ved, Prague, Czechoslovakia). In: The origin of life and evolutionary biochemistry. New York, Plenum Press, 1974, p. 355-368. 25 refs.

Questions of the origin of life processes and natural selection, cell structure, and the conditions of self-replication are analyzed. The paper attempts to present a feasible explanation of events in the coacervate-in-coacervate theory. A concept is suggested stating that abiogenic nucleotides and bases were firstly attracted into the proteinoid coacervates. Only then were they polymerized into the most primitive nucleic acids. The question of the living molecule and monomolecular organisms is discussed. The sociability principle and the fact that the development from the monomolecular to the unicellular organism passes through the same five phases is discussed. T.S.

A75-18516 * Evolution of models for evolution. D. L. Rohlfing (South Carolina, University, Columbia, S.C.). In: The origin of life and evolutionary biochemistry. New York, Plenum Press, 1974, p. 397-415. 48 refs. Grant No. NGR-41-002-034.

The paper discusses models of evolution and their values, and some critiques of these models and the value of these critiques. A model is investigated which involves the formation of prebiotic protein from amino acids. Its formation by four theoretical critiques that suggest alternative environmental conditions is discussed. Experiments are reviewed so as to illustrate the experimental testing of the possible weaknesses of a model for a single molecular evolutionary phase and to suggest some necessary changes in the model. T.S.

A75-18517 * **Oparin and the origin of life - Cosmological considerations.** R. S. Young (NASA, Office of Space Science, Washington, D.C.). In: The origin of life and evolutionary biochemistry. New York, Plenum Press, 1974, p. 469-471.

The question of the origin of life is examined on a cosmological scale from early observations made by Oparin. Even by a comparison of the amount of data presently available from telescopic and spacecraft observations Oparin's conclusions have been confirmed. The concept of panspermia is rejected and details of the role of carbon on earth are presented. Formation of C2, CN and CH is explained and various aspects of the atmospheres of planets are considered. Finally, the origin of amides, amines and other nitrogenous derivatives from hydrocarbons is discussed. N.D.

A75-18527 * **A comparison of leaf epinasty induced by weightlessness or by clinostat rotation.** A. H. Brown, D. K. Chapman, and S. W. W. Liu (Pennsylvania, University; University City Science Center, Philadelphia, Pa.). *Bioscience,* vol. 24, Sept. 1974, p. 518-520. 9 refs. Grants No. NGR-39-010-104; No. NGR-39-010-149; No. NGR-39-030-010; Contracts No. NAS2-2432; No. NAS2-7730; No. NASw-2208.

A space flight experiment to determine the effect of weightlessness on the liminal angle of leaves of pepper as compared to the angles of leaves of central plants that rotate horizontally on an earth-based clinostat is evaluated. Copies of the Biosatellite II pepper plant flight film and of the clinostat central film were obtained, and an objective analysis of the information on these films is presented. Results confirm that epinastic leaf movements are characteristic in both orbital and clinostated pepper plants. Claims that the rotation on the clinostat produce the same effect as weightlessness are not supported by the pepper plant experiment. T.S.

A75-18544 **Echocardiographic examination of the left ventricle.** H. Feigenbaum (Indiana University; Marion County General Hospital, Indianapolis, Ind.). *Circulation,* vol. 51, Jan. 1975, p. 1-7. 62 refs. Research supported by the Herman C. Krannert Fund; Grants No. PHS-HE-09815-08; No. PHS-HL-6308; No. PHS-HL-5363; No. PHS-HL-5749.

The evolution and application of various echocardiographic techniques for examining the left ventricle are surveyed. The fact that echocardiography measures an internal left ventricular dimension, rather than the left ventricular volume, is discussed. Methods are being developed for obtaining real-time, cross-sectional echocardiographic images. Despite its limitations, echocardiographic examination of the left ventricle can provide much valuable information if the techniques are used carefully. A.T.S.

A75-18545 **The echocardiogram of the anterior leaflet of the mitral valve - Correlation with hemodynamic and cineroentgenographic studies in dogs.** G. M. Pohost, R. E. Dinsmore, J. J. Rubenstein, D. D. O'Keefe, R. N. Grantham, H. E. Scully, E. A. Beierholm, J. W. Frederiksen, M. L. Weisfeldt, and W. M. Daggett (Massachusetts General Hospital; Harvard University, Boston, Mass.). *Circulation,* vol. 51, Jan. 1975, p. 88-97. 22 refs. Grants No. PHS-HL-12777; No. PHS-HL-12322; No. PHS-HL-14209; No. PHS-HL-06664.

A75-18546 **The echocardiographic determination of mitral valve opening and closure - Correlation with hemodynamic studies in man.** J. J. Rubenstein, G. M. Pohost, R. E. Dinsmore, and J. W. Harthorne (Massachusetts General Hospital; Harvard University, Boston, Mass.). *Circulation,* vol. 51, Jan. 1975, p. 98-103. 27 refs. Grants No. PHS-PH-543-67-1443; No. PHS-HL-14209; No. PHS-HL-06664-10.

A75-18547 **A study of the dynamic relations between the mitral valve echogram and phasic mitral flow.** S. Laniado, E. Yellin, M. Kotler, L. Levy, J. Stadler, and R. Terdiman (Ichilov Hospital, Tel Aviv, Israel). *Circulation,* vol. 51, Jan. 1975, p. 104-113. 31 refs. Research supported by the United States-Israel Bi-National Science Foundation.

A75-18548 **Systolic time intervals by echocardiography.** M. A. Stefadouros and A. C. Witham (Georgia, Medical College, Augusta, Ga.). *Circulation,* vol. 51, Jan. 1975, p. 114-117. 16 refs.

Technical difficulties in recording phonocardiogram or indirect carotid pulse occasionally preclude determination of the systolic time intervals. Accordingly, an alternative method was tested in 52 patients, using high-speed strip chart recording of the aortic valve echocardiogram. Satisfactory records were obtained in 36. These findings indicate that the echocardiogram of the aortic valve provides an alternative, noninvasive method for determination of the systolic time intervals whenever the usual methods fail. (Author)

A75-18549 **Myocardial blood flow response to isometric /handgrip/ and treadmill exercise in coronary artery disease.** D. K. Lowe, D. A. Rothbaum, P. L. McHenry, B. C. Corya, and S. B. Knoebel (Krannert Institute of Cardiology; Indiana University; U.S. Veterans Administration Hospital, Indianapolis, Ind.). *Circulation,* vol. 51, Jan. 1975, p. 126-131. 28 refs. Research supported by the Herman C. Krannert Fund, American Heart Association, and Indiana Heart Association; Grants No. NIH-HL-06308; No. NIH-HL-05363; No. NIH-HL-05749.

A75-18579 # **The possible functional significance of the different phases of the reactions of visual cortex neurons to adequate stimuli (O vozmozhnom funktsional'nom znachenii razlichnykh faz reaktsii neironov zritel'noi kory na adekvatnye razdrazheniia).** A. Ia. Supin (Akademiia Nauk SSSR, Institut Evoliutsionnoi Morfologii i Ekologii Zhivotnykh, Moscow, USSR). *Fiziologicheskii Zhurnal SSSR,* vol. 60, Nov. 1974, p. 1634-1640. 11 refs. In Russian.

The selectivity of cortical neurons to the characteristics of moving visual stimuli was investigated in rabbits, and the different functional role of the various phases of the reactions in this process is shown. The transient response to start of the movement was characterized by lesser selectivity to the stimulus features (size, speed of movement, and direction) as compared to the sustained response to prolonged stimulus movement through the whole visual field. P.T.H.

A75-18580 # **Evoked responses to light in man and their functional significance (Vyzvannye potentsialy na svet u cheloveka i ikh funktsional'noe znachenie).** I. A. Sviatogor (Leningradskii Nauchno-Issledovatel'skii Institut Ekspertizy Trudosposobnosti i Organizatsii Truda Invalidov, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR,* vol. 60, Nov. 1974, p. 1641-1647. 24 refs. In Russian.

The evoked responses to light of 46 normal human subjects were recorded under conditions of functional rest and various loads. According to the patterns of the responses, two types of response were discerned: type I (24% of the subjects) and type II (76%). Comparison of the evoked responses showed that the subgroup of subjects with type I response gave less stable results than that with type II response. It is suggested that the type II response reflects the optimal level of a person's functional state and is characterized by sufficient stability to the various loads presented, while type I response may reflect insufficiency of homeostatic mechanisms as a result of individual characteristics or latent pathology. P.T.H.

A75-18581 # **Cardiac rhythm in the wakefullness/sleep cycle of white rats (Serdechnyi ritm v tsikle bodrstvovanie-son u belykh krys).** A. A. Snisarenko (Akademiia Nauk SSSR, Laboratoriia Klinicheskoi i Eksperimental'noi Kardiologii, Leningrad, USSR) and E. V. Churnosov (Akademiia Nauk SSSR, Institut Evoliutsionnoi Fiziologii i Biokhimii, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR,* vol. 60, Nov. 1974, p. 1668-1676. 27 refs. In Russian.

A75-18595 **Myocardial oxygen consumption in isovolumic hearts with varying cardiac outputs.** J. Simaan and G. Fawaz (Beirut, American University, Beirut, Lebanon). *Cardiovascular Research,* vol. 8, Nov. 1974, p. 763-768. 13 refs. Research supported by the National Research Council of Lebanon.

Myocardial oxygen consumption in isovolumic hearts with varying cardiac outputs was explored in heart-lung preparations from dogs, modified to measure coronary flow. The results of 10 comparative studies in six preparations indicate that at constant heart rate and mean systemic pressure, myocardial oxygen consumption was the same in preparations with identical left ventricular volumes but drastically different cardiac outputs. It may be concluded from this study that the oxygen cost of an increase in volume work of the heart, at constant mean aortic pressure and heart rate, is determined by the concomitant increase in the volume of the heart in so far as it affects the development of tension in accordance with the Laplace relationship. (Author)

A75-18596 **Effects of intracoronary temperature variation on the coronary circulation.** A. J. Liedtke and H. C. Hughes (M. S. Hershey Medical Center, Hershey, Pa.). *Cardiovascular Research,* vol. 8, Nov. 1974, p. 787-795. 45 refs. Research supported by the Pennsylvania Heart Association.

A75-18597 **Spectral analysis as a method of quantitative interpretation of Doppler-shift signals.** L. W. Hall (School of Veterinary Medicine, Cambridge, England) and K. W. Clarke. *Cardiovascular Research,* vol. 8, Nov. 1974, p. 796-800. 7 refs. Research supported by Wellcome Trust.

The accuracy of the use of spectral analysis as a method of quantitative interpretation of Doppler-shift flow signals from chronically implanted probes was investigated in sheep and ponies. Doppler-shift flow probes, chronically implanted around the pulmonary artery, were used to obtain a continuous beat-by-beat measurement of cardiac output. The average velocity blood flow in the vessel was found by spectral analysis, and output calculated using the internal diameter of the vessel. The results were compared with those obtained simultaneously by the dye dilution method. In these circumstances the Doppler-shift flow probes gave results which accurately reflected changes in cardiac output, and which were quantitatively at least as accurate as those measured by dye-dilution methods. (Author)

A75-18598 **The magnetocardiogram in cardiac disorders.** M. Saarinen, P. J. Karp, T. E. Katila, and P. Siltanen (Helsinki, University, Helsinki; Helsinki University of Technology, Otaniemi, Finland). *Cardiovascular Research,* vol. 8, Nov. 1974, p. 820-834. 13 refs. Research supported by the Sigrid Juselius Foundation.

Magnetocardiograms of 24 normal subjects and of 31 patients with cardiac disorders have been studied with the aid of a magnetometer of the gradiometer principle which utilizes a superconducting quantum interference device (SQUID). The precordial magnetocardiograms observed are closely related to the conventional 12-lead electrocardiogram, but also reveal new information as compared with the standard ECG. There are differences between MCGs in different cardiac disorders, but the small number of cases and recording positions applied do not permit analysis of the specifity of the MCG patterns. There are certain differences between 12-lead ECG and precordial MCG in the relative sensitivity to different phases of the cardiac electromotive events. Magnetocardiography may prove to be of clinical value in cardiac disorders, especially in those producing primary abnormalities in the repolarization process. (Author)

A75-18654 # **Learning characteristics and modeling of human controller in compensatory tracking systems.** H. Taguchi and K. Fujii (Osaka University, Osaka, Japan). *Osaka University, Technology Reports,* vol. 24, Oct. 1974, p. 573-587. 6 refs.

A dual-mode model of the human operator in compensatory tracking tasks is proposed. This model selects either a gradual or binary mode strategy corresponding to the control situations. The plant simulated for the tracking task is a yaw tracking system with two feedback control loops, the attitude and the rate feedback loops. The overall system is stabilized by using both of the feedback loops. The human gradual responses, which are frequently observed in case of the failure detection of the rate feedback loop, are simulated by using the G mode strategy of this model. The G mode strategy incorporates the learning process involving the identification and the modification phase. The human responses in a bang-bang manner are often observed in the failure of both of the feedback loops. The B mode strategy associated with these bang-bang operations is designed on the basis of the adjustment of the switching lines on the phase plane. (Author)

A75-18728 **Causes and prevention of coronary disease; Proceedings of the International Symposium, Argenteuil, Belgium, May 23-25, 1974.** Symposium sponsored by the Princess Lilian Foundation of Cardiology. *Acta Cardiologica, Supplementum,* no. 20, 1974. 188 p.

The participation of lysosomes in the transformation of smooth muscle cells to foamy cells in the aorta of cholesterol-fed rabbits is considered along with genetic factors in coronary heart disease, the relation between thrombosis and myocardial infarction, ischaemic heart disease in young women, and neural and psychological factors in coronary disease. Attention is given to physical inactivity and coronary heart disease, tobacco smoking and coronary disease, hypertension and coronary risk, primary prevention of coronary heart disease, and medical aspects of coronary surgery. G.R.

A75-18729 **The participation of lysosomes in the transformation of smooth muscle cells to foamy cells in the aorta of cholesterol-fed rabbits.** C. de Duve (Louvain, Université Catholique, Louvain, Belgium; Rockefeller University, New York, N.Y.). *(International Symposium on Causes and Prevention of Coronary Disease, Argenteuil, Belgium, May 23-25, 1974.) Acta Cardiologica, Supplementum,* no. 20, 1974, p. 9-25. 22 refs. Grant No. PHS-HD-05065.

The model considered was formulated as a result of a combined biochemical and morphological study based on the use of cell fractionation techniques. According to this model cholesteryl ester-rich plasma lipoproteins which infiltrate across the arterial endothelium are pinocytized by smooth muscle cells and taken up within lysosomes where they are subjected to enzymatic degradation. G.R.

A75-18730 **Hyperlipidemia, lipoproteins and coronary disease.** A. G. Olsson (King Gustaf V Research Institute, Stockholm, Sweden). *(International Symposium on Causes and Prevention of Coronary Disease, Argenteuil, Belgium, May 23-25, 1974.) Acta Cardiologica, Supplementum,* no. 20, 1974, p. 37-45. 8 refs.

It is shown by means of four different clinical epidemiological approaches that the concentration of serum cholesterol and the concentration of triglycerides is important for the development of ischemic heart disease (IHD). Details concerning retrospective studies, a prospective study, an 'interspective' study, and a 'geographic' study are presented. The results of all investigations displaying the association between hyperlipidemia and IHD are reviewed. G.R.

A75-18731 **Physical inactivity and coronary heart disease.** J. N. Morris (London School of Hygiene and Tropical Medicine, London, England). *(International Symposium on Causes and Prevention of Coronary Disease, Argenteuil, Belgium, May 23-25, 1974.) Acta Cardiologica, Supplementum,* no. 20, 1974, p. 95-103. 16 refs.

An investigation is conducted concerning the association between physically active work and the health of the coronary arteries, the conducting system of the heart, and the myocardium. It appears that adequate exercise provides some protection against

coronary occlusion, dysrhythmias, and ischaemic heart disease. Middle-aged men who take such exercise have fewer cardiac abnormalities in the presence of high levels of blood pressure or cholesterol or of cigarette smoking than persons who do not do this. G.R.

A75-18732 **Hypertension and coronary risk - Implications of current knowledge.** J. Stamler (Northwerstern University, Chicago, Ill.). *(International Symposium on Causes and Prevention of Coronary Disease, Argenteuil, Belgium, May 23-25, 1974.) Acta Cardiologica, Supplementum,* no. 20, 1974, p. 119-157. 45 refs. Research supported by the American Heart Association, Chicago Heart Association, Illinois Regional Medical Program, and NIH.

The independent and additive role of hypertension as a major risk factor for cardiovascular morbidity, disability, and mortality is considered. The unsatisfactory diagnostic and therapeutic status of millions of persons with elevated blood pressure in the U.S. is discussed along with the failure to undertake effective implementation of sound programmatic proposals for the control of hypertension. Recommendations are made for the primary prevention of the atherosclerotic diseases. G.R.

A75-18733 **Primary prevention of coronary heart disease.** M. J. Karvonen (Institute of Occupational Health, Helsinki, Finland). *(International Symposium on Causes and Prevention of Coronary Disease, Argenteuil, Belgium, May 23-25, 1974.) Acta Cardiologica, Supplementum,* no. 20, 1974, p. 159-173. 20 refs.

Attention is given to dietary interventions, diet and thrombosis, statistics and intervention, prospects of prevention, and trends and promises. Approaches for preventing coronary heart disease in the community are discussed. In prevention, the individual approach consists of identifying the risks of a person and then devising a prevention program to fit his individual needs. When a risk factor affects an entire community, efforts of prevention may be made at a community scale, without differentiating between high and low risk individuals. G.R.

A75-18766 **Molecular biology and cardiac insufficiency (Biologie moléculaire de l'insuffisance cardiaque).** M. Blanc. *La Recherche,* vol. 6, Jan. 1975, p. 63-65. In French.

The causes of cardiac insufficiency and consequent heart enlargement are being investigated at the level of molecular biology. It has been shown that the critical moment in the evolution of cardiac insufficiency, when contractions decrease considerably, is due to a failure of protein contractility in the cardiac cell, rather than of energy supply. Decreased enzymatic activity of myosin, which catalyzes ATP hydrolysis, is at fault. The causes of this decrease are being sought in structural studies of the myosin chains. A.T.S.

A75-18900 **Nonobstructive hypertrophic cardiomyopathy mimicking mitral stenosis - Documentation by echocardiography, phonocardiography and intracardiac pressure and sound recordings.** M. R. Smith, N. S. Agruss, N. I. Levenson, and R. J. Adolph (Cincinnati General Hospital, Cincinnati, Ohio). *American Journal of Cardiology,* vol. 35, Jan. 1975, p. 89-96. 19 refs. Research supported by the American Heart Association; Grants No. NIH-HE-06307; No. NIH-LI-5445.

The physical findings in hypertrophic cardiomyopathy with left ventricular outflow tract obstruction are well described. In the absence of outflow tract obstruction the findings are less distinctive. There have been several reported cases in which the cardiac findings have suggested the diagnosis of mitral stenosis. In this report we describe a patient whose auscultatory and roentgenographic findings more closely mimicked mitral stenosis. The patient had a loud first heart sound, mitral opening snap and an apical presystolic murmur; left atrial enlargement was present. Noninvasive studies, including phonocardiography, echocardiography and apex cardiography, strongly suggested the correct diagnosis of nonobstructive hypertrophic cardiomyopathy. The diagnosis and unusual auscultatory findings were confirmed by results of cardiac catheterization and intracardiac phonocardiography. The importance of recognizing this syndrome and the use of noninvasive methods to establish the diagnosis are stressed. (Author)

A75-18924 * **Heavy cosmic-ray exposure of Apollo astronauts.** E. V. Benton, R. P. Henke (San Francisco, University, San Francisco, Calif.), and J. V. Bailey (NASA, Johnson Spacecraft Center, Houston, Tex.). *Science,* vol. 187, Jan. 24, 1975, p. 263-265. 20 refs.

A comprehensive study of the heavy-particle cosmic-ray exposure received by the individual astronauts during the nine lunar Apollo missions reveals a significant variation in the exposure as a function of shielding and the phase of the solar cycle. The data are useful in planning for future long-range missions and in estimating the expected biological damage. (Author)

A75-18944 # **Extracellular potential field of an excitable fibre, immersed in anisotropic volume conductor, limited by two infinite dielectric walls, forming a two-wall angle.** G. V. Dimitrov (B'lgarska Akademiia na Naukite, Institut po Fiziologiia, Sofia, Bulgaria). *Bolgarskaia Akademiia Nauk, Doklady,* vol. 27, no. 9, 1974, p. 1275-1278. 6 refs.

Consideration of a method for determining in situ the location of motor units with the aid of a multi-electrode having the shape of a two-wall angle, it being assumed that the volume in which the motor unit is immersed is infinite. An analysis is carried out which estimates the changes in the amplitudes of the extracellular potentials measured on the surface of a dielectric wall, which occur as a result of the presence of a second dielectric wall forming a two-wall angle with the first. P.T.H.

A75-18962 **Left and right in cockpit evolution.** L. F. E. Coombs. *Aeronautical Journal,* vol. 78, Nov. 1974, p. 513-522. 72 refs.

The report attempts to explain why some features of the aircraft cockpit and the way in which an aircraft is controlled have been related to a particular direction of turning and cycling. The origin of the left-hand circuit is discussed. The possible origin for the principal pilot in the left-hand layout is dealt with. This is contrasted with the side of the cockpit occupied by the pilot in the multi-engine British aircraft compared with contemporary German aircraft practice. It is concluded that although aviation is dominated by the left-turn and left-hand circuit more sophisticated aircraft technology must rely more on electronics, thus making the distinction between left and right no longer of importance. T.S.

A75-19049 # **Comparative analysis by various mathematical models for best fitting of dicentric yields in human lymphocytes exposed to different kinds of radiations.** S. A. Todorov (Academy of Medicine, Sofia, Bulgaria). *Bolgarskaia Akademiia Nauk, Doklady,* vol. 27, no. 10, 1974, p. 1451-1453. 6 refs.

A75-19222 # **Formation of amino acids and nucleic acid constituents under possible primitive earth conditions.** P. C. Joshi and H. D. Pathak (D.S.B. Government College, Naini Tal, India). *British Interplanetary Society, Journal,* vol. 28, Feb. 1975, p. 90-96. 40 refs.

A75-19276 **International Symposium on the Origin of Life, 4th, Barcelona, Spain, June 25-28, 1973, Proceedings.** Symposium sponsored by the International Society for the Study of the Origin of Life. *Origins of Life,* vol. 6, Jan.-Apr. 1975. 304 p.

Topics discussed include amino acids in the Murchison meteorite, prebiological molecules in the primitive atmosphere and ocean, biogenic structures from the Early Precambrian of Eurasia, and electron spin resonance study of the photochemical synthesis of organic free radicals, the synthesis of organic compounds from methane and ammonia by high-frequency discharge, the formation of

organic compounds in the primitive atmosphere from mixtures containing C-H-N elements by means of silent discharges at low pressure, the synthesis of amino acids behind shock waves, the role of aminonitriles in chemical evolution, nuclear magnetic resonance studies of polypeptides synthesized according to possible prebiotic methods, prebiotic synthesis of nucleotides from mineral phosphate, biochemical reactions involving the formation and use of condensed phosphorylated compounds, and the formation of coacervate-like microparticles from proteinoid enriched with lysine.

Individual items are announced in this issue. A.B.K.

A75-19278 * Remarks on the chemical conditions on the surface of the primitive earth and the probability of the evolution of life. H. E. Suess. *(International Society for the Study of the Origin of Life, International Symposium on the Origin of Life, 4th, Barcelona, Spain, June 25-28, 1973.) Origins of Life,* vol. 6, Jan.-Apr. 1975, p. 9-13. 16 refs. Grant No. NGL-05-009-005.

A75-19279 Molten earth and the origin of prebiological molecules. M. Shimizu (Tokyo, University, Tokyo, Japan). *(International Society for the Study of the Origin of Life, International Symposium on the Origin of Life, 4th, Barcelona, Spain, June 25-28, 1973.) Origins of Life,* vol. 6, Jan.-Apr. 1975, p. 15-21. 23 refs.

Evidence for the molten earth at its accretion time has been accumulated through the geochemical investigations and the observations of the surfaces of planets by space probes such as Venera 8, Mariner 9, Surveyor, Luna, and Apollo. The primitive terrestrial atmosphere might have been derived from the volcanic gases, as suggested the Rubey (1951), but at a higher temperature than so far assumed. A thermochemical calculation of the composition of the volcanic gas suggests that large amounts of H2 and CO were present in the primitive atmosphere, thus providing a theoretical basis for the HCN production experiment by Abelson; HCHO and NH3 existed in the primitive oceans in amounts comparable to the weight of the present biosphere; and large amounts of NO3(-), SO4(2+), and PO4(3+) were expected in the primitive oceans. The NO3(+) ions might have been useful for the nitrate respiration advocated by Egami (1974). (Author)

A75-19280 Soil and water and its relationship to the origin of life. D. M. Anderson (U.S. Army, Cold Regions Research and Engineering Laboratory, Hanover, N.H.) and A. Banin. *(International Society for the Study of the Origin of Life, International Symposium on the Origin of Life, 4th, Barcelona, Spain, June 25-28, 1973.) Origins of Life,* vol. 6, Jan.-Apr. 1975, p. 23-36. 85 refs.

Recent experimental bearing on the involvement of soil particulates in biogenesis is surveyed. Reactions and interactions involving organic compounds and water that are induced or catalyzed by clays are discussed. The possibilities of biogenesis on Mars involving these processes are considered. A.T.S.

A75-19281 Microbial contributions to the evolution of the 'steady state' carbon dioxide system. R. Y. Morita (Oregon State University, Corvallis, Ore.). *(International Society for the Study of the Origin of Life, International Symposium on the Origin of Life, 4th, Barcelona, Spain, June 25-28, 1973.) Origins of Life,* vol. 6, Jan.-Apr. 1975, p. 37-44. 15 refs. NSF Grant No. GA-38583X.

Various processes for the production of carbon dioxide by microorganisms are presented. It is postulated that a 'microniche' developed in a reducing environment; a symbiotic relationship between alga-like organisms and bacterium-like organisms in the 'microniche' governed the production of carbon dioxide resulting in the establishment of the steady state carbon dioxide system in the sea. (Author)

A75-19282 Structures of biogenic origin from Early Precambrian rocks on Euro-Asia. A. S. Lopuchin (Akademiia Nauk Kirgizskoi SSR, Institut Geologii, Frunze, Kirgiz SSR). *(International Society for the Study of the Origin of Life, International Symposium on the Origin of Life, 4th, Barcelona, Spain, June 25-28, 1973.) Origins of Life,* vol. 6, Jan.-Apr. 1975, p. 45-57. 34 refs.

Spheroidal microfossils mainly 20 to 100 microns in diameter and exhibiting granular surface textures have been recovered from Early Precambrian rocks by applying a new method of water separation in combination with thin chemical preparation. In contrast to the Acritarcha, these microfossils are characterized by a relatively low specific weight (close to one) and considerable fragility due to impregnation by mineral matter. They occur in Archean sediments of Hindustan, in rocks of the Baltic and Aldan Shields with ages of 3.0 to 3.5 b.y., and in Proterozoic deposits in many regions of Eurasia. They commonly occur in great number in Precambrian sediments of West Africa, Australia, and North America. These forms are regarded as Menneria Lopuchin and are considered to be blue-green algae. The biogenic structures described from the Early Precambrian of Eurasia are considered to have been photosynthetic and planktonic. Their progressive evolution, intensive production of organic matter, and biogeochemical role in the concentration of rare elements are discussed. (Author)

A75-19283 * Photochemical synthesis of simple organic free radicals on simulated planetary surfaces - An ESR study. S.-S. Tseng and S. Chang (NASA, Ames Research Center, Planetary Biology Div., Moffett Field, Calif.). *(International Society for the Study of the Origin of Life, International Symposium on the Origin of Life, 4th, Barcelona, Spain, June 25-28, 1973.) Origins of Life,* vol. 6, Jan.-Apr. 1975, p. 61-73. 38 refs.

Electron spin resonance (ESR) spectroscopy provided evidence for formation of hydroxyl radicals during ultraviolet photolysis (254 nm) at -170 C of H2O adsorbed on silica gel or of silica gel alone. The carboxyl radical was observed when CO or CO2 or a mixture of CO and CO2 adsorbed on silica gel at -170 C was irradiated. The ESR signals of these radicals slowly disappeared when the irradiated samples were warmed to room temperature. However, reirradiation of CO or CO2, or the mixture CO and CO2 on silica gel at room temperature then produced a new species, the carbon dioxide anion radical, which slowly decayed and was identical with that produced by direct photolysis of formic acid adsorbed on silica gel. The primary photochemical process may involve formation of hydrogen and hydroxyl radicals. Subsequent reactions of these radicals with adsorbed CO or CO2 or both yield carboxyl radicals, CO2H, the precursors of formic acid. These results confirm the formation of formic acid under simulated Martian conditions and provide a mechanistic basis for gauging the potential importance of gas-solid photochemistry for chemical evolution on other extraterrestrial bodies, on the primitive earth, and on dust grains in the interstellar medium. (Author)

A75-19285 Formation of prebiochemical compounds in models of the primitive earth's atmosphere. I - CH4-NH3 and CH4-N2 atmospheres. G. Toupance, F. Raulin, and R. Buvet (Paris XII, Université, Créteil, Val-de-Marne, France). *(International Society for the Study of the Origin of Life, International Symposium on the Origin of Life, 4th, Barcelona, Spain, June 25-28, 1973.) Origins of Life,* vol. 6, Jan.-Apr. 1975, p. 83-90. 11 refs.

In order to understand the formation of organic compounds in the primitive atmosphere, the first steps of evolution in models of the primitive atmosphere were investigated. Mixtures containing C-H-N elements were subjected to a low-pressure silent electric discharge for several seconds, and the resulting effluents were analyzed mainly by gas chromatography, infrared spectrometry, and chemical analysis. The formation of hydrocarbons and nitrogen-containing compounds is reported. The influence of the initial mixture composition on the amount of compounds formed was systematically studied. The nature of the nitrogen source (N2 or NH3) in the primitive atmosphere has a great influence on the amount and on the very nature of the synthesized products. It is shown that important precursors such as cyanogen and cyanoacetylene are formed only in very rich N2 media. These results show the important role played by the nature of the primitive atmosphere in the determination of the chemical evolution pathways. (Author)

A75-19286 **Formation of prebiochemical compounds in models of the primitive earth's atmosphere. II - CH4-H2S atmospheres.** F. Raulin and G. Toupance (Paris XII, Université, Créteil, Val-de-Marne, France). *(International Society for the Study of the Origin of Life, International Symposium on the Origin of Life, 4th, Barcelona, Spain, June 25-28, 1973.) Origins of Life,* vol. 6, Jan.-Apr. 1975, p. 91-97. 10 refs.

In order to understand the role of sulfur in the primitive atmosphere, a study was made of the action of a silent discharge on mixtures of CH4 and H2S at low pressure. The nature of the products formed in the gaseous phase, and the influence of several parameters, especially the H2S percentage, on the yield of the products are reported. The analysis of the products is carried out by gas-liquid chromatography and infrared spectrometry. The formation of sulfur-containing compounds, such as thiols and sulfides, is reported. CS2 is formed in high yield (a few per cent) in mixtures containing 40 to 50 per cent of H2S, while the maximum concentration of thiols (i.e., CH3SH and C2H5SH) is reached with lower percentages of H2S. The formation of hydrocarbons decreases rapidly with increasing proportions of H2S. These results show the important inhibitor effect of H2S on the formation of hydrocarbons and the possibility of occurrence of many sulfur compounds in prebiological evolution. (Author)

A75-19287 * **Organic synthesis by quench reactions.** W. K. Park, A. R. Hochstim (Wayne State University, Detroit, Mich.), and C. Ponnamperuma (Maryland, University, College Park, Md.). *(International Society for the Study of the Origin of Life, International Symposium on the Origin of Life, 4th, Barcelona, Spain, June 25-28, 1973.) Origins of Life,* vol. 6, Jan.-Apr. 1975, p. 99-107. 8 refs. Research supported by Wayne State University; Grant No. NGR-05-007-215.

Study of the effects of chemical quench reactions on the formation of organic compounds at a water surface under simulated primordial earth conditions. A mixture of gaseous methane and ammonia over a water surface was exposed to an arc discharge between an electrode and the water surface, generating reactive species. Various organic molecules were formed by a subsequent quenching of these species generated on the water surface. The effects of these water-surface quench reactions were assessed by comparing the amounts of synthesized molecules to the amounts which formed during the discharge of an arc above the water level. It is concluded that the quench (or wet) discharge led to faster rates of reactions, higher-molecular-weight organic compounds, and one-order-of-magnitude larger yields than the dry discharge. A.B.K.

A75-19289 * **Quantum chemical study of the thermodynamics, kinetics of formation and bonding of H2CH - Relevance to prebiotic chemistry.** G. H. Loew (Stanford University, Stanford, Calif.) and S. Chang (NASA, Ames Research Center, Chemical Evolution Branch, Moffett Field, Calif.). *(International Society for the Study of the Origin of Life, International Symposium on the Origin of Life, 4th, Barcelona, Spain, June 25-28, 1973.) Origins of Life,* vol. 6, Jan.-Apr. 1975, p. 117-125. 40 refs.

A75-19290 * **Aminonitriles - Possible role in chemical evolution.** M. S. Chadha (Bhabha Atomic Research Centre, Bombay, India), P. M. Molton, and C. Ponnamperuma (Maryland, University, College Park, Md.). *(International Society for the Study of the Origin of Life, International Symposium on the Origin of Life, 4th, Barcelona, Spain, June 25-28, 1973.) Origins of Life,* vol. 6, Jan.-Apr. 1975, p. 127-136. 22 refs. Grant No. NGR-21-002-317.

The formation of HCN, ammonium cyanide, alkylnitriles, aminoacetonitrile and its C- and N-methyl homologs was demonstrated earlier in a simulated Jovian atmosphere. The polymeric material resulting in these experiments was shown to give glycine, alanine, sarcosine, aspartic acid and some imino dibasic acids on acid hydrolysis, suggesting thereby the participation of the monomeric nitriles in the formation of the polymeric product(s). Further examination of products resulting from semicorona and arc discharge through a mixture of methane and ammonia has provided evidence for the formation of alkylaminopropionitriles as a complex mixture and also some pyridyl and pyrimidyl type heterocyclic compounds. A gas chromatograph/mass spectrometer examination of the heterocyclics showed resemblance with those found in some carbonaceous chondrites. The significance of these findings in relation to chemical evolution is discussed. (Author)

A75-19291 **Macromolecules and the origin of life.** H. Noda, H. Mizutani, and H. Okihana (Tokyo, University, Tokyo, Japan). *(International Society for the Study of the Origin of Life, International Symposium on the Origin of Life, 4th, Barcelona, Spain, June 25-28, 1973.) Origins of Life,* vol. 6, Jan.-Apr. 1975, p. 139-146. 11 refs.

Possibilities regarding the formation of macromolecules preceding the origin of life are considered, giving attention to mechanisms utilizing HCN. In connection with these concepts an experimental study was conducted of the reaction of HCN in the gas phase under conditions of UV irradiation with a low-pressure mercury lamp. After some time a solid material of reddish brown color was found on the inner surface of the reaction cell. Questions regarding the coacervation of gelatin were also investigated. G.R.

A75-19292 **NMR studies of prebiotic polypeptides.** S. Andini, E. Benedetti, L. Ferrara, L. Paolillo, and P. A. Temussi (Napoli, Università, Naples, Italy). *(International Society for the Study of the Origin of Life, International Symposium on the Origin of Life, 4th, Barcelona, Spain, June 25-28, 1973.) Origins of Life,* vol. 6, Jan.-Apr. 1975, p. 147-153. 6 refs. Consiglio Nazionale delle Ricerche Grant No. 71,01561.

Several polypeptides prepared by means of pyrocondensation have been the subject of structural investigations. Attention has been focused on the constitutional characterization of homo- and copolymers containing aspartic and glutamic acid residues, whose role is essential for the formation of the so-called proteinoids. Contrary to the literature data based on chemical degradation, NMR studies show conclusively that in thermal poly-aspartic acid only beta-peptide linkages are present. This result casts serious doubt on the role thermal condensation might have played in prebiotic polypeptide syntheses. (Author)

A75-19293 **The origin of proteins - Heteropolypeptides from hydrogen cyanide and water.** C. N. Matthews (Illinois, University, Chicago, Ill.). *(International Society for the Study of the Origin of Life, International Symposium on the Origin of Life, 4th, Barcelona, Spain, June 25-28, 1973.) Origins of Life,* vol. 6, Jan.-Apr. 1975, p. 155-162. 38 refs.

The considered model for terrestrial molecular evolution assumes the direct synthesis of heteropolypeptides from hydrogen cyanide and water without the intervening formation of alpha-amino acids. According to this model the primeval earth could have been covered with a proteinaceous matrix able to assist the synthesis and further evolution of nucleic acid and other macromolecules essential for life today. Attention is given to reports of the existence of abiotic water-soluble compounds hydrolyzable to alpha-amino acids in materials obtained from the moon, carbonaceous chondrites, photochemical experiments, and hydrogen cyanide reactions in the laboratory. G.R.

A75-19295 * **Models of prebiological phosphorylation.** M. Halmann (Weizmann Institute of Science, Rehovot, Israel). *(International Society for the Study of the Origin of Life, International Symposium on the Origin of Life, 4th, Barcelona, Spain, June 25-28, 1973.) Origins of Life,* vol. 6, Jan.-Apr. 1975, p. 169-174. 41 refs. NASA-supported research.

The model of phosphorylation in aqueous solutions considered involves the cyanogen-induced activation of orthophosphate. In this reaction, preferential phosphorylation of reducing sugars occurs, to produce the corresponding glycosyl phosphates. Attention is given to the molecular mechanism of phosphate uptake as it occurs in contemporary cells. It is proposed that the site of prebiological phosphorylation may have been in the interstitial water of sediment.

It is also suggested that the site to search for forms of life on other planets is in the interstitial water, which possibly may be found, e.g., in the canyons of Mars. G.R.

A75-19298 A technique for the determination of enantiomeric amino acids in biological samples. K. D. Haegele, P. Y. Howard, and W. Parr (Houston, University, Houston, Tex.). *(International Society for the Study of the Origin of Life, International Symposium on the Origin of Life, 4th, Barcelona, Spain, June 25-28, 1973.) Origins of Life,* vol. 6, Jan.-Apr. 1975, p. 195-202. 31 refs.

Methods for the determination of the optical isomers of amino acids in biological material are briefly examined. By far the best method is gas liquid chromatography. The two different approaches of this method are considered in detail, giving attention to the resolution of diastereoisomers and the resolution of enantiomers on optically active stationary phases. G.R.

A75-19299 * Coacervate-like microspheres from lysine-rich proteinoid. D. L. Rohlfing (South Carolina, University, Columbia, S.C.). *(International Society for the Study of the Origin of Life, International Symposium on the Origin of Life, 4th, Barcelona, Spain, June 25-28, 1973.) Origins of Life,* vol. 6, Jan.-Apr. 1975, p. 203-209. 22 refs. Grant No. NGR-41-002-034.

Microspheres form isothermally from lysine-rich proteinoid when the ionic strength of the solution is increased with NaCl or other salts. Studies with different monovalent anions and with polymers of different amino acid composition indicate that charge neutralization and hydrophobic bonding contribute to microsphere formation. The particles also form in sea water, especially if heated or made slightly alkaline. The microspheres differ from those made from acidic proteinoid but resemble coacervate droplets in some ways (isothermal formation, limited stability, stabilization by quinone, uptake of dyes). Because the constituent lysine-rich proteinoid is of simulated prebiotic origin, the study is interpreted to add emphasis to and suggest an evolutionary continuity for coacervation phenomena. (Author)

A75-19300 Evolution in bioids - Hypercompetitivity as a source of bistability and a possible role of metal complexes as prenucleoprotic mediators of molecular asymmetry. P. Decker (Hannover, Tierärztliche Hochschule, Hanover, West Germany). *(International Society for the Study of the Origin of Life, International Symposium on the Origin of Life, 4th, Barcelona, Spain, June 25-28, 1973.) Origins of Life,* vol. 6, Jan.-Apr. 1975, p. 211-218. 14 refs. Research supported by the Deutsche Forschungsgemeinschaft and Verband der Chemischen Industrie.

A75-19301 Entropy of the genetic information and evolution. M. Hasegawa and T.-A. Yano (Tokyo, University, Tokyo, Japan). *(International Society for the Study of the Origin of Life, International Symposium on the Origin of Life, 4th, Barcelona, Spain, June 25-28, 1973.) Origins of Life,* vol. 6, Jan.-Apr. 1975, p. 219-227. 20 refs.

The entropy of the amino acid sequences coded by DNA is considered as a measure of diversity or variety of proteins, and is taken as a measure of evolution. The DNA or m-RNA sequence is considered as a stationary second-order Markov chain composed of four kinds of bases. Because of the biased nature of the genetic code table, increase of entropy of amino acid sequences is possible with biased nucleotide sequence. Thus the biased DNA base composition and the extreme rarity of the base doublet CpG of higher organisms are explained. It is expected that the amino acid composition was highly biased at the days of the origin of the genetic code table, and the more frequent amino acids have tended to get rarer, and the rarer ones more frequent. This tendency is observed in the evolution of hemoglobin, cytochrome C, fibrinopeptide, immunoglobulin and lysozyme, and protein as a whole. (Author)

A75-19302 Physical foundations of the probability of biogenesis. C. A. Bogdanski (CNRS, Laboratoire d'Evolution des Etres Organisés, Paris, France). *(International Society for the Study of the Origin of Life, International Symposium on the Origin of Life, 4th, Barcelona, Spain, June 25-28, 1973.) Origins of Life,* vol. 6, Jan.-Apr. 1975, p. 229-237. 12 refs.

Elementary conditions for biogenesis are examined, giving attention to minimum complexity requirements, questions concerning the compactness of the system structure, and the needed structural complexity level of the constituent elements of the system. The maintenance of biohomeostasis is considered along with aspects regarding the evolution of some models of spontaneous self-regulating systems. G.R.

A75-19303 Some physical parameters controlling cell size during the evolution of the procaryons. M. McCabe (Uppsala, University, Uppsala, Sweden). *(International Society for the Study of the Origin of Life, International Symposium on the Origin of Life, 4th, Barcelona, Spain, June 25-28, 1973.) Origins of Life,* vol. 6, Jan.-Apr. 1975, p. 239-243. 17 refs.

Possible factors controlling cell size during the evolution of unicellular organisms have been examined. It has been shown that considerations of osmotic and membrane pressure equilibria will predict minimal cell sizes which are in good agreement with those found in present day microorganisms. It has also been shown that the possibility of random proton 'noise' would not be a limiting factor for even the smallest organisms or structures. Maximum cell size would be governed by the requirements of diffusion and transport within the cell. (Author)

A75-19304 The beginning of photosynthesis. E. Broda (Wien, Universität, Vienna, Austria). *(International Society for the Study of the Origin of Life, International Symposium on the Origin of Life, 4th, Barcelona, Spain, June 25-28, 1973.) Origins of Life,* vol. 6, Jan.-Apr. 1975, p. 247-251. 14 refs.

Photosynthesis bacteria evolved from fermenters that did not use light. The 'conversion hypothesis' asserts that photosynthesis and respiration, both of which use electron flow coupled with phosphorylation, have a common origin. It is shown that photosynthesis must have come first. The substances necessary for respiration, oxygen for aerobic respiration and sulfate or nitrate for anaerobic respiration, were produced in the biosphere by photosynthetic processes in bacteria and blue-green algae. The question of how photosynthesis could have evolved from fermentation is considered. Photophosphorylation may have originated through the combination with membrane function of substrate-level phosphorylation in reactions of photoproducts. Cyclic photophosphorylation arose while the biosphere was still reducing and was later supplemented by noncyclic photophosphorylation. A.T.S.

A75-19305 Evolution of photosystems of photosynthetic organisms. N. V. Karapetian (Akademiia Nauk SSSR, Institut Biokhimii, Moscow, USSR). *(International Society for the Study of the Origin of Life, International Symposium on the Origin of Life, 4th, Barcelona, Spain, June 25-28, 1973.) Origins of Life,* vol. 6, Jan.-Apr. 1975, p. 253-256. 18 refs.

The possible mechanisms of NAD photoreduction in Chromatium are discussed. Two independently functioning photosystems in purple bacteria are suggested, one of them capable of reducing NAD. The evolution of photosystems apparently involved interaction between the independent photosystems, with one of them operating under more oxidative conditions and using water as the electron donor. A.T.S.

A75-19306 Evolution of oxygen by plants in relation to biosphere evolution. V. M. Kutiurin (Akademiia Nauk SSSR, Institut Geokhimii i Analiticheskoi Khimii, Moscow, USSR). *(International Society for the Study of the Origin of Life, International Symposium on the Origin of Life, 4th, Barcelona, Spain, June 25-28, 1973.) Origins of Life,* vol. 6, Jan.-Apr. 1975, p. 257-263. 10 refs.

The process of water decomposition by plants is discussed in connection with biosphere evolution. This process consists of two parts: water oxidation and oxygen evolution. The origin of the water

oxidation process took place after the synthesis of chlorine-type pigments, the structure of which corresponds to a more oxidized state than the bacteriochlorophyll type. The ability of plants to evolve oxygen is the result of a long evolution process. The capability of decomposing water in the long-wave length spectral region by algae and higher plants, which can be only seen under anaerobic conditions was discovered. This mechanism was suggested to be a reflection of a relict form of plant apparatus having operated under ancient, strictly anaerobic, conditions. (Author)

A75-19307 Ambiguity in the interpretation of abiotic syntheses. A. G. Cairns-Smith (Glasgow, University, Glasgow, Scotland). *(International Society for the Study of the Origin of Life, International Symposium on the Origin of Life, 4th, Barcelona, Spain, June 25-28, 1973.) Origins of Life,* vol. 6, Jan.-Apr. 1975, p. 265-267. 8 refs.

The idea of original biochemical similarity, i.e., the view that the original hereditary mechanisms were similar to those which now operate, is questioned. The unity of present biochemistry does not prove original similarity, since the earliest common ancestor of present systems may have been itself the product of long evolution, and, thus, distant from the origin of life. Another spontaneously forming replicating apparatus, such as in the growth processes of inorganic crystals, could have been the early mechanism from which modern biochemical systems evolved. A.T.S.

A75-19308 On the question of the origin and evolution of the genetic system. V. Novak and V. Liebl (Ceskoslovenska Akademie Ved, Mikrobiologicky Ustav, Prague, Czechoslovakia). *(International Society for the Study of the Origin of Life, International Symposium on the Origin of Life, 4th, Barcelona, Spain, June 25-28, 1973.) Origins of Life,* vol. 6, Jan.-Apr. 1975, p. 269-271. 7 refs.

An evolutionary sequence is proposed for the origin of the molecular mechanisms of heredity from nonliving material. It is suggested that the original abiogenic proteins in which nucleic acid replication first began preexisted in the form of coacervates. The evolution of originally monohelical nucleic acid into a double-helix structure is considered a major step in the formation of coacervates within coacervates, which later developed into primitive cells with membranes. A.T.S.

A75-19309 * A model for the coevolution of the genetic code and the process of protein synthesis - Review and assessment. J. C. Lacey, Jr., A. L. Weber, and W. E. White, Jr. (Alabama, University, Birmingham, Ala.). *(International Society for the Study of the Origin of Life, International Symposium on the Origin of Life, 4th, Barcelona, Spain, June 25-28, 1973.) Origins of Life,* vol. 6, Jan.-Apr. 1975, p. 273-283. 31 refs. Grants No. NIH-5-501-RR-05300-10; No. NIH-CA-08888; No. NGR-01-010-001.

A75-19310 * Chemical evolution and the origin of life - Bibliography supplement 1973. M. W. West, E. D. Gill (San Jose State University, San Jose, Calif.), and K. A. Kvenvolden (NASA, Ames Research Center, Moffett Field, Calif.). *(International Society for the Study of the Origin of Life, International Symposium on the Origin of Life, 4th, Barcelona, Spain, June 25-28, 1973.) Origins of Life,* vol. 6, Jan.-Apr. 1975, p. 285-300. 316 refs.

A75-19399 Consequences of long-term hypokinesia as compared to mild exercise in lipid metabolism of the heart, skeletal muscle and adipose tissue. J. Parizkova (Karlova Universita, Prague, Czechoslovakia) and R. Poledne (Institute of Clinical and Experimental Medicine, Prague, Czechoslovakia). *European Journal of Applied Physiology,* vol. 33, no. 4, 1974, p. 331-338. 17 refs.

A75-19569 Functional adaptation to high altitude hypoxia. A. R. Frisancho (Michigan University, Ann Arbor, Mich.). *Science,* vol. 187, Jan. 31, 1975, p. 313-319. 90 refs. NSF Grant No. GS-37542X; Grant No. NIH-HB-13805.

A description is given of the various adaptive mechanisms which enable both the lowland and the highland native to overcome the hypoxic stress of high altitudes and to attain physiological homeostasis under the conditions of high altitude hypoxia. It is pointed out that the biological problem of adaptation to high altitude hypoxia depends mainly upon the partial pressure of oxygen in the atmosphere which decreases proportionately with an increase in altitude. Symptoms of high altitude hypoxia are discussed along with cardiovascular traits and work capacity. G.R.

STAR ENTRIES

N75-14358*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE PROCEEDINGS OF THE SKYLAB LIFE SCIENCES SYMPOSIUM, VOLUME 1
Richard S. Johnston and Lawrence F. Dietlein Nov. 1974 430 p refs Presented at Houston, Tex., 27-29 Aug. 1974 2 Vol.
(NASA-TM-X-58154-Vol-1; JSC-09275-Vol-1) Avail: NTIS HC $11.25 CSCL 06B

The three manned Skylab missions resulted in biomedical experiment data in the areas of neurophysiology, musculoskeletal physiology, biochemistry, hematology, cytology, cardiovascular and respiratory metabolic functions: as well as detailed test objectives involving crew health and environment procedures. Major emphasis was placed on results from the last mission, Skylab 4, which covered 84 days of in-flight data collection. Many new norms were defined for normal man living and operating in a unique environment. While man is quite adaptable to this unique environment, many of the changes observed in Skylab require additional research for future flights lasting very long periods of time such as a Mars mission requiring 18 months.

N75-14359* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SKYLAB MEDICAL PROGRAM OVERVIEW
Richard S. Johnston *In its* Proc. of the Skylab Life Sci. Symp., Vol. 1 Nov. 1974 p 1-47 refs

CSCL 06E

An overview is given of the Skylab medical program and its results. Areas discussed cover: (1) food systems; (2) waste management; (3) personal hygiene; (4) inflight medical support systems; (5) cardiovascular counterpressure garment; (6) life sciences experiments; (7) medical experiment altitude test; and (8) premission, in-flight, and postflight support. The medical program met or exceeded all of the planned objectives. The medical operations were conducted without any major problems, the medical equipment functioned flawlessly, and the medical data received from the crews were of excellent quality. A.L.

N75-14360* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
FLIGHT CONTROL EXPERIENCES
F. Story Musgrave *In its* Proc. of the Skylab Life Sci. Symp., Vol. 1 Nov. 1974 p 43-46

CSCL 06B

An astronaut physician, Dr. Story Musgrave, discussed the biomedical aspects of mission control, and the management, direction, and support of in-flight biomedical activities. A.L.

N75-14361* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SKYLAB 4 CREW OBSERVATIONS
Edward G. Gibson *In its* Proc. of the Skylab Life Sci. Symp., Vol. 1 Nov. 1974 p 47-54

CSCL 06B

The scientist pilot on Skylab 4 Dr. Ed Gibson, briefly discussed the medical aspects of: food, exercise, scheduling, medical training, effects of fluid shift, and vestibular effects during the mission. A.L.

N75-14362* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SKYLAB 2 CREW OBSERVATIONS AND SUMMARY
J. P. Kerwin *In its* Proc. of the Skylab Life Sci. Symp., Vol. 1 Nov. 1974 p 55-59
CSCL 06B

The first U.S. astronaut physician in space, Dr. Joe Kerwin, briefly discussed the signs, symptoms, and effects of weightlessness on crew performance and operations during the Skylab 2 mission. He concluded that man's potential efficiency in zero-g is as high as it is any place else. The degree to which this potential is realized is a function of the experience and training of the crew and of the degree to which their needs are met in flight. A.L.

N75-14363* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SKYLAB CREW HEALTH - CREW SURGEONS' REPORTS

J. R. Hordinsky *In its* Proc. of the Skylab Life Sci. Symp., Vol. 1 Nov. 1974 p 61-73

CSCL 06E

A physician was designated as the Crew Surgeon for each of the three manned Skylab missions. He was responsible for the health of the Skylab crewmembers and their families, the development and use of the Inflight Medical Support System, the preflight medical examination and arrangement of all crew medical-related activities, and the postflight coordination of medical activity on board the recovery ship and afterwards at the NASA-Lyndon B. Johnson Space Center. From a clinical point of view, all of the physiological and psychological responses noted in the Skylab missions were either self-limiting or represented work-around problems requiring minimal counteraction. As such, these changes do not preclude extending man's duration in zero-gravity for longer periods of time. Author

N75-14364* Texas Univ., Houston.
SKYLAB ORAL HEALTH STUDIES
Lee R. Brown, William J. Frome (Air Force Dental Corps), Sandra Handler, Merrill G. Wheatcroft, and Linda J. Rider *In* NASA. Johnson Space Center Proc. of the Skylab Life Sci. Symp., Vol. 1 Nov. 1974 p 75-97 refs

CSCL 06E

Oral health considerations for the Skylab series of manned space flights included three areas of responsibility: clinical, provisions for in-flight care, and research. Clinically, prevention of dental disease was emphasized through frequent oral evaluations and an intensive home care program. During all missions provision was made for an extension of the crewmen's home care program and equipment and training were provided all astronauts for self-treatment in-flight should the need arise. Research was dedicated to the identification of potential oral health problems which might occur in prolonged space flights. Skylab crewmembers were monitored for: shifts in oral microbial populations, changes in the secretion of specific salivary components, and alterations in clinical indices of oral health and preexisting dental disease. Assuming no future clinical detection of mission-related intraoral complications, the most

significant finding from these investigations was the relatively nonexistence of health-hazardous intraoral changes. Author

N75-14365* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ANALYSIS OF THE SKYLAB FLIGHT CREW HEALTH STABILIZATION PROGRAM
J. K. Ferguson, G. W. McCollum, and B. L. Portnoy (Public Health Service, Atlanta) *In its* Proc. of the Skylab Life Sci. Symp., Vol. 1 Nov. 1974 p 99-119

CSCL 06E

Throughout the Skylab Program, an extensive effort was made to reduce the probability of an illness occurrence in the flight crewmen. The Flight Crew Health Stabilization Program accomplished this objective by isolating the flight crew during preflight periods. In addition, the number of personal contacts with the crewmen was limited, and ill persons were not permitted to enter primary work areas. Initially, all persons who required contact with the flight crewmen during a 21-day period before flight were identified. Physical examinations and immunizations were given to the identified personnel. Voluntary reporting and active surveillance were used to detect illness occurrences and exposures to illness among the primary contact personnel. During the postflight period, the crewmen again were isolated and their contacts limited to medically approved personnel to reduce the occurrence of illness and to reintroduce the crewmen gradually to the normal environment. The methods and procedures used in the program are presented, together with a descriptive analysis of the surveillance data. Author

N75-14366* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SKYLAB ENVIRONMENTAL AND CREW MICROBIOLOGY STUDIES
R. M. Brockett (School of Aerospace Med.), J. K. Ferguson, R. C. Graves, T. O. Groves, M. R. Henney, C. J. Hodapp, K. D. Kropp, J. L. McQueen (Natl. Cancer Inst.), B. J. Mieszkuc, F. J. Pipes et al *In its* Proc. of the Skylab Life Sci. Symp., Vol. 1 Nov. 1974 p 121-143 refs

CSCL 06M

The results of some ground-based simulations have engendered theories that forecasted microbial simplification, intercrew transfer of microbial pathogens, autoinfections, and postflight microbial shock. In an effort to understand the effects of space flight, microbiological samples from multiple sites on the crewmembers were collected several times before, during, and after the space flights. The Skylab are related to analogous Apollo data and are discussed in a manner that will allow an evaluation of the validity of the hypotheses presented. Additionally, in-flight environmental samples were acquired from designated sites within the spacecraft and returned to earth for analysis. The resulting data were used to identify potential microbial problems for the maintenance of a habitable environment in the orbital workshop. Author

N75-14367* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
RADIOLOGICAL PROTECTION AND MEDICAL DOSIMETRY FOR THE SKYLAB CREWMEN
J. Vernon Bailey, R. A. Hoffman, and R. A. English *In its* Proc. of the Skylab Life Sci. Symp., Vol. 1 Nov. 1974 p 145-155 refs
CSCL 06R

Dose equivalent radiation exposure of the Skylab crewmen has been maintained well below the limits recommended by the Radiobiological Advisory Panel, Committee on Space Medicine, National Academy of Sciences. Operational procedures and mission rules were established; ground support specialists were responsible for overall coordination and evaluation of data from Skylab onboard radiation-monitoring instruments, satellite monitoring systems, and solar observatory reports. Also, the Skylab crewmen were provided with instrumentation and training to enable autonomous response had a radiation problem arisen while the spacecraft was not within range of a ground communications site. A comparison among all Skylab crewmen of dose equivalents to skin, lens of the eye, and blood-forming organs is presented. Author

N75-14368* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
TOXICOLOGICAL ASPECTS OF THE SKYLAB PROGRAM
Wayland J. Rippstein, Jr. and Howard J. Schneider *In its* Proc. of the Skylab Life Sci. Symp., Vol. 1 Nov. 1974 p 157-168 refs
CSCL 06T

A toxicology support capability for the Skylab Program was used to ensure a safe, habitable spacecraft environment for the crewmen. From previous experience with closed-loop environmental operations, it was known that trace-gas concentration buildup could cause mission-abort conditions. Therefore, the major toxicological consideration for the Skylab Program was to provide and maintain relatively low levels of contaminant gases in the spacecraft cabin atmosphere. To circumvent the possibility of the buildup of trace-gas levels, several preventive measures were taken. The most important measure was a screening test designed to eliminate materials that created serious outgassing problems. An atmospheric analysis of the completed Orbital Workshop was also made. Results of analyses indicated the presence of approximately 300 compounds in the Orbital Workshop atmosphere; 107 of these compounds were identified. It is important to note that had an effective trace-gas removal capability not been contained within the environmental control system of the spacecraft, the atmospheric contamination buildup in the crew compartment could have been a serious problem. Author

N75-14369* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EXPERIMENT M-131. HUMAN VESTIBULAR FUNCTION
Ashton Graybiel (Naval Aerospace Med. Res. Lab., Pensacola, Fla.), Earl F. Miller, II (Naval Aerospace Med. Res. Lab., Pensacola, Fla.), and J. L. Homick *In its* Proc. of the Skylab Life Sci. Symp., Vol. 1 Nov. 1974 p 169-220 refs
4n
CSCL 06P

This experiment comprised three subtasks: (1) susceptibility to motion sickness; (2) thresholds for perception of angular acceleration as indicated by the oculogyral illusion; and (3) the perceived direction of internal and external space. Results of each of the subtasks are discussed in some detail. A.L.

N75-14370* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE EFFECTS OF PROLONGED EXPOSURE TO WEIGHTLESSNESS ON POSTURAL EQUILIBRIUM
J. L. Homick, M. F. Reschke, and E. F. Miller, II (Naval Aerospace Med. Res. Lab., Pensacola, Fla.) *In its* Proc. of the Skylab Life Sci. Symp., Vol. 1 Nov. 1974 p 221-238 refs

CSCL 06P

Postural equilibrium performance by the Skylab 2, 3, and 4 crewmen following exposure to weightlessness was evaluated using a modified version of a quantitative ataxia test. The test employed a series of narrow metal rails of varying widths on which the crewman was required to maintain an upright posture with his feet tandemly aligned and arms folded across his chest. Performance for this test was measured under two sets of conditions. In the first the crewman was required to maintain postural equilibrium on the rail (or floor) with his eyes open. In the second condition he attempted to balance with his eyes closed. A comparison of the preflight and postflight data indicated moderate postflight decrements in postural equilibrium in three of the crewmen during the eyes open test condition. However, in the eyes closed condition, a considerable decrease in ability to maintain balance on the rails was observed postflight for all crewmen tested. The findings are explained in terms of functional alterations in the kinesthetic, touch, vestibular, and neuromuscular sensory mechanisms induced by the prolonged absence of a normal gravitational stimulus. Author

N75-14371* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SKYLAB SLEEP MONITORING EXPERIMENT (M133)
James D. Frost, Jr. (Methodist Hospital), William H. Shumate, Joseph G. Salamy (Technology, Inc., Houston, Tex.), and Cletis R. Booher *In its* Proc. of the Skylab Life Sci. Symp., Vol. 1 Nov. 1974 p 239-285 refs

CSCL 05E

The first objective measurements of man's ability to obtain adequate sleep during prolonged space flight were made during the three manned Skylab missions. Electroencephalographic, electro-oculographic, and head-motion signals were acquired during sleep by use of an elastic recording cap containing sponge electrodes and an attached miniature preamplifier/accelerometer unit. One subject was studied during each manned mission. In only the 28-day mission (Skylab 2) was there a significant decrease in total sleep time; in that case it was a result of voluntarily reduced rest time and was not due to difficulty in sleeping nor frequent awakening. Findings suggest that men are able to obtain adequate sleep in regularly scheduled eight-hour rest periods during extended space flights. It seems likely, based upon these results, that the problems encountered in earlier space flights did not arise from the zero-g environment per se, but possibly they were a result of more restricted living and working areas in the pre-Skylab spacecraft. Author

N75-14372* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
VISUAL LIGHT FLASH OBSERVATIONS ON SKYLAB 4
R. A. Hoffman, L. S. Pinsky (Tex. Univ., Houston), Z. Osborne (Tex. Univ., Houston), and J. V. Bailey *In its* Proc. of the Skylab Life Sci. Symp., Vol. 1 Nov. 1974 p 287-295 refs

CSCL 06P

During the Skylab 4 mission, two separate light flash observation sessions were performed on mission days 74 and 81 by the pilot, William R. Pogue. These sessions occurred during orbits that allowed observations from high northern geomagnetic latitudes, through the equatorial region, and on to southern geomagnetic latitudes. The South Atlantic Anomaly was also traversed during each session. During each session, the pilot (in the sleep-restraint mode) donned a blindfold and recorded his observations of flashes on the voice recorder. The data obtained indicate a latitude effect on the frequency of the flashes; this effect would be expected if primary cosmic particles cause the flashes. Additionally, high flash rates (15 to 20 flashes/min) were observed when the spacecraft was over the center of the South Atlantic Anomaly. This observation has stimulated questions regarding the possible presence of trapped particles (larger than protons) in the South Atlantic Anomaly. Further observations and measurements regarding light flashes are planned for the Apollo-Soyuz Test Project. Author

N75-14373* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
CHANGES IN THE ACHILLES TENDON REFLEXES FOLLOWING SKYLAB MISSIONS
J. T. Baker (Technology, Inc., Houston, Tex.), A. E. Nicogossian, G. W. Hoffler, R. L. Johnson, and J. R. Hordinsky *In its* Proc. of the Skylab Life Sci. Symp., Vol. 1 Nov. 1974 p 297-305 refs

CSCL 06P

A generalized hyperreflexia was clinically reported in the crew of the first manned Skylab mission. To assess possible neuromuscular alterations following extended space flight a decision was made to conduct duration measurements of the Achilles tendon reflex and its associated muscle potential. Reflex duration was measured from the initial stroke upon the tendon until all oscillations had ceased. The muscle potential interval for each reflex was measured from the initial tendon stroke to the point of greatest amplitude of the muscle potential spike. Crewmembers of Skylab 3 and 4 exhibited a significantly shortened reflex in the immediate postflight period. A compensatory prolongation of the reflex duration was exhibited between 4 and 12 days after recovery followed by a gradual return to the preflight values. In general, the muscle potential interval corresponded with the increase and decrease in the reflex duration. Author

N75-14374* National Aeronautics and Space Administration, Washington, D.C.
TASK AND WORK PERFORMANCE ON SKYLAB MISSION 2, 3 AND 4 (TIME AND MOTION STUDY - EXPERIMENT M151)
Joseph F. Kubis (Fordham Univ.), Edward J. McLaughlin, Rudolph Rusnak (Fordham Univ.), Gary H. McBride (Fordham Univ.), and Susan V. Saxon (Fordham Univ.) *In its* Proc. of the Skylab Life Sci. Symp., Vol. 1 Nov. 1974 p 307-399

CSCL 05E

This experiment was to study the effects of the Skylab environment on a variety of work tasks involving different types of activity. In-flight crewman performance, sampled over the duration of the mission, was compared with corresponding preflight training data in terms of efficiency and possible behavioral stress effects associated with length of exposure to the working and living conditions of the Skylab environment. The basic finding from this experiment was the uniformity of crew performance over the three missions. In general, crewmen adjusted rapidly to the weightless environment and became proficient in developing techniques to optimize task performance. Performance time varied with method change and with task and hardware configurations. The use of arms and legs (and the entire body) as subtle guidance and restraint systems facilitated the efficient translation and control of large and small masses, including the crewman himself. Differences in crew performance were not pronounced; variations in training procedure, the natural tempo and style of each crewman, and method changes were critical explanatory factors. Author

N75-14375* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
CREW EFFICIENCY ON FIRST EXPOSURE TO ZERO-GRAVITY
Owen K. Garriott and Gary L. Doerre *In its* Proc. of the Skylab Life Sci. Symp., Vol. 1 Nov. 1974 p 341-352 refs

CSCL 05E

The many individual work tasks accomplished by each of the three Skylab flight crews in their early activation phase have been identified and their respective performance times estimated. These work performances were compared both with preflight estimates of the rate at which work would be done and with crew output later in the mission when adaptation was complete and when the crewmembers were experienced in zero-gravity operations. The very substantial amount of work devoted to repair tasks during the early mission days was also included. It was found that on only two of the total of nine full or partial activation days was the crew work output significantly reduced. On the day of lowest efficiency, mission day 2 of the Skylab 3 mission, it appears that the crewmen were working at approximately 75 percent of their normal efficiency and may have lost approximately 7 man-hours of work. Overall, a nearly constant level of work was achieved on these activation days. However, as crew proficiency improved later in the missions, the daily crew work output in these same categories increased from approximately a 26 man-hour/day to at least a 34 man-hour/day. Author

N75-14376* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
MINERAL AND NITROGEN METABOLIC STUDIES, EXPERIMENT M071
G. Donald Whedon (NIH), Leo Lutwak (Calif. Univ. Los Angeles), Paul C. Rambaut, Michael W. Whittle, Malcolm C. Smith, Jeanne Reid (NIH), Carolyn S. Leach, Connie Rae Stadler (Technology, Inc., Houston, Tex.), and Deanna D. Sanford (Technology, Inc., Houston, Tex.) *In its* Proc. of the Skylab Life Sci. Symp., Vol. 1 Nov. 1974 p 353-371 refs

CSCL 06P

Metabolic study of the effects of space flight on various

chemical elements, particularly those with special relevance to the musculoskeleton system, was performed on the nine astronauts who participated in the three Skylab flights. In the Skylab experiment, increases in urinary calcium during space flight and in-flight changes in calcium balance were closely similar in degree to those found in bedrest immobilization. The similarity to bed rest in the pattern of urinary calcium increases and of total calcium shifts suggested that calcium losses would continue for a very long time. Significant losses on nitrogen and phosphorus occurred that were associated with observed reduction in muscle tissue. Both mineral and muscle losses occurred despite vigorous exercise regimens during flight. It was concluded that these studies give warning that capable musculoskeletal function may be significantly impaired during prolonged space flights lasting one and one-half to three years unless protective measures are developed. Author

N75-14377* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PHYSIOLOGICAL MASS MEASUREMENTS IN SKYLAB

William E. Thornton and J. Ord (Scott Air Force Base) *In its* Proc. of the Skylab Life Sci. Symp., Vol. 1 Nov. 1974 p 373-386

CSCL 06P

One of the first changes noted in man following space flight was a loss in weight. To study the mechanism of such changes during flight, intake/output balance studies and measurements of crew mass were required. These measurements depended on the availability of nongravimetric mass-measurement devices. Such devices were flown and successful operation was demonstrated for the first time during Skylab missions. Electronically timed spring/mass oscillators were used to routinely determine all crew food residue and fecal masses to accuracies of a few grams. Daily body mass measurements were made with errors of a small fraction of a pound. Two general patterns of body mass loss, usually mixed, were apparent. The first is a more or less continuous loss beginning before flight with an increase in rate of loss during flight. A second pattern is indicated by relative stability except for a small loss during the first few days of weightlessness with a reciprocal gain during the first few days after flight. Author

N75-14378* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
BONE MINERAL MEASUREMENT - EXPERIMENT M078

John M. Vogel (Calif. Univ., Davis) and M. W. Whittle *In its* Proc. of the Skylab Life Sci. Symp., Vol. 1 Nov. 1974 p 387-401 refs

CSCL 06P

The probability of significant bone mineral loss being initiated by extended periods of weightlessness has been predicted on the basis of observations in bedrested and immobilized subjects. The mineral content of the distal right radius and ulna and the central left os calcis was measured preflight and postflight on the nine crewmen of the three Skylab manned missions using the photon absorptionmetric technique. No significant mineral losses were observed in any of the three Skylab 2 crewmen. Only the scientist pilot of Skylab 3 and scientist pilot and pilot of Skylab 4 had significant mineral losses in the os calcis. No losses in the radius and ulna were seen. The losses observed generally followed the loss patterns observed in a heterogeneous group of bedrested subjects. It is concluded that mineral losses do occur from the bones of the lower extremities during missions of up to 84 days and that in general, they follow the loss patterns of the bedrested situation. The levels of loss observed in the Skylab crews have been of no clinical concern but it was fortuitous that all of the Skylab 4 crewmen had high prediction terms. Author

N75-14379* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
MUSCULAR DECONDITIONING AND ITS PREVENTION IN SPACE FLIGHT

SKYLAB MISSION

R. L. Johnson, G. W. Hoffler, A. E. Nicogossian, S. A. Bergman, and M. M. Jackson *In its* Proc. of the Skylab Life Sci. Symp., Vol. 2 Nov. 1974 p 545-595 refs

Under weightlessness without countermeasures, a rapid disuse atrophy of weight-bearing muscular groups appears to occur. For the Skylab Program, such losses were measured with a constant speed (isokinetic) dynamometer. Ten maximum-effort, full-range flexion/extensions of the elbow and hip/knee at 45 degrees/second were recorded and evaluated for each crewman before and after flight. Anthropometric measurements allowed computation of volume changes of limb segments. Although weightlessness could cause rapid atrophy of many major muscle groups and disability on return to normal gravity could result after long missions, it has been demonstrated that such deconditioning can be prevented relatively easily through use of familiar exercise techniques. Future research efforts should focus on optimum methods of exercise with respect to crew time and crew acceptance, interrelationship of musculoskeletal fitness with cardiovascular fitness, and design of practical, efficient, total body exercisers. Author

N75-14380* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
BIOSTEREOMETRIC ANALYSIS OF BODY FORM

Michael W. Whittle, Robin Herron (Tex. Inst. for Rehabilitation and Res., Houston), and Jaime Cuzzi (Tex. Inst. for Rehabilitation and Res., Houston) *In its* Proc. of the Skylab Life Sci. Symp., Vol. 1 Nov. 1974 p 417-424 refs

CSCL 06B

Stereophotogrammetry was used to derive the Cartesian coordinates of numerous points on the body surface of the Skylab crewmen, both before and after flight, on all three Skylab missions. Mathematical analysis of the coordinate description allows the computation of whole body surface area and volume, as well as the volume of body segments, and the area and shape of cross sections. Loss of body weight in the first two Skylab flight crews was accompanied by comparable loss of volume and little change in density. Volume loss was divided about equally between the trunk and the legs; however, because the volume of the legs is less than that of the trunk, this finding represented a greater proportional volume loss in the legs. Comparison of cross-sectional areas suggests that the calf undergoes shrinkage to a greater extent than does the thigh. The suggested interpretation of these changes is that during flight there was a reduction in body fluid, a partial muscle atrophy, particularly in the legs, and, in all but two of the crewmen, a loss of body fat. The partial muscle atrophy probably resulted from relative disuse in the absence of gravity, and was lessened to some extent by the in-flight exercise program. Author

N75-14381*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE PROCEEDINGS OF THE SKYLAB LIFE SCIENCES SYMPOSIUM, VOLUME 2

Richard S. Johnston and Lawrence F. Dietlein Nov. 1974 430 p refs Presented at Houston, Tex., 27-29 Aug. 1974 2 Vol.

(NASA-TM-X-58154-Vol-2; JSC-09275-Vol-2) Avail: NTIS HC $11.25 CSCL 06B

The three manned Skylab missions resulted in biomedical experiment data in the areas of neurophysiology, musculoskeletal physiology, biochemistry, hematology, cytology, cardiovascular and respiratory metabolic functions: as well as detailed test objectives involving crew health and environment procedures. Major emphasis was placed on results from the last mission, Skylab 4, which covered 84 days of in-flight data collection. Many new norms were defined for normal man living and operating in a unique environment. While man is quite adaptable to this unique environment, many of the changes observed in Skylab require additional research for future flights lasting very long periods of time such as a Mars mission requiring 18 months.

N75-14382* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
BIOCHEMICAL RESPONSES OF THE SKYLAB CREWMAN

Carolyn S. Leach and Paul C. Rambaut *In its* Proc. of the Skylab Life Sci. Symp., Vol. 2 Nov. 1974 p 427-454 refs

CSCL 06A

The biochemical investigations of the Skylab crewmen were designed to study the physiological changes that were observed on flight crews returning from previous space flight missions as well as to study those changes expected to result from prolonged weightless exposure. These studies can be divided into two broad categories. One category included routine blood studies similar to those used in clinical medical practice. The second included research-type endocrine analyses used to investigate more thoroughly the metabolic/endocrine responses to the space flight environment. The premission control values indicated that all Skylab crewmen were healthy and were free from biochemical abnormalities. The routine results during and after flight showed slight but significant changes in electrolytes, glucose, total protein, osmolality, uric acid, cholesterol, and creatinine. Plasma hormal changes included adrenocorticotrophic hormone, cortisol, angiotensin I, aldosterone, insulin, and thyroxine. The 24-hour urine analyses results revealed increased excretion of cortisol, catecholamines, antidiuretic hormone, and aldosterone as well as excretion of significant electrolyte and uric acid during the Skylab flights. Author

N75-14383* Texas Univ., Galveston. Medical Branch.
CYTOGENIC STUDIES OF BLOOD (EXPERIMENT M111)

Lillian H. Lockhart *In* NASA. Johnson Space Center Proc. of the Skylab Life Sci. Symp., Vol. 2 Nov. 1974 p 455-465 refs

CSCL 06E

The Skylab M111 experiment was a continuation of the preflight and postflight chromosomal analyses of the flight crews that have been performed since the Gemini 3 mission. The experiment was designed to determine whether some space flight parameter produces cytogenetic effects in human cells and to provide biological radiation dosimetric capability in the event of significant radiation exposure to a flight crew. On each of the Skylab flights, blood lymphocytes for analysis of chromosomes for structural defects were obtained from each of the prime crewmembers and from a ground-based control group before and after flight. Two types of defects were recorded. The minor defects included the following aberrations: chromatid fragments, chromosome fragments, and deletions. Structural rearrangements such as dicentrics, exchanges, ring chromosomes, and translocazions were photographed, and the cells were karyotyped to delineate, when possible, the chromosome or chromosomes involved in the rearrangement. Result seems to indicate that the flight itself was not a major contributing factor. Author

N75-14384* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE RESPONSE OF SINGLE HUMAN CELLS TO ZERO GRAVITY
P. OB. Montgomery, Jr. (Woodlawn Hosp., Dallas), J. E. Cook (Woodlawn Hosp., Dallas), R. C. Reynolds (Texas Univ., Dallas), J. S. Paul (Woodlawn Hosp., Dallas), L. Hayflick (Stanford Univ., Palo Alto, Calif.), D. Stock (Texas Univ., Houston), W. W. Schulz (Woodlawn Hosp., Dallas), S. L. Kimzey, R. G. Thirolf, T. Rogers et al *In its* Proc. of the Skylab Life Sci. Symp., Vol. 2 Nov. 1974 p 467-491 refs

CSCL 06B

The SO15 experiment was designed to extend observations of the effects of zero-gravity to living human cells during and subsequent to a 59-day flight on Skylab 3. A strain of diploid human embryonic lung cells, WI-38, was chosen for this purpose. The studies were concerned with observations designed to detect the effects of zero-gravity on cell growth rates and on cell structure as observed by light microscopy, transmission and scanning electron microscopy and histochemistry. Studies of the effects of zero-gravity on the cell function and the cell cycle were performed by time lapse motion picture photography and microspectrophotometry. Subsequent study of the returned living cells included karotyping, G- and C-banding, and analyses of the culture media used. Some of the living cells returned were banked by deep freeze techniques for possible future experiments. Author

N75-14385* Baylor Univ., Houston, Tex. Coll. of Medicine.
BLOOD VOLUME CHANGES
Philip C. Johnson, Theda B. Driscoll, and Adrian D. LeBlance *In* NASA. Johnson Space Center Proc. of the Skylab Life Sci. Symp., Vol. 2 Nov. 1974 p 495-505 refs

CSCL 06E

Analysis of radionuclide volume determinations made for the crewmembers of selected Gemini and Apollo missions showed that orbital spaceflight has an effect on red cell mass. Because the methods and the protocol developed for earlier flights were used for the crews of the three Skylab missions, direct comparisons are possible. After each Skylab mission, decreases were found in crewmembers' red cell masses. The mean red cell mass decrease of 11 percent or 232 milliliters was approximately equal to the 10 percent mean red cell mass decrease of the Apollo 14 to 17 crewmembers. The red cell mass drop was greatest and the postrecovery reticulocyte response least for crewmembers of the 28-day Skylab 2 mission. Analyses of data from the red cell mass determinations indicate that the red cell mass drops occurred in the first 30 days of flight and that a gradual recovery of the red cell mass deficits began approximately 60 days after launch. The beginning of red cell mass regeneration during the Skylab 4 flight may explain the higher postmission reticulocyte counts. Author

N75-14386* Missouri Univ., Columbia.
RED CELL METABOLISM STUDIES ON SKYLAB
Charles E. Mengel *In* NASA. Johnson Space Center Proc. of the Skylab Life Sci. Symp., Vol. 2 Nov. 1974 p 507-518 refs

CSCL 06P

On the basis of these background data, metabolic studies were performed on humans involved in space flight. These studies included the Skylab experiences. The primary purpose of the investigations was to study red cells for: (1) evidences of lipid peroxidation, or (2) changes at various points in the glycolytic pathway. The Skylab missions were an opportunity to study blood samples before, during, and after flight and to compare results with simultaneous controls. No direct evidence that lipid peroxidation had occurred in the red blood cells was apparent in the studies. Author

N75-14387* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EXPERIMENT M115: SPECIAL HEMATOLOGIC EFFECTS: DYNAMIC CHANGES IN RED CELL SHAPE IN RESPONSE TO THE SPACE-FLIGHT ENVIRONMENT
Stephen L. Kimzey, Linda C. Burns (Northrop Services, Inc., Houston, Tex.), and Craig L. Fischer (Eisenhower Memorial Hosp., Palm Desert, Calif.) *In its* Proc. of the Skylab Life Sci. Symp., Vol. 2 Nov. 1974 p 519-544 refs

CSCL 06S

The significance of the transformations in red cell shape observed during the Skylab study must be considered relative to the limitation of man's participation in extended space flight missions. The results of this one study are not conclusive with respect to this question. Based on these examinations of red cells in normal, healthy men and based on other Skylab experiment data relative to the functional capacity of the red cells in vitro and the performance capacity of man as an integrated system, the changes observed would not appear to be the limiting factor in determining man's stay in space. However, the results of this experiment and the documented red cell mass loss during space flight raise serious questions at this time relative to the selection criteria utilized for passengers and crews of future space flights.

Until the specific cause and impact of the red cell shape change on cell survival in vivo can be resolved, individuals with diagnosed hematologic abnormalities should not be considered as prime candidates for missions, especially those of longer duration.
Author

N75-14388* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LOWER BODY NEGATIVE PRESSURE: THIRD MANNED SKYLAB MISSION
R. L. Johnson, G. W. Hoffler, A. E. Nicogossian, S. A. Bergman, and M. M. Jackson *In its* Proc. of the Skylab Life Sci. Symp., Vol. 2 Nov. 1974 p 545-595 refs

CSCL 06S

The crew of the Skylab 4 Mission exhibited physiological changes during their 84-day mission that resembled but in several important areas did not reach the magnitude of changes exhibited in crewmen of the two earlier Skylab flights. At rest all three crewmen showed, in comparison to preflight levels, elevated mean systolic and pulse pressures and decreased mean diastolic and mean arterial pressures. Similar changes were seen in most Skylab 2 and Skylab 3 crewmen. While mean resting heart rates of both the Skylab 3 and Skylab 4 crews were elevated, those of the Skylab 2 crew were, however, lower than during preflight tests. Stressed heart rates followed previous patterns in being consistently elevated over preflight values. Postflight changes in cardiovascular parameters for the most part resembled those seen in previous crewmen of space missions. Their recovery to preflight limits occurred rapidly. In-flight data and subjective impressions of the crewmen confirmed that lower body negative pressure in weightlessness imposed a greater stress upon the cardiovascular system than in earth's gravity.
Author

N75-14389* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
VECTORCARDIOGRAPHIC RESULTS FROM SKYLAB MEDICAL EXPERIMENT M092: LOWER BODY NEGATIVE PRESSURE
G. W. Hoffler, R. L. Johnson, A. E. Nicogossian, S. A. Bergman, and M. M. Jackson *In its* Proc. of the Skylab Life Sci. Symp., Vol. 2 Nov. 1974 p 597-621 refs

CSCL 06S

Vectorcardiograms were recorded via a modified Frank lead system from all crewmen of the three Skylab missions in conjuction with the Lower Body Negative Pressure - M092 Experiment. Data were analyzed by a specially developed computer program (VECTAN). Design of the test sequences allowed direct comparisons of supine resting, Earth based (reference) vectorcardiograms with those taken during lower body negative pressure stress and those obtained at rest in orbit, as well as combinations of these conditions. Results revealed several statistically significant space flight related changes; namely, increased testing and lower body negative pressure stressed heart rates, modestly increased PR interval and corrected QTC interval, and greatly increased P and QPS loop maximal amplitudes. In addition, orientation changes in the QRS maximum vector and the J-vector at rest in space seem quite consistent among crewmen and different from those caused by the application of lower body negative pressure. No clinical abnormalities were observed. Etiology of these findings is conjectured to be, at least in part, related to fluid mass shifts occurring in weightlessness and attendant alterations in cardiovascular dynamics and myocardial autonomic control mechanisms.
Author

N75-14390* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
HEMODYNAMIC STUDIES OF THE LEGS UNDER WEIGHTLESSNESS
William E. Thornton and G. W. Hoffler *In its* Proc. of the Skylab Life Sci. Symp., Vol. 2 Nov. 1974 p 623-635

CSCL 06S

Following exposure to weightlessness, alterations in the return of blood from the legs play a crucial role in orthostatic tolerance and may be an important factor in work tolerance. To investigate some of the hemodynamic mechansism involved, an experiment was performed on the Skylab 3 and Skylab 4 missions to study arterial blood flow, venous compliance, and muscle pumping of blood. Skylab 4 results indicated that the most likely cause of increased blood flow was an increase in cardiac output secondary to increased central venous pressure caused by blood redistribution. Changes in venous compliance are thought to be primarily changes in somatic musculature which is postulated to primarily determine venous compliance of the legs. This was also thought to be demonstrated by the changes in muscle pumping. It is thought that these compliance changes, when taken with the decreased blood volume; provide a basis for the changes seen in orthostatic tolerance, work capacity and lower body negative pressure response.
Author

N75-14391* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ANTHROPOMETRIC CHANGES AND FLUID SHIFTS
William E. Thornton, G. W. Hoffler, and J. A. Rummel *In its* Proc. of the Skylab Life Sci. Symp., Vol. 2 Nov. 1974 p 637-658

CSCL 06S

Several observations of body size, shape, postute, and configuration were made to document changes resulting from direct effects of weightlessness during the Skylab 4 mission. After the crewmen were placed in orbit, a number of anatomical and anthropometric changes occurred including a straightening of the thoracolumbar spine, a general decrease in truncal girth, and an increase in height. By the time of the earliest in-flight measurement on mission day 3, all crewmen had lost more than two liters of extravascular fluid from the calf and thigh. The puffy facies, the bird legs effect, the engorgement of upper body veins, and the reduced volume of lower body veins were all documented with photographs. Center-of-mass measurements confirmed a fluid shift cephalad. This shift remained throughout the mission until recovery, when a sharp reversal occurred; a major portion of the reversal was completed in a few hours. The anatomical changes are of considerable scientific interest and of import to the human factors design engineer, but the shifts of blood and extravascular fluid are of more consequence. It is hypothesized that the driving force for the fluid shift is the intrinsic and unopposed lower limb elasticity that forces venous blood and then other fluid cephalad.
Author

N75-14392* Vanderbilt Univ., Nashville, Tenn.
VECTORCARDIOGRAPHIC CHANGES DURING EXTENDED SPACE FLIGHT
Raphael F. Smith, Kevin Stanton (Naval Aerospace Med. Inst.), David Stoop (Naval Aerospace Med. Inst.), Donald Brown (Naval Aerospace Med. Inst.), Walter Janusz (Naval Aerospace Med. Inst.), and Paul King *In* NASA. Johnson Space Center Proc. of the Skylab Life Sci. Symp., Vol 2 Nov. 1974 p 659-679 refs

CSCL 06S

To assess the effects of space flight on cardiac electrical properties, vectorcardiograms were taken on the 9 Skylab astronauts during the flights of 28, 59, and 84 days. The Frank lead system was used and observations were made at rest; during 25%, 50% and 75% of maximum exercise; during a short pulse of exercise (150 watts, 2 minutes); and after exercise. Data from 131 in-flight tests were analyzed by computer and compared to preflight and postflight values. Statistically significant increase in QRS vector magnitude (six of nine crewmen); T vector magnitude (five of nine crewmen); and resting PR interval duration (six of nine crewmen) occurred. During exercise the PR interval did not differ from preflight. Exercise heart rates inflight were the same as preflight, but increased in the immediate postflight period. With the exception of the arrhythmias, no deleterious vectorcardiographic changes were observed during the Skylab missions.
Author

N75-14393* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

EVALUATION OF THE ELECTROMECHANICAL PROPERTIES OF THE CARDIOVASCULAR SYSTEM

Stuart A. Bergman, Jr., G. W. Hoffler, and R. L. Johnson *In its* Proc. of the Skylab Life Sci. Symp., Vol. 2 Nov. 1974 p 681-709 refs

CSCL 06S

Cardiovascular electromechanical measurements were collected on returning Skylab crewmembers at rest and during both lower body negative pressure and exercise stress testing. These data were compared with averaged responses from multiple preflight tests. Systolic time intervals and first heart sound amplitude changes were measured. Clinical cardiovascular examinations and clinical phonocardiograms were evaluated. All changes noted returned to normal within 30 days postflight so that the processes appear to be transient and self limited. The cardiovascular system seems to adapt quite readily to zero-g, and more importantly it is capable of readaptation to one-g after long duration space flight. Repeated exposures to zero-g also appear to have no detrimental effects on the cardiovascular system. Author

N75-14394* National Institutes of Health, Bethesda, Md.

EFFECT OF PROLONGED SPACE FLIGHT ON CARDIAC FUNCTION AND DIMENSIONS

Walter L. Henry, Stephen E. Epstein, James M. Griffith, Robert E. Goldstein, and David R. Redwood *In* NASA. Johnson Space Center Proc. of the Skylab Life Sci. Symp., Vol. 2 Nov. 1974 p 711-721 refs

CSCL 06S

Echocardiographic studies were performed preflight 5 days before launch and on recovery day and 1, 2, 4, 11, 31, and 68 days postflight. From these echocardiograms measurements were made. From these primary measurements, left ventricular end-diastolic volume, end-systolic volume, stroke volume, and mass were derived using the accepted assumptions. Findings in the Scientist Pilot and Pilot resemble those seen in trained distance runners. Wall thickness measurements were normal in all three crewmembers preflight. Postflight basal studies were unchanged in the Commander on recovery day through 68 days postflight in both the Scientist Pilot and Pilot, however, the left ventricular end-diastolic volume, stroke volume, and mass were decreased slightly. Left ventricular function curves were constructed for the Commander and Pilot by plotting stroke volume versus end-diastolic volume. In both astronauts, preflight and postflight data fell on the same straight line demonstrating that no deterioration in cardiac function had occurred. These data indicate that the cardiovascular system adapts well to prolonged weightlessness and suggest that alterations in cardiac dimensions and function are unlikely to limit man's future in space. Author

N75-14395* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

RESULTS OF SKYLAB MEDICAL EXPERIMENT M171: METABOLIC ACTIVITY

E. L. Michel, J. A. Rummel, C. F. Sawin, M. C. Buderer (Technology, Inc., Houston, Tex.), and J. D. Lem *In its* Proc. of the Skylab Life Sci. Symp., Vol. 2 Nov. 1974 p 723-762 refs

CSCL 06S

The experiment was conducted to establish whether man's ability to perform mechanical work would be progressively altered as a result of exposure to the weightless environment of space flight. The Skylab crewmen exercised on a bicycle ergometer at workloads approximating 25, 50, and 75 percent of their maximum aerobic capacity. The physiological parameters monitored were respiratory gas exchange, blood pressure, and vectorcardiogram/heart rate. The results of these tests indicate that the crewmen had no significant decrement in their responses to exercise during their exposure to zero gravity. The results of the third manned Skylab mission (Skylab 4) are presented and a comparison is made of the overall results obtained from the three successively longer Skylab manned missions. The Skylab 4 crewmembers' 84-day in-flight responses to exercise were no worse and were probably better than the responses of the crewmen on the first two Skylab missions. Indications that exercise was an important contributing factor in maintaining this response are discussed. Author

N75-14396* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

PULMONARY FUNCTION EVALUATION DURING AND FOLLOWING SKYLAB SPACE FLIGHTS

C. F. Sawin, A. E. Nicogossian, A. P. Schachter (Technology, Inc., Houston, Tex.), J. A. Rummel, and E. L. Michel *In its* Proc. of the Skylab Life Sci. Symp., Vol. 2 Nov. 1974 p 763-774 refs

CSCL 06E

Previous experience during the Apollo postflight exercise testing indicated no major changes in pulmonary function. Although pulmonary function has been studied in detail following exposure to hypoxic and hyperoxic environments, few studies have dealt with normoxic environments at reduced total pressure as encountered during the Skylab missions. Forced vital capacity was measured during the preflight and postflight periods of the Skylab 2 mission. Initial in-flight measurements of vital capacity were obtained during the last two weeks of the second manned mission (Skylab 3). Comprehensive pulmonary function screening was accomplished during the Skylab 4 mission. The primary measurements made during Skylab 4 testing included residual volume determination, closing volume, vital capacity, and forced vital capacity and its derivatives. In addition, comprehensive in-flight vital capacity measurements were made during the Skylab 4 mission. Vital capacity was decreased slightly during flight in all Skylab 4 crewmen. No major preflight to postflight changes were observed in the other parameters. Author

N75-14397* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

METABOLIC COST OF EXTRAVEHICULAR ACTIVITIES

James M. Waligora and David J. Horrigan, Jr. *In its* Proc. of the Skylab Life Sci. Symp., Vol. 2 Nov. 1974 p 775-784 refs

CSCL 06S

The data on metabolic rates during Skylab extravehicular activities are presented and compared with prior experience during Gemini and Apollo. Difficulties experienced with Gemini extravehicular activities are reviewed. The effect of a pressure suit on metabolic rate is discussed and the life support equipment capabilities of each life support system are reviewed. The methods used to measure metabolic rate, utilizing bioinstrumentation and operational data on the life support system, are described. Metabolic rates are correlated with different activities. Metabolic rates in Skylab were found to be within the capacities of the life support systems and to be similar to the metabolic rates experienced during Apollo lunar 1/6-g extravehicular activities. They were found to range from 100 kcal/h to 500 kcal/h, during both 1/6-g and zero-g extravehicular activities. The average metabolic rates measured during long extravehicular activities were remarkably consistent and appeared to be a function of crew pacing of activity rather than to the effort involved in individual tasks. Author

N75-14398* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

DETERMINATION OF CARDIAC SIZE FROM CHEST ROENTGENOGRAMS FOLLOWING SKYLAB MISSIONS

A. E. Nicogossian, G. W. Hoffler, R. L. Johnson, and R. J. Gowen (Air Force Academy) *In its* Proc. of the Skylab Life Sci. Symp., Vol. 2 Nov. 1974 p 785-793 refs

CSCL 06P

Decreased cardiothoracic transverse diameter ratios following Mercury, Gemini and Apollo space flights have been reported previously. To evaluate further changes in cardiac size, standard posteroanterior chest films in systole and diastole were obtained before flight and within a few hours after recovery on each of

the Skylab astronauts. Postflight chest X-rays were visually compared to the preflight roentgenograms for possible changes in pulmonary vasculature, lung parenchyma, bony or soft tissue structures. From these roentgenograms the following measurements were obtained: cardiac and thoracic transverse diameters, cardiothoracic transverse diameter ratio, cardiac area from the product of both diagonal diameters, cardiac silhouette area by planimetry, thoracic cage area and cardiothoracic area ratio. The postflight frontal cardiac silhouette sizes were significantly decreased when compared with the respective preflight values ($P < 0.05$ or 0.01). The observed changes are thought to be related to postflight decrease in the intracardiac chamber volume. Author

N75-14399* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SKYLAB: A BEGINNING
Lawrence F. Dietlein *In its* Proc. of the Skylab Life Sci. Symp., Vol. 2 Nov. 1974 p 795-814 refs

CSCL 06S

Skylab biomedical experience indicates that man adapts well to and functions effectively in the space environment for time periods approaching three months. Appropriate dietary intake coupled with adequate, programmed exercise, sleep, work and recreation periods are essential to crew health and well being. No untoward physiological responses have been noted that would preclude longer duration space flights, but more research is required in order to understand the mechanisms involved in the observed responses. Remedial or preventive measures may be required for Mars-type missions, and further study of man in earth orbit for an uninterrupted six-month period should ideally precede this Mars-type mission. Author

N75-14400# Rochester Univ., N.Y. Dept. of Radiation Biology and Biophysics.
DETERMINATION OF AEROSOL MASS DISTRIBUTION IN AN AEROSOL CENTRIFUGE BY MEANS OF QUARTZ OSCILLATORS
F. J. Moenig N. Schwarzer, and W. Stoeber 1973 8 p refs In GERMAN; ENGLISH summary Presented at 1st Meeting of Gesellsch. f. Aerosolforsch, Bad Soden, West Germany, 20 Oct. 1973 Sponsored by AEC Prepared in cooperation with Fraunhofer-Ges. zur Forderung der Angew. Forsch. E. V., Grafschaft, West Germany
(UR-3490-478; Conf-731080-1) Avail: NTIS HC $3.25

The function, design and performance tests of quartz oscillator circuits integrated in a spiral centrifuge type aerosol size spectrometer are described. The quartz oscillators are thin disks mounted flush to the deposition wall of the centrifuge collecting size-separated particles according to their deposit location in the duct. The shift on the oscillator frequency by the build-up of the deposit layer is related to the surface concentration of deposited mass. A deposit concentration of 0.00000001 grams/sq cm causes a frequency shift of 2.3 Hz. This is close to the optimum sensitivity of the prototype design because the oscillator frequency is also slightly dependent on thermal influences and humidity changes. Results with a fluorescein test aerosol are reported. Author

N75-14401# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
INVESTIGATION OF THE EFFECTS OF NOISE ON THE ENCODING FUNCTION OF A SYNCODER M.S. Thesis
John H. Miller Jun. 1974 89 p refs
(AD-785070; GE/EE/74-13) Avail: NTIS CSCL 06/4

A syncoder is an electronic model of a neuron (nerve cell). An approximate performance analysis under arbitrary additive noise conditions is developed. A computer program to provide graphical results is written and effects of varying parameters are discussed. Comparisons with studies of the noiseless syncoder are made. Author (GRA)

N75-14402# Svenska Institutet, Stockholm (Sweden).
ENVIRONMENTAL PLANNING IN SWEDEN: NUMBER 55: THE ABISKO RESEARCH STATION
Lars Emmelin Sep. 1974 8 p Submitted for publication
(PB-235794/5) Avail: NTIS HC $3.25 CSCL 06F

Work being done at the Abisko Research Station operated by the Royal Swedish Academy of Sciences in the extreme north of Sweden is summarized. The station has recently attracted attention as a potential member of the global environmental monitoring network. GRA

N75-14403*# Linguistic Systems, Inc., Cambridge, Mass.
INTRACYTOPLASMIC ULTRASTRUCTURES IN PERIPHERAL BLOOD CELLS IN LUPUS ERYTHEMATOSUS
Gudrun Metz and J. Metz Washington NASA Dec. 1974 20 p refs Transl. into ENGLISH from Arch. Dermatol. Forschung. (West Germany), v. 249, no. 1, 1974 p 35-43 and 46-50
(Contract NASw-2482)
(NASA-TT-F-15710) Avail: NTIS HC $3.25 CSCL 06E

Buffy coats of peripheral blood of different manifestations of lupus erythematosus were studied by electron microscopy for the existence of viruslike intracytoplasmic tubular structures. They could always be demonstrated in the blood leukocytes of systemic lupus erythematosus independent of duration, severity and prior medical treatment of the disease, but were completely absent in chronic discoid lupus erythematosus. So far these inclusions have been observed only in the active dermal lesions of the chronic lupus erythematosus whereas various organs involved in systemic lupus erythematosus contained these structures. Their appearence in blood cells can therefore be interpretated as an early signal of visceral manifestation of the illness, which clinically is yet undetectable. Author

N75-14404*# National Aeronautics and Space Administration, Washington, D.C.
THE FUNCTION OF THE BODY AND FACTORS OF SPACE FLIGHT
N. N. Gurovskiy, ed. 1974 342 p refs Transl. into ENGLISH from the book "Funktsiya Organizma i Faktory Kosmicheskogo Poleta" Moscow, Meditsina Press, 1974 p 1-227
(NASA-TT-F-15971) Avail: NTIS HC $9.50 CSCL 06S

Various aspects of artificial cabin atmospheres, human thermoregulation, hypodynamia, vestibular stability, and radiation safety during manned space flight are elaborated.

N75-14405* National Aeronautics and Space Administration, Washington, D.C.
COOPERATION BETWEEN SOCIALIST COUNTRIES IN SPACE BIOLOGY AND MEDICINE WITHIN THE FRAMEWORK OF THE INTERKOSMOS PROGRAM
N. N. Gurovskiy *In its* The Function of the Body and Factors of Space Flight (NASA-TT-F-15971) 1974 p 1-19 Transl. into ENGLISH from the book "Funktsiya Organizma i Faktory Kosmicheskogo Poleta" Moscow, Meditsina Press, 1974 p 6-18

CSCL 06S

Upon the proposal of the Soviet Union, experts from the socialist countries accepted the following scientific problems for cooperation in space biology and medicine: (1) the effect on the body of extreme space flight factors (space physiology); (2) radiation safety of space flights and search for pharmaco-chemical means of antiradiation protection; and (3) medico-biological aspects of closed ecological systems. Author

N75-14406* National Aeronautics and Space Administration, Washington, D.C.
THE PROBLEM OF HYPOXIA, HYPEROXIA AND HYPERCAPNIA IN SPACE PHYSIOLOGY
N. A. Agadzhanyan, P. M. Gramenitskiy, Ye. A. Kovalenko, I. I. Dvorzhak, M. Moravek, and L. Palash *In its* The Function of the Body and Factors of Space Flight (NASA-TT-F-15971) 1974 p 20-41 refs Transl. into ENGLISH from the book "Funktsiya Organizma i Faktory Kosmicheskogo Poleta" Moscow, Meditsina

Press, 1974 p 19-33
CSCL 06S

The dynamics of basic functional systems and behavioral reactions depend on the oxygen regime of the human body when confined in pressurized compartments during space flight. Permissible concentrations of oxygen, carbon dioxide and other gases to avoid symptoms of hypoxia, hyperoxia and hypercapnia are discussed in relation to numerous human tolerance studies. G.G.

N75-14407* National Aeronautics and Space Administration, Washington, D.C.

THE INTERNAL NATURE OF FUNCTIONAL DISTURBANCES ARISING IN THE BODY UNDER THE EFFECT OF EXTREME FACTORS

P. M. Gramenitskiy, Ye. A. Kovalenko, I. I. Dvorzhak, M. M. Moravek, Ya. I. Tsmiral, K. Zlatarev, and K. Kh. Kunchev *In its* The Function of the Body and Factors of Space Flight (NASA-TT-F-15971) 1974 p 41-49 refs Transl. into ENGLISH from the book "Funktsiya Organizma i Faktory Kosmicheskogo Poleta" Moscow, Meditsina Press, 1974 p 34-37

CSCL 06S

Physiological factors in human tolerance and adaptation to pressurized cabin atmospheres during manned space flight are analyzed. It is shown that individuals display different degrees of functional changes and disturbances despite identical indices of compensation by the body of external factors. The significance of reactions at the cellular tissue level to factors of an altered gaseous environment is emphasized. G.G.

N75-14408* National Aeronautics and Space Administration, Washington, D.C.

INTERNAL THERMOTOPOGRAPHY AND SHIFTS IN GENERAL THERMAL BALANCE IN MAN UNDER SPECIAL HEAT TRANSFER CONDITIONS

S. M. Gorodinskiy, P. M. Gramenitskiy, Ye. I. Kuznets, O. Ye. Ozerov, E. V. Yakovleva, P. Groza, S. Kozlovskiy, and Yu. Naremski *In its* The Function of the Body and Factors of Space Flight (NASA-TT-F-15971) 1974 p 50-62 Transl. into ENGLISH from the book "Funktsiya Organizma i Faktory Kosmicheskogo Poleta" Moscow, Meditsina Press, 1974 p 40-46

CSCL 06S

Thermal regulation for astronauts working in pressure suits in open space provides for protection by a system of artificial heat removal and compensation to counteract possible changes in the heat regulating function of the human body that occur under the complex effects of space flight conditions. Most important of these factors are prolonged weightlessness, prolonged limitation of motor activity, and possible deviations of microclimatic environmental parameters. G.G.

N75-14409* National Aeronautics and Space Administration, Washington, D.C.

TOLERANCE OF ACUTE HYPOXIA WHILE PERFORMING OPERATOR ACTIVITY AND AFTER A PROLONGED PERIOD UNDER ALTERED GAS ENVIRONMENT CONDITIONS

P. Bloshchinskiy, L. Golets, N. A. Agadzhanyan, and A. V. Sergiyenko *In its* The Function of the Body and Factors of Space Flight (NASA-TT-F-15971) 1974 p 63-74 Transl. into ENGLISH from the book "Funktsiya Organizma i Faktory Kosmicheskogo Poleta" Moscow, Meditsina Press, 1974 p 48-55
CSCL 06S

Human and animal studies on physiological factors in resistance to acute hypoxia are elaborated. Results show that tolerance of acute hypoxia depends on gas composition and temperature in a sealed cabin, on the length of the stay and motive regime, and on the kind of operator and professional activity. After preliminary adaptation to hypoxia, resistance of the body increases not only to insufficiency of oxygen in inspired air, but also to the effects of other extremum factors of manned space flight. G.G.

N75-14410* National Aeronautics and Space Administration, Washington, D.C.

ON THE CHARACTERISTICS OF CALORIC NYSTAGMUS IN HEALTHY PERSONS

D. Bodo, V. P. Baranova, E. I. Matsnev, and M. Ya. Yakovleva *In its* The Function of the Body and Factors of Space Flight (NASA-TT-F-15971) 1974 p 74-79 Transl. into ENGLISH from the book "Funktsiya Organizma i Faktory Kosmicheskogo Poleta" Moscow, Meditsina Press, 1974 p 56-58

CSCL 06S

The asymmetry of reflex activity of labyrinths and directional preponderance of the reaction were studied on healthy persons subjected to caloric tests. Calorization with hot water was accompanied by less pronounced reactions in all parameters of nystagmus than analogous indices at cold water stimulation. The symmetry of labyrinth function shifted to the right in individuals with greater activity of the left central vestibular formations, analogous to right handedness behavior. It is concluded that asymmetry of reflex nystagmus in healthy persons can be due to a certain preponderance of functional activity in structures of the left hemisphere of the brain. G.G.

N75-14411* National Aeronautics and Space Administration, Washington, D.C.

GAS EXCHANGE AND THE COAGULATION SYSTEM OF THE BLOOD DURING THE EFFECT ON THE BODY OF HIGH CONCENTRATIONS OF OXYGEN AND CARBON DIOXIDE

L. Palosh, N. A. Agadzhanyan, G. A. Davydov, B. K. Rybakov, and A. S. Sergiyenko *In its* The Function of the Body and Factors of Space Flight (NASA-TT-F-15971) 1974 p 80-100 refs Transl. into ENGLISH from the book "Funktsiya Organizma i Faktory Kosmicheskogo Poleta" Moscow, Meditsina Press, 1974 p 59-71
CSCL 06S

Maximum permissible concentrations of oxygen and carbon dioxide in a controlled atmosphere were determined by evaluating their effects on human gas exchange, blood coagulation, and tolerances to acute hypoxia, acceleration, and physical loads. It was found that functional disturbances depend on the concentration of respiratory gases and the length of stay in an altered atmosphere. By changing the atmospheric composition and by bringing the gaseous environment into accordance with the work and rest regimen and energy expenditures, the general reactivity of the body changes favorably. G.G.

N75-14412* National Aeronautics and Space Administration, Washington, D.C.

CORRELATION CHANGES IN EEG, CONDITIONED AND BEHAVIORAL REACTIONS WITH VARIOUS DEGREES OF OXYGEN INSUFFICIENCY

N. A. Agadzhanyan, I. N. Zakharova, L. V. Kalyuzhnyy, I. I. Dvorzhak, M. Moravek, and Ya. I. Tsmiral *In its* The Function of the Body and Factors of Space Flight (NASA-TT-F-15971) 1974 p 100-112 Transl. into ENGLISH from the book "Funktsiya Organizma i Faktory Kosmicheskogo Poleta" Moscow, Meditsina Press, 1974 p 72-80
CSCL 06S

The dynamics of change in bioelectric activity of the brain during acute hypoxia are studied for the time that working capacity and active consciousness are preserved, and to establish the correlation between EEG changes and behavioral reactions under oxygen starvation. Changes in body functions and behavioral disturbances are related to the degree of oxygen saturation in the blood, to bioelectric activity of the brain, and to an increase in conditioned reflexes. The capacity for adequate reaction to external signals and for coordinated psychomotor activity after loss of consciousness returns to man after 30 seconds. Repeated effects of hypoxia produce changes in the physiological reactions of the body directed toward better adaptation to changing gaseous environments. G.G.

N75-14413* National Aeronautics and Space Administration, Washington, D.C.

STUDIES OF HYPOKINESIA IN ANIMALS TO SOLVE URGENT PROBLEMS OF SPACE BIOLOGY AND MEDICINE

S. Baranski, K. Bodya, V. Reklevska, L. Tomashevska, M. S. Gayevskaya, Ye. I. Ilina-Kakuyeva, G. Katsyuba-Ustiko, Ye. A. Kovalenko, L. M. Kurkina, E. S. Mailyan et al *In its* The Function of the Body and Factors of Space Flight (NASA-TT-F-15971) 1974 p 113-140 refs Transl. into ENGLISH from the book "Funktsiya Organizma i Faktory Kosmicheskogo Poleta" Moscow, Meditsina Press, 1974 p 81-94

CSCL 06S

The effects of hypokinesia on animals were studied by observing: (1) hormonal and mediator balance of the body; (2) gas exchange and tissue respiration; (3) protein content in skeletal muscles; (4) structure of skeletal muscles; and (5) function of skeletal muscles. Sharp limitation of motor activity causes interconnected processes of a dystropic and pathological character expressed as a reduction in the force of various muscle group with disturbance of velocity properties and motor coordination due to disturbances in the control link of the neuromuscular system. G.G.

N75-14414* National Aeronautics and Space Administration, Washington, D.C.

JUSTIFICATION OF PERMISSIBLE DOSES OF RADIATION DURING PROLONGED SPACE FLIGHTS

Yu. G. Grigoryev, Kh. Abel, V. Varteres, N. Nilolov, Z. Karpfel, and M. Prislichka *In its* The Function of the Body and Factors of Space Flight (NASA-TT-F-15971) 1974 p 141-145 Transl. into ENGLISH from the book "Funktsiya Organizma i Faktory Kosmicheskogo Poleta" Moscow, Meditsina Press, 1974 p 96-99

CSCL 06R

Maximum permissible radiation doses for astronauts are reported based on chronic radiation experiments with dogs and actual measurements during space flights. Observed were clinical conditions, peripheral blood and marrow, the state of the cardiovascular system, higher nervous activity, the state of the vestibular analyzer, the organ of vision, spermatogenic function and the ability to reproduce, the state of immunity and a number of biological indices in blood and tissues. The following maximum permissible doses are determined as preliminary values: 1 year of flight - 200 rem; 2 years of flight - 250 rem; 3 years of flight - 275 rem. G.G.

N75-14415* National Aeronautics and Space Administration, Washington, D.C.

STUDY OF A NUMBER OF BIOCHEMICAL INDICES OF THE BLOOD AND TISSUE OF DOGS AFTER PROLONGED GAMMA-RADIATION

I. Alers, E. Alersova, T. Praslichka, E. Mishurova, A. Sedlakova, Zh. Malatova, A. A. Akhunov, and B. A. Markelov *In its* The Function of the Body and Factors of Space Flight (NASA-TT-F-15971) 1974 p 145-151 Transl. into ENGLISH from the book "Funktsiya Organizma i Faktory Kosmicheskogo Poleta" Moscow, Meditsina Press, 1974 p 100-104

CSCL 06R

The glucose content in blood and the lipid content in serum and tissues of dogs exposed to chronic radiation for 3 and 5 years were studied. In tissues of these animals, the concentration of soluble DNA and DNA contained in DNP was studied in the spleen, lymph node (deep cervical node) and bone marrow of thigh bones. Results indicate that chronic gamma irradiation significantly changes concentrations of glucose in the blood, and that of several lipids in serum and tissues. A reduction in the concentration of DNP in tested organs reflects changes in the relative number of cells with various nuclear cytoplasmic ratios; most pronounced changes in biochemical indices occure in dogs exposed to chronic gamma radiation in doses of 125 rad per year. G.G.

N75-14416* National Aeronautics and Space Administration, Washington, D.C.

A STUDY OF IMMUNOLOGICAL REACTIONS IN DOGS EXPOSED TO PROLONGED CHRONIC RADIATION

I. V. Konstantinova, Yu. G. Grigoryev, B. A. Markelov, A. S. Skryabin, V. M. Zemskov, I. S. Vasilyev, Yu. K. Veysfeyler, and I. Iokai *In its* The Function of the Body and Factors of Space Flight (NASA-TT-F-15971) 1974 p 152-162 Transl. into ENGLISH from the book "Funktsiya Organizma i Faktory Kosmicheskogo Poleta" Moscow, Meditsina Press, 1974 p 104-111

CSCL 06R

Immunomorphological studies on dog tissues exposed to long term gamma irradiation show that the number of cells containing antibodies increased and that the blast transformation reaction was activated. Prolonged radiation did not cause a reliable change in the synthesis of nucleic acids in spleen cells. G.G.

N75-14417* National Aeronautics and Space Administration, Washington, D.C.

RADIOBIOLOGICAL EFFECTS OF HEAVY IONS AND PROTONS

N. I. Ryzhov, S. V. Vorozhtsova, Ye. A. Krasavin, T. Ye. Mashinskaya, N. Ya. Savchenko, B. S. Fedorov, V. F. Khlanonina, V. N. Shelegedin, L. Gut, L. Sabo et al *In its* The Function of the Body and Factors of Space Flight (NASA-TT-F-15971) 1974 p 163-173 Transl. into ENGLISH from the book "Funktsiya Organizma i Faktory Kosmicheskogo Poleta" Moscow, Meditsina Press, 1974 p 112-118

CSCL 06R

Radiobiological effects of heavy ions and protons are studied on cells of mammals, bacteria, viruses and DNA of bacteria. Results show that the dose effect dependence bears an exponential character; the reduction of RBE as LET of particle increases reflects the different character of microdistribution of absorbed energy in biological objects with different levels of biological organization. G.G.

N75-14418* National Aeronautics and Space Administration, Washington, D.C.

THE EFFECT OF SYNTHETIC HOMOPOLYMER POLY I:C ON THE SYNTHESIS OF NUCLEIC ACIDS, PROTEIN AND INTERFERON IN SPLEEN CELLS NORMALLY AND WITH RADIATION

Ye. N. Antropova, I. V. Konstantinova, B. B. Fuks, M. Ya. Talosh, and Yu. K. Veysfeyler *In its* The Function of the Body and Factors of Space Flight (NASA-TT-C-15971) 1974 p 174-184 Transl. into ENGLISH from the book "Funktsiya Organizma i Faktory Kosmicheskogo Poleta" Moscow, Meditsina Press, 1974 p 119-125

CSCL 06P

A comparative study is reported of the effect of the synthetic homopolymer poly I:C and Newcastle Disease virus on the synthesis of RNA, DNA, total protein and interferon in the spleen of nonradiated and radiated mice. In radiated animals, poly I:C and NDV had no stimulating effect on the synthesis of RNA; administration of both inducers to radiated mice did not significantly affect the content of lymphoid cellular elements in the spleen. However, while reduction of RNA synthesis, caused by radiation, also increases slightly under the effect of poly I:C and the virus, the synthesis of interferon in spleen cells and in the entire body is activated. G.G.

N75-14419* National Aeronautics and Space Administration, Washington, D.C.

INDIVIDUAL RADIOSENSITIVITY AND ITS DAILY VARIATIONS

Yu. N. Druzhinin, Yu. G. Grigoryev, G. N. Podluzhnaya, and M. Pospishil *In its* The Function of the Body and Factors of Space Flight (NASA-TT-F-15971) 1974 p 185-193 Transl. into ENGLISH from the book "Funktsiya Organizma i Faktory Kosmicheskogo Poleta" Moscow, Meditsina Press, 1974 p 126-130

CSCL 05R

The effectiveness of determining individual radiosensitivity of rats by total gas exchange measurements, studies of Na/K

content in urine, and the reaction of leukocytes to intra-abdominal administration of epinephrine, was studied. The most indicative results of predicting individual reaction to radiation were obtained by the leukocyte reaction to epinephrine load; however, changes in the leukocyte content of peripheral blood after epinephrine administration depended on the initial level during the day. G.G.

N75-14420* National Aeronautics and Space Administration, Washington, D.C.

DAILY RHYTHMS OF RADIOSENSITIVITY OF ANIMALS AND SEVERAL DETERMINING CAUSES

Yu. P. Druzhinin, T. S. Malyutina, V. M. Seraya, G. P. Rodina, A. Vatsek, and A. Rakova *In its* The Function of the Body and Factors of Space Flight (NASA-TT-F-15971) 1974 p 193-203 refs Transl. into ENGLISH from the book "Funktsiya Organizma i Faktory Kosmicheskogo Poleta" Moscow, Meditsina Press, 1974 p 131-139

CSCL 06R

Daily rhythms of radiosensitivity in rats and mice were determined by survival rates after acute total radiation at the same dosage at different times of the day. Radiosensitivity differed in animals of different species and varieties. Inbred mice exhibited one or two increases in radiosensitivity during the dark, active period of the day. These effects were attributed to periodic changes in the state of stem hematopoietic cells. G.G.

N75-14421* National Aeronautics and Space Administration, Washington, D.C.

THE TEMPORAL ORGANIZATION OF PROCESSES OF CELL REPRODUCTION AND ITS CONNECTION WITH RHYTHMS OF RADIOSENSITIVITY OF THE BODY

Yu. P. Druzhinin, Yu. A. Romanov, and A. Vatsek *In its* The Function of the Body and Factors of Space Flight (NASA-TT-F-15971) 1974 p 203-215 refs Transl. into ENGLISH from the book "Funktsiya Organizma i Faktory Kosmicheskogo Poleta" Moscow, Meditsina Press, 1974 p 139-147

CSCL 06R

Radiosensitivity of individual phases of the mitotic cycle was studied in synchronous cell cultures and in several biological objects. It was found that radiosensitivity changed essentially according to phases of the mitotic cycle, depending on the kind of cells, evaluation criteria and the radiation dosage. Tests on partially synchronized HeLa cell populations, according to the criterion of survival, showed them most sensitive during mitosis, as well as in later G sub 1- or early DNA-synthesizing stages. With radiation in doses of 300 rad, the proportion of surviving cells showed a sensitivity directly before DNA synthesis of approximately 4 times higher than the later S-phase and during the major portion of G sub 1- and G sub 2-periods. Sensitivity of cells in mitosis was approximately 3 times higher than in late G sub 1- and early S-phases. Author

N75-14422* National Aeronautics and Space Administration, Washington, D.C.

DEVELOPMENT AND CREATION OF CONDITIONS FOR THE RADIATION OF BIOLOGICAL OBJECTS WITH HIGH ENERGY PROTONS

V.P. Popov, A. I. Portman, M. A. Sychkov, A.V. Kolodkin, and I. Nikl *In its* The Function of the Body and Factors of Space Flight (NASA-TT-F-15971) 1974 p 216-226 Transl. into ENGLISH from the book "Funktsiya Organizma i Faktory Kosmicheskogo Poleta" Moscow, Meditsina Press, 1974 p 148-155

CSCL 06R

Depth distribution of an absorbed proton radiation dose was studied by both calculation and experimental methods on a cylindrical, homogeneous plexiglass phantom that represented the geometric form of a dog. The basis of the heterogeneous phantom was the natural skeleton of a dog, muscle tissue was simulated by a mixture of paraffin and silica filler, and lung tissue by gelatine capsules. Author

N75-14423* National Aeronautics and Space Administration, Washington, D.C.

PHYSICAL CONDITIONS FOR CONDUCTING RADIOBIOLOGICAL EXPERIMENTS IN BEAMS OF ACCELERATED PARTICLES WITH HIGH LINEAR ENERGY TRANSFER

Ye. I. Kudryashov, A. M. Marennyy, V. I. Popov, K. Aykhorn, and G. Ertsgreber *In its* The Function of the Body and Factors of Space Flight (NASA-TT-F-15971) 1974 p 226-236 Transl. into ENGLISH from the book "Funktsiya Organizma i Faktory Kosmicheskogo Poleta" Moscow, Meditsina Press, 1974 p 155-161

CSCL 06R

The design and construction of an accelerator to conduct radiobiological experiments is reported that uses aluminum filters to control the accelerated ion beam while preserving its stability, and a vacuum chamber to conduct the ion beam with the help of a collector through a lavsan exit port to the target. Depth distribution of the absorbed dose from a monodirectional ion beam is practically completely represented by the change in the energy spectrum of the biological object. G.G.

N75-14424* National Aeronautics and Space Administration, Washington, D.C.

ISOTOPE ALPHA IRRADIATORS FOR RADIOBIOLOGICAL RESEARCH

V. Drasher, Ye. I. Dudryashov, O. M. Meshcheryakova, and A. M. Marennyy *In its* The Function of the Body and Factors of Space Flight (NASA-TT-F-15971) 1974 p 236-246 Transl. into ENGLISH from the book "Funktsiya Organizma i Faktory Kosmicheskogo Poleta" Moscow, Meditsina Press, 1974 p 162-170

CSCL 06R

Radiation absorption is considered for the case where the isotopic alpha source, in the form of a flat disk, and the axially located biological object, also in the form of a flat disk, are separated by a layer of gas. Frequently the biological object is covered by a polymer film with minimal thickness for protection against radioactive contaminants. The energy of the alpha particle is calculated at the place where the absorbed dose is determined, taking into account loss of energy in air, film and tissue. The level of energy is determined by the specific loss in energy of the alpha particle arriving from the point source to a point at the biological subject. G.G.

N75-14425* National Aeronautics and Space Administration, Washington, D.C.

MICRODOSIMETRY AND THE RADIATION DANGER OF COSMIC RAYS

K. Gunter, V. Schultz, A. T. Gubin, Ye. Ye. Kovalev, and V. A. Sakovich *In its* The Function of the Body and Factors of Space Flight (NASA-TT-F-15971) 1974 p 247-258 Transl. into ENGLISH from the book "Funktsiya Organizma i Faktory Kosmicheskogo Poleta" Moscow, Meditsina Press, 1974 p 170-177

CSCL 06R

The radiation danger of space flights is due primarily to intensive proton fluxes accompanying solar flares and heavy multiple charged ions in galactic cosmic radiation. Evaluation of the biological effect of these kinds of rays is based on calculations of tissue dose, taking into account the formation of secondary radiation in shielding and tissue. The essential role in such calculations is played by the dependence of the factor of quality on linear energy transfer (LET) of these charged particles. Recommendations concerning the dependence of the quality factor on LET are based on radiobiological experiments carried out on many biological systems using various kinds of rays, including heavy ions with energies in the 1-10 Mev/nucleon range. Justification of the results of these experiments, as well as their extrapolation to other energies, requires development of a model description of the radiation effect of charged particles on biological microstructures. Author

N75-14426* National Aeronautics and Space Administration, Washington, D.C.
METHODOLOGICAL QUESTIONS OF CREATING TISSUE-EQUIVALENT PHANTOMS
A. V. Kolodkin, V. I. Popov, M. A. Sychkov, I. Nikl, M. Erdei, and O. Eyben *In its* The Function of the Body and Factors of Space Flight (NASA-TT-F-15971) 1974 p 258-272 refs Transl. into ENGLISH from the book "Funktsiya Organizma i Faktory Kosmicheskogo Poleta" Moscow, Meditsina Press, 1974 p 178-185
CSCL 06R

On the basis of analysis and generalization of literature data, the composition of tissue equivalent plastic was justified, parameters of a standard man were determined, plaster and metal forms were created for casting dummies, and an experimental model was produced from tissue equivalent material. Author

N75-14427* National Aeronautics and Space Administration, Washington, D.C.
PATHOGENETIC VALIDATION OF THE USE OF BIOLOGICAL PROTECTIVE AGENTS AND EARLY TREATMENT IN CASES OF RADIATION INJURY SIMULATING RADIATION EFFECTS UNDER SPACE FLIGHT CONDITIONS
V. D. Rogozkin, V. Varteres, L. Sabo, N. Groza, and I. Nikolov *In its* The Function of the Body and Factors of Space Flight (NASA-TT-F-15971) 1974 p 273-296 Transl. into ENGLISH from the book "Funktsiya Organizma i Faktory Kosmicheskogo Poleta" Moscow, Meditsina Press, 1974 p 186-202

In considering a radiation safety system for space flights, the various measures to protect man against radiation include drug prophylaxis. At the present time a great deal of experimental material has been accumulated on the prevention and treatment of radiation injuries. Antiradiation effectiveness has been established for sulfur- and nitrogen-containing substances, auxins, cyanides, polynucleotides, mucopolysaccharides, lipopolysaccharides, aminosaccharides, synthetic polymers, vitamins, hormones, amino acids and other compounds which can be divided into two basic groups - biological and chemical protective agents. Author

N75-14428* National Aeronautics and Space Administration, Washington, D.C.
THE BIOLOGICAL EFFECT OF PROLONGED RADIATION AND WAYS OF SELECTING NEW ANTI-RADIATION DRUGS EFFECTIVE IN THIS KIND OF RADIATION INJURY
V. D. Rogozkin, K. S. Chertkov, and I. Nikolov *In its* The Function of the Body and Factors of Space Flight (NASA-TT-F-15971) 1974 p 296-309 Transl. into ENGLISH from the book "Funktsiya Organizma i Faktory Kosmicheskogo Poleta" Moscow, Meditsina Press, 1974 p 202-211
CSCL 06R

The basic characteristics of prolonged radiation - increased tolerance of radiation injury - are attributed to cellular kinetics; as dose rate is reduced, the population rate is not disturbed, particularly that of stem cells which makes it possible for the organism to tolerate higher radiation loads. It is concluded that this effect makes approved radio protectors, whose effect contains an established cytostatic component, unsuitable for prolonged radiation. It is better to correct the stem pool formation process by either accelerating the proliferation of cells or limiting the effect of stimuli causing cells to lose colony forming properties. Author

N75-14429* National Aeronautics and Space Administration, Washington, D.C.
EXPERIMENTAL-CLINICAL VALIDATION OF THE USE OF AMITETRAVIT, ATP AND AUTOLOGOUS BONE MARROW IN RADIATION INJURIES CAUSED BY PROLONGED RADIATION
O. M. Atamanova, L. M. Vodyakova, N. I. Gvozdeva, S. A. Davydova, L. P. Ignasheva, V. D. Rogozkin, M. F. Sbitneva, L. M. Ostroumova, M. V. Tikhomirova, A. G. Fedotenkov et al *In its* The Function of the Body and Factors of Space Flight (NASA-TT-F-15971) 1974 p 310-334 refs Transl. into ENGLISH from the book "Funktsiya Organizma i Faktory Kosmicheskogo Poleta" Moscow, Meditsina Press, 1974 p 211-226
CSCL 06R

Experimental clinical studies show that early pathogenetic treatment against the effects of prolonged radiation includes amitetravit as a means of increasing natural radio resistance, ATP as protective therapeutic agent, and automyelotransplantation for early pathogenetic treatment. The high effectiveness of the combined use of ATP and amitetravit in tests on dogs indicates an ability to prevent primary damages to genetic structures and accelerated processes of reparation in the first stages of radiopathological processes. G.G.

N75-14430# California Univ., San Francisco.
ECOLOGICAL FACTORS INVOLVED IN MAINTAINING THE BIOZA OF THE ANTERIOR NARES OF MAN, 1968 - 1974 Final Report
Howard I. Maibach and Raza Aly 1974 11 p refs
(Grant NGR-05-025-008)
(NASA-CR-141248) Avail: NTIS HC $3.25 CSCL 06E

Several experiments were conducted to determine the types, quantities, and interactions of the organisms present in human nasal passages. Emphasis was placed on factors influencing the growth and persistence of staphylococcus in carriers and non-carriers. Results of the various experiments point to the following conclusions: (1) no difference in the nasal bacterial ecology allowing differentiation of carriers from non-carries was observed; (2) experimental infection of embryonated eggs has demonstrated that prior allantoic infection with viridans streptococci affords significant protection against subsequent challenge with virulent staphylococci; (3) S. aureus, S. pyogenes, and C. albicans are sensitive to the antimicrobial effect of skin surface lipids; and (4) not all individuals have the ability to destroy S. aureus on the skin. N.E.R.

N75-14431*# Public Health Service Hospital, San Francisco, Calif.
PREVENTION OF BONE MINERAL CHANGES INDUCED BY BED REST: MODIFICATION BY STATIC COMPRESSION SIMULATING WEIGHT BEARING, COMBINED SUPPLEMENTATION OF ORAL CALCIUM AND PHOSPHATE, CALCITONIN INJECTIONS, OSCILLATING COMPRESSION, THE ORAL DIOPHOSPHONATEDISODIUM ETIDRONATE, AND LOWER BODY NEGATIVE PRESSURE Final Report
Victor S. Schneider, Stephen B. Hulley, Charles L. Donaldson, John M. Vogel, Sheldon N. Rosen, David A. Hantman, Darrell R. Lockwood, Derald Seid, Kenneth H. Hyatt, and Lester B. Jacobson [1974] 55 p refs
(NASA Order T-81070)
(NASA-CR-141453) Avail: NTIS HC $4.25 CSCL 06E

The phenomenon of calcium loss during bed rest was found to be analogous to the loss of bone material which occurs in the hypogravic environment of space flight. Ways of preventing this occurrence are investigated. A group of healthy adult males underwent 24-30 weeks of continuous bed rest. Some of them were given an exercise program designed to resemble normal ambulatory activity; another subgroup was fed supplemental potassium phosphate. The results from a 12-week period of treatment were compared with those untreated bed rest periods. The potassium phosphate supplements prevented the hypercalciuria of bed rest, but fecal calcium tended to increase. The exercise program did not diminish the negative calcium balance. Neither treatment affected the heavy loss of mineral from the calcaneus. Several additional studies are developed to examine the problem further. N.E.R.

N75-14432# Medical Biological Lab. RVO-TNO, Rijswijk (Netherlands).
FURTHER STUDIES ON THE THERAPY OF ORGANOPHOSPHOROUS ANTICHOLINESTERASE INTOXICATION WITH VERATRINIC COMPOUNDS. THE ROLE OF CALCIUM
Victor J. Nickolson, Herma J. Clason-vanderWiel, and Otto L. Wolthuis 1974 27 p refs
(MBL-1974-17; TDCK-64560) Avail: NTIS HC $3.75

Experiments were carried out to investigate the role of calcium in soman intoxication with 9-anthroic acid (ANCA), a compound with veratrine-like pharmacological properties. The effects of ANGA on respiratory paralysis and on the calcium content of the blood and hind leg muscles were determined in anaesthetized, atropinized rats. The respiratory paralysis which occurs within a few minutes after soman injection can be delayed about 2.5 hours by treatment with ANCA. However it is concluded that this therapy falls short of completely preventing respiratory failure since ANCA causes an accumulation of calcium in the stimulated muscles of soman poisoned animals. ESRO

N75-14433# Medical Biological Lab. RVO-TNO, Rijswijk (Netherlands).
PITFALLS IN DETERMINATION OF ACETYLCHOLINE FROM BRAIN BY PYROLYSIS. GASCHROMATOGRAPHY/MASS SPECTROMETRY
R. L. Polak and P. C. Molenaar 1974 13 p refs Partly in ENGLISH and partly in DUTCH
(MBL-1974-18; TDCK-64633) Avail: NTIS HC $3.25

Gas chromatographic determination of acetylcholine (ACh) requires prior volatilization which can be achieved by demethylation of the quaternary N-atom with sodium benzenethiolate or by pyrolysis of a halide salt of ACh. During pyrolysis the halogen atom combines with a CH3-group which then leaves the N-atom. Experiments show that demethylation by pyrolysis is also suitable for the simultaneous determination of deuterium labelled variants of ACh by means of gas chromatography mass spectrometry. However, care must be taken that the samples do not contain appreciable amounts of choline, since exchange of deuterium labelled groups between ACh and choline during pyrolysis may yield erroneous results. Author (ESRO)

N75-14434# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
LIGHT PROFILES OF THE FOVEAL IMAGE OF A POINT SOURCE
J. J. Vos, J. Walraven, and A. VanMeeteren 1974 14 p refs
(Contract A72/KL/057)
(IZF-1974-22; TDCK-65254) Avail: NTIS HC $3.25

Intensity profiles are given, for various pupil sizes, for the foveal image of a white point source from the very image center to point far from it. These profiles were constructed from fundus reflectometric data on the point spread function below 5 min of arc, from glare studies on entoptic straylight beyond 1 deg, and from data on straylight artifacts in color induction in the region between. The results were also expressed in terms of the effective size of the foveal image and of the cornea to retina concentration factor. The latter quantity is often used in studies on laser damage. Author (ESRO)

N75-14435# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
THE ACTION SPECTRUM FOR RETINAL BURN: A LITERATURE COMPILATION
J. J. Vos 1974 14 p refs
(Contract A72/KL/057)
(IZF-1974-23; TDCK-65266) Avail: NTIS HC $3.25

The action spectrum for retinal burn is determined by the spectral transmittance of the ocular media and the spectral absorptance of the pigment layers of the fundus. Data on both components were collected from literature, and the resulting action spectrum is presented in tabular form. It is concluded that incandescent light remains below the danger limit up to 100 million troland retinal illumination. From these data the susceptibility of the retina to damage from laser radiation can be predicted. ESRO

N75-14436# Physics Lab. RVO-TNO, The Hague (Netherlands).
MEASUREMENT OF THE SPECTRAL IRRADIANCE OF AN ULTRAVIOLET HANDLAMP [METING VAN DE SPECTRALE BESTRALINGSSTERKTE VAN EEN ULTRA-VIOLET HANDLAMP]
M. Deutekom and J. vanSchie Aug. 1974 8 p In DUTCH; ENGLISH summary
(PhL-1974-26; TDCK-65201) Avail: NTIS HC $3.25

In order to assess whether eye irritation can be caused by using an ultraviolet handlamp to irradiate objects at a distance of 25 cm to observe fluorescence, the spectral irradiance was measured at this distance. The results of the measurement in the ultraviolet wavelength region are presented. The irradiance produced by the lamp is fairly high, and thus leads to the introduction of precautions. ESRO

N75-14437# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
ON THE FLUID DYNAMICS OF PROSTHETIC HEART VALVE FLOW: A PRELIMINARY NUMERICAL AND EXPERIMENTAL STUDY
Thomas J. Mueller (Notre Dame Univ.) Jun. 1974 35 p refs Sponsored in part by Indiana Heart Assoc., Notre Dame Univ., and Minna-James-Heineman Stifting
(VKI-TN-101) Avail: NTIS HC $3.75

The results of a numerical and experimental investigation of the steady flow through a fully open disk-type prosthetic heart valve in a circular tube are presented. While it appears that for this simple geometry the numerical approach offers important advantages over laboratory experiments at low Reynolds numbers, great care must be exercised in the choice of the numerical method. Furthermore, it is suggested that both numerical and laboratory experiments be performed as a check on each other. Author (ESRO)

N75-14438# Pennsylvania State Univ., University Park. Center for Air Environment Studies.
INFLUENCE OF ALTERED GASEOUS ENVIRONMENTS ON LUNG METABOLISM Final Progress Report, 1 Jun. 1973 - 31 May 1974
Rodney A. Rhoades Jul. 1974 31 p refs
(Grant AF-AFOSR-2559-73; AF Proj. 9777)
(AD-784908; CAES-Pub-374-74; AFOSR-74-1296TR) Avail: NTIS CSCL 06/19

Studies with isolated perfused rat lungs ventilated for 1.5 hr. at different oxygen tensions indicate that: Lactate production is inversely related to oxygen tension being significantly decreased with hyperoxia and significantly increased with hypoxia. Pyruvate production was not markedly affected with hypoxia. Glucose uptake is stimulated slightly with hypoxia, but the increase is not significant at the 5% level. Both glucose and palmitate utilization assessed by incorporation into total lipids, neutral lipids, phospholipids, PL - fatty acids, PL - glyceride glycerol, and oxidation to 14CO2 was not significantly altered by acute hypoxic stress. Pulmonary pressure showed a significant 31% increase during acute hypoxia; however, the presence of pulmonary edema was minimal. Acute hypoxic stress did not significantly affect lung glycogen content. Exposure to hypoxia for 24 hours, on the other hand, had a profound influence on the lung. Lactate production showed a significant 80% increase with the lactate-pyruvate ratio showing a 40% increase. Pyruvate production also showed a marked increase. Glucose uptake was significantly stimulated with 24 hour hypoxia. Glucose oxidation and incorporation into lung lipids were also significantly increased. (Modified author abstract) GRA

N75-14439# Battelle Pacific Northwest Labs., Richland, Wash. Biology Dept.
EFFECTS OF EXPOSURE TO PULSED MICROWAVES (RADAR) ON CENTRAL NERVOUS SYSTEM EXCITABILITY IN LABORATORY ANIMALS Final Report
Edward L. Hunt, Richard D. Phillips, and Nancy W. King 10 Oct. 1974 70 p refs
(Contract N00014-70-C-0197; NR Proj. 101-09)
(AD-786753) Avail: NTIS CSCL 06/18

A microwave bioeffects project was designed to develop reliable exposure methods and dose estimation procedures for use with laboratory animals to investigate potential effects on central nervous system (CNS) excitability. A resonating cavity exposure system, powered by a commercial 2.45 GHz pulsed magnetron, was developed and provided accurate control of the integral energy delivered multilaterally to the animal. A high

performance anechoic chamber facility, powered by a 2.88 GHz radar transmitter, pulsed with high peak power, provided plane wave irradiation. A biodosimetry method, based on latency for microwave-induced seizure, was developed for use in both systems for indexing exposure levels, for validating biophysical dosimetry measurements and for investigating effects of field geometry. (Modified author abstract) GRA

N75-14440# Bureau of Radiological Health, Rockville, Md.
BIOLOGICAL BASES FOR AND OTHER ASPECTS OF A PERFORMANCE STANDARD FOR LASER PRODUCTS
F. Alan Andersen Jul. 1974 29 p refs
(PB-235953/7; DHEW/FDA-75-8004) Avail: NTIS HC $3.75 CSCL 06R

The biological basis for a performance standard for laser products is found in the pattern of biological effects of light that can be considered as hazardous to human health and safety. From the pattern of known biological effects, a classification of laser emissions is made that define the relative hazard of the emissions. The result of the classification scheme is four classes of laser products in the proposed laser product performance standard which convey the risks associated with accessible emission as is now understood. GRA

N75-14441*# Scientific Translation Service, Santa Barbara, Calif.
INFLUENCE OF SPATIAL AND ENERGISTIC FACTORS ON A VISUAL FIELD OF AN OPERATOR
V. A. Yekimov and V. M. Mironov Washington NASA Dec. 1974 13 p Transl. into ENGLISH from Vop. Psikhologii (USSR), v. 18, no. 5, 1974 p 124-128
(Contract NASw-2483)
(NASA-TT-F-16081) Avail: NTIS HC $3.25 CSCL 05E

The influence of spatial and energistic factors upon the visual field of an operator was studied as a function of the angle of view under the influence of the following factors: dimensions of the recording, its brightness, color, and external illumination. Author

N75-14442*# Scientific Translation Service, Santa Barbara, Calif.
THE HYGIENIC BASIS OF STANDARDS OF ILLUMINATION. TYPES OF VISUAL FATIGUE
S. V. Kravkov Washington NASA Dec. 1974 18 p refs Transl. into ENGLISH from the book "In Glaz i Ego Rabota" Moscow, Medgiz, 1945 p 331-339
(Contract NASw-2483)
(NASA-TT-F-16066) Avail: NTIS HC $3.25 CSCL 05E

An evaluation is made of eye fatigue over a long working period under given lighting conditions. Methods of measuring visual fatigue and the resultant data are discussed. It is found that the method of optical ergography is not very sensitive. Author

N75-14443*# Stanford Univ., Calif. Electronics Labs.
BIOELECTRIC SIGNAL ANALYSIS AND MEASUREMENT Final Technical Report
David C. Lai Jan. 1975 32 p refs
(Grant NGR-05-020-575)
(NASA-CR-141168) Avail: NTIS HC $3.75 CSCL 06D

Nonstationary time series techniques are used to analyze EEG signals for the estimation of alertness. A time varying order is extracted in sequential time series measurement of these data and strategies are devised for obtaining optimal representation of the EEG signal. Author

N75-14444*# Florida Univ., Gainesville. Dept. of Psychology.
ELECTROENCEPHALOGRAPHIC STUDIES OF SLEEP Final Report, 1 Jan. - 31 Dec. 1974
W. B. Webb and H. W. Agnew, Jr. 10 Jan. 1975 7 p refs
(Grant NGR-10-005-057)
(NASA-CR-141144) Avail: NTIS HC $3.25 CSCL 06S

Various experimental studies on sleep are described. The following areas are discussed: (1) effect of altered day length on sleep, (2) effect of a partial loss of sleep on subsequent nocturnal sleep; (3) effect of rigid control over sleep-wake-up times; (4) sleep and wakefulness in a time-free environment; (5) distribution of spindles during a full night of sleep; and (6) effect on sleep and performance of swiftly changing shifts of work. J.M.S.

N75-14445# Army Combat Developments Experimentation Command, Fort Ord, Calif.
NIGHT NAP-OF-THE EARTH FLIGHT TRAINING
Frederick A. Isgrig and Paul R. Best, Jr. 1973 15 p
(AD-785635) Avail: NTIS CSCL 05/9

The paper discusses the exploratory evaluation of training requirements and performance expectations for night tactical operations by conventionally equipped attack helicopter teams. (Modified author abstract) GRA

N75-14446*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
HUMAN FACTORS CONSIDERATIONS FOR THE USE OF COLOR IN DISPLAY SYSTEMS
Sylvester A. DeMars 5 Jan. 1975 36 p refs
(NASA-TM-X-72196; TR-1329) Avail: NTIS HC $3.75 CSCL 05E

Identified and assessed are those human factor considerations impacting an operator's ability to perform when information is displayed in color as contrasted to monochrome (black and white only). The findings provide valuable guidelines for the assessment of the advantages (and disadvantages) of using a color display system. The use of color provides an additional sensory channel (color perception) which is not available with black and white. The degree to which one can exploit the use of this channel is highly dependent on available display technology, mission information display requirements, and acceptable operational modes. Author

N75-14447*# Western Michigan Univ., Kalamazoo.
THE EFFECTS OF SIMULTANEOUS BUT UNEQUAL RESPONSE-INDEPENDENT PAY TO PAIRS OF HUMAN SUBJECTS ON MASSETER EMG AND BODILY MOVEMENTS M.S. Thesis
David M. Keenan Aug. 1974 38 p refs
(Grant NGR-23-014-002; Contract N00014-70-A-0183-0001; Grant NSF GB-33620X)
(NASA-CR-141286) Avail: NTIS HC $3.75 CSCL 05E

Electromyographic activity and bodily movement of the masseter muscle were recorded in three pairs of human subjects, where one member of each pair was systematically presented with greater pay and each could reduce the value of money received by the other. The number of biting responses was as high or higher for the subject receiving less money immediately after coin delivery. However, the number of masseter contractions for the subject receiving more money remained higher at other times during the unequal pay conditions. No responses of pay reduction were emitted by any subject toward another. Author

N75-14448*# Kalamazoo State Hospital, Mich. Research Dept.
THE MEASUREMENT AND FACILITATION OF COOPERATIVE TASK PERFORMANCE Final Report, 1 Feb. 1974 - 31 Jan. 1975
Ronald R. Hutchinson 13 Jan. 1975 20 p refs
(NASA-CR-141285; Grant NGR-23-014-002) Avail: NTIS HC $3.25 CSCL 05J

Experiments were conducted to determine under what conditions jaw clenching will occur in humans as a response to stress exposure. The method for measuring reactions to stress involves a series of electrical recordings of the masseter and temporalis muscles. A high fixed-ratio response requirement in the first series of experiments shows that jaw clenching in humans occurs in situations analogous to those which produce biting in infrahuman subjects. In the second series, reduction in the amounts of money recieved by subjects is shown to cause increases in the jaw clench response and other negative effect motor behaviors. The third series demonstrates that perception of more favorable conditions existing for another person can increase anger and hostility in the subject. N.E.R.

N75-14449# Civil Aeromedical Inst., Oklahoma City, Okla.
ADAPTATION TO VESTIBULAR DISORIENTATION. 12: HABITUATION OF VESTIBULAR RESPONSES: AN OVERVIEW
William E. Collins Mar. 1974 41 p refs
(AD-780562; FAA-AM-74-3) Avail: NTIS HC $3.75

The possibility is investigated of abolishing or reducing undesired vestibular responses (inaccurate experiences of motion and eye movements which could blur vision) by repeated exposure to appropriate stimulus conditions. Relevant research is reviewed, with emphasis on activity and responses from the semicircular canals of the vestibular system. Methodological problems are presented briefly and the influence of arousal on vestibular responses is detailed. Data obtained from animals and from man are treated separately. Author

N75-14450# Commissariat a l'Energie Atomique, Grenoble (France).
ACQUISITION AND PROCESSING METHOD FOR HUMAN SENSORIAL, SENSITIVE, MOTORY, AND PHONATORY CIRCUITS REACTION TIMES Ph.D. Thesis - Univ. (Sci. et Med.)
C. Doche Jun. 1974 120 p refs In FRENCH
(CEA-R-4534) Avail: AEC Depository Libraries HC $9.00

Steps taken to measure the precise reaction of human sensorial, sensitive, motory, and phonatory circuits are explained. Methods are also proposed for the determination and treatment of latent reaction problems in the sensory circuits.
Transl. by E.H.W.

N75-14451# Gesellschaft fuer Kernforschung m.b.H., Karlsruhe (West Germany).
HUMAN OPERATOR CHARACTERISTICS AND CAPABILITIES IN PERFORMING PROCESS CONTROL TASKS
K. Etschberger and R. Zimmermann Jan. 1974 27 p refs In GERMAN
(KFK-PDV-19) Avail: AEC Depository Libraries HC $4.50

The integration of relevant human behavior traits and human capabilities for improved control of technological processes is considered. Transl. by G.G.

N75-14452# Institut fuer Informationsverarbeitung in Technik und Biologie, Karlsruhe (West Germany).
ANALYSIS OF TWO-DIMENSIONAL BIOLOGICAL RECEIVER SYSTEMS USING DETECTION EXPERIMENTS [ANALYSE FLAECHENHAFTER BIOLOGISCHER EMPFANGSSYSTEME MIT HILFE VON DETEKTIONSEXPERIMENTEN]
D. Paul Bonn Bundeswehramt 1974 104 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Verteidigung
(BMVG-FBWT-74-4) Avail: NTIS HC $5.25; Bundeswehramt 30 DM

Analytical methods were developed for the identification of the structure of sense organs with two-dimensional receptor arrays, i.e. linear receptors and axisymmetric coupling functions, and nonlinear receptor systems and nonaxisymmetric coupling functions. These methods were applied to experimental studies on the human visual system and the electric organ of the weakly-electric fish gnathonemus. During the experiments these biological receiver systems were forced to operate in the mode of binary signal detection; the examined sense organs had to determine whether a certain signal was present or not. The result of the studies is a decision rule which quantitatively describes the behavior of the system with respect to the detection task. Author (ESRO)

N75-14453# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
A PSYCHOLOGICAL EXPLANATION OF SONAR DEGRADATION
W. A. Wagnaar, A. A. Bunt, and L. W. M. Spiekman 1974 9 p refs In DUTCH; ENGLISH summary
(Contract A73/KM/032)
(IZF-1974-10; TDCK-64281) Avail: NTIS HC $3.25

Sonar degradation is discussed for the situation in which sonar operators perform better in an experimental than operational situation. These situations are psychologically different. In the experimental situation there is neither time nor signal uncertainty (cueing condition), whereas the reverse is the case in an operational situation (noncueing condition). Moreover, vigilance aspects can be attributed to the latter situation, since operators have to wait a long time for the next critical series of signals. This consideration was illustrated by a simple experiment in which there were no vigilance aspects. In the noncued situation, the results indicate that cueing was better than non-cueing performance. It is shown that the difference would have been even larger if the noncueing task had been a realistic vigilance task. It appears that a psychological explanation of the sonar degradation phenomenon is plausible. ESRO

N75-14454# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
AMPHETAMINE AND BARBITURATE EFFECTS ON TWO TASKS PERFORMED SINGLY AND IN COMBINATION
C. L. Truijens, D. A. Trumbo, and W. A. Wagenaar 1974 21 p refs
(IZF-1974-11; TDCK-64575) Avail: NTIS HC $3.25

The effects of amphetamine and barbituate on the performance of two specific tasks were investigated. The two tasks are identified as randomization and pursuit tracking. The subjects performed the tasks both separately and simultaneously. During randomization, both the barbituate and a secondary task resulted in a shift toward repetition. Amphetamine had the opposite effect. Barbituate and a secondary task produced higher error scores during pursuit tracking tests. Amphetamine produced a lower score during pursuit tracking. No interaction between drug treatment and single versus dual tasks occurred during randomization or tracking tests. It was concluded that drugs and dual tasks affect different stages of information processing. ESRO

N75-14455# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
COLORIMETRIC AND PHOTOMETRIC PROPERTIES OF A 2 DEG FUNDAMENTAL OBSERVER
J. J. Vos 1974 21 p refs
(IZF-1974-12; TDCK-64576) Avail: NTIS HC $3.25

Chromaticity data, color matching functions, and receptor system primaries were tabulated for a two degree fundamental observer. These tables are the result of combining data from various sources, they are intended as complementary tables to those published by the International Commission on Illumination. ESRO

N75-14456# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
SOME REMARKS ON USING CLEAR VISORS DURING NIGHT FLIGHTS IN THE ALOUETTE 3
J. Walraven 1974 6 p In DUTCH; ENGLISH summary
(Contract A73/KLu/076)
(IZF-1974-13; TDCK-64630) Avail: NTIS HC $3.25

Wearing an (obligatory) clear visor during night flights in the Alouette III may cause, according to complaints from some pilots, visual discomfort because of reflections from the rim of the visor. It was verified that these reflections cause no reduction of visual functions but that the visibility of the rim might indeed cause some hindrance, particularly during landing operations. Three solutions are suggested: (1) beveling and polishing the rim of the visor, causing a noticeable reduction reflections; (2) using safety glasses; and (3) withdrawing the regulation, at least under the given circumstances, that helicopter pilots should wear the clear visor. Author (ESRO)

N75-14457# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
THE IW-TNO SIMULATOR. AN INVESTIGATION OF ROTATION SENSATION
M. L. Toppinga 1974 97 p refs In DUTCH; ENGLISH summary Sponsored by Res. Inst. for Road Vehicles TNO

(IZF-1974-16; TDCK-64715) Avail: NTIS HC $4.75

The simulation of acceleration and deceleration time functions, as experienced during automobile driving, was investigated by means of a moving base simulator based on a swing construction. In addition, rotation accelerations, generated as a by-product by the proposed simulator, were examined. Two simultaneous differential equations for swing excursion and liquid rotation in a semicircular channel were treated, using Laplace techniques, while applying an acceleration function with a variable slope. Computations were carried out to determine liquid rotation functions versus time, which were compared to experimental threshold values, taking into account threshold raising effects for an existing driving task. It is concluded that a driver in a swing type moving base simulator will most probably undergo realistic acceleration sensations. ESRO

N75-14458# Institute for Perception RVO-TNO, Soesterberg (Netherlands).

ERGONOMICS FOR COMMAND AND CONTROL ROOMS

H. J. Leebeek 1974 74 p refs In DUTCH; ENGLISH summary

(IZF-1974-17; TDCK-65078) Avail: NTIS HC $4.25

Optimal arrangements and shaping for command and control rooms with regard to human factors engineering are summarized. Some of the aspects are the arrangement of equipment, color and lighting specifications, wall finishing, and effects occurring when looking through windows. The utilization of display scopes, computer terminals, systems, etc., is discussed. An effort is made to provide specifications for direct use in practical situations. ESRO

N75-14459# Institute for Perception RVO-TNO, Soesterberg (Netherlands).

SOME EFFECTS OF ACTH 4-10 ON PERFORMANCE DURING A SERIAL REACTION TASK

A. W. K. Gaillard and A. F. Sanders 1974 21 p refs Sponsored by NV Organon

(IZF-1974-19; TDCK-65253) Avail: NTIS HC $3.25

A group of 18 subjects, 9 injected with ACTH 4-10 and 9 with placebo, worked continuously during 30 minutes in a self paced reaction task. The test group showed a larger improvement in reaction time than the control group. This effect disappeared in a short retest. Results suggest that the peptide has no effect on skill acquisition but counteracts building up of reactive inhibition, i.e. suppresses decrease in motivation occurring during continuous performance. ESRO

N75-14460# Institute for Perception RVO-TNO, Soesterberg (Netherlands).

THE EFFECTS OF ACTH 4-10 ON A SERIAL LEARNING AND A SHORT-TERM RETENTION TASK

A. A. Bunt and A. F. Sanders 1974 9 p refs Sponsored by NV Organon

(IZF-1974-21; TDCK-65252) Avail: NTIS HC $3.25

The effects of ACTH on serial learning of a list of single words and on short term retention of lists of known and unknown length were tested by two separate double blind studies. ACTH slows down the rate of serial learning. In the short term retention test an effect of ACTH was found only when the list length was unknown. ACTH had a negative effect on the recall of the list position which has to be reproduced first. This suggests that ACTH operates negatively on temporal recency cues which are supposed to mediate retrieval under the conditions of the experiment. ESRO

N75-14461# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Bad Godesberg (West Germany). Inst. fuer Flugmedizin.

BEHAVIOR OF CIRCADIAN RHYTHM OF TEMPERATURE AND PERFORMANCE AFTER TWO SUBSEQUENT TRANS-ATLANTIC FLIGHTS Ph.D. Thesis - Bonn Univ. [DAS VERHALTEN DER TAGESRHYTHMIK VON KOERPERTEMPERATUR UND LEISTUNG NACH ZWEI TRANSATLANTIK-FLUEGEN IN RASCHER FOLGE]

Raimund Haske 18 Jul. 1974 52 p refs In GERMAN; ENGLISH summary

(DLR-FB-74-55) Avail: NTIS HC $4.25; DFVLR, Porz, West Ger. 21,20 DM

Circadian rhythms of temperature and performance were studied in 8 students in 3-hour-intervals during periods of 24 hours after a jet flight from Germany to the U.S. and vice versa with a stay of 24 hours in the U.S. Two 24-hour preflight periods revealed the basic normal daily rhythm of temperature and performance. The effects of a 6 hour time shift after the 24-hour stay in the U.S. were evaluated by determining temperature and performance parameters on day 1, 3, and 5 following the flights. A considerable desynchronization with local time was observed after flights. The subsequent resynchronization time amounted up to 3 to 5 days in Germany. Author (ESRO)

N75-14462# Institut Franco-Allemand de Recherches, St. Louis (France).

INFLUENCE OF A PRECURSOR NOISE ON THE STARTLE DUE TO IMPULSE NOISE (WEAPON NOISE) [INFLUENCE D'UN BRUIT PRECURSEUR SUR LE SURSAUT DU A UN BRUIT IMPULSIONNEL (BRUIT D'ARME)]

A. Dancer, R. Franke, and G. Chatelier (LEMP) 7 Aug. 1973 32 p refs In FRENCH

(ISL-20/73) Avail: NTIS HC $3.75

The startle following an impulse noise due to an electric detonation is considerably reduced when the impulse noise is preceded by a white noise of sufficiently long duration (about 750 ms) and 25 dB intensity. The results from a target aiming experiment also show an improvement in performance and accelerated acclimatization. ESRO

N75-14463# Institut Franco-Allemand de Recherches, St. Louis (France).

SONIC BOOMS EFFECTS ON SLEEP [EFFETS DU BANG SONIQUE SUR LE SOMMEIL]

G. Jansen (Essen Univ.) 16 Jan. 1974 37 p Transl. into FRENCH from Beeinflussung des Nachtschlafs durch den Flugzeugknall In FRENCH

(Contract DRME-72/693)

(ISL-2/74) Avail: NTIS HC $3.75

The EEC and peripheral circulation modifications induced by sonic booms during human sleep are presented. Experiments were performed during two periods of 19 and 43 days at the rate of 2 to 4 sonic booms per night, sound pressure between 67 and 77 db (A), duration 300 ms, and pressure intensity 1 mbar. Experiments were performed during low EEG frequency periods (deep sleep). A significant and regular increase of electrical activity was demonstrated with no habituation together with significant and regular decrease of peripheral circulation. During low frequency EEG activity the induced perturbation duration and intensity increases. The reduction of the onset of deep sleep stage 3 was compensated by subsequent sleep. No overall modification of sleep characteristics was possible nor was any relationship derived between sleep deepness and neuronic activity. Indeed a constant sound pressure level in the room was impossible to maintain. ESRO

N75-14464# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

FREQUENCY DISCRIMINATION AS A FUNCTION OF THE NUMBER OF PERIODS OF THE SIGNAL PRESENTED

Thomas J. Moore Aug. 1974 15 p refs

(AF Proj. 7233)

(AD-786457; AMRL-TR-74-62) Avail: NTIS CSCL 05/10

The present experiment attempted to determine how frequency discrimination improved as a function of the number of periods of the signal presented. Performance was found to improve in the same manner for frequencies from 100 to 8000 Hz and discrimination was maximized for all frequencies at about the same number of periods. The argument was made that the results could best be explained by postulating that the auditory system accomplishes frequency discrimination by means of a phase frequency analysis mechanism. Author (GRA)

N75-14465# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
HUMAN FACTORS IN ENGINEERED SYSTEMS: WHERE THE (INTER) ACTION IS
Julien M. Christensen Sep. 1974 23 p refs
(AF Proj. 7184)
(AD-785214; AMRL-TR-74-98) Avail: NTIS CSCL 05/10

A view is presented on motivation and self actualization incentives as a means of engineering humans to their best performance on the job. GRA

N75-14466# Army Edgewood Arsenal, Md.
THE EFFECT OF SOUND ON MAN (SELECTIVE ANNOTATED BIBLIOGRAPHY, 1965 - 1972 Technical Report, Sep. - Dec. 1972
K. A. Zych Sep. 1974 28 p refs Sponsored in part by HDL
(DA Proj. 1W5-62606-AD-16)
(AD-785525; EB-TR-74020) Avail: NTIS CSCL 06/21

The literature on the effects of sound on man was reviewed for the years 1965-1972. The purpose of the review was to identify the aversive properties of sound which might be exploited in the development of nonlethal (and non-permanently-damaging) weapon systems. The results suggest that, although parameters such as frequency, wave form, and sound pressure level do affect human behavior, further experimental work is needed in the analysis and synthesis of aversive sounds before significant short-term behavioral changes are possible. Author (GRA)

N75-14467*# Life Systems, Inc., Cleveland, Ohio.
ELECTROCHEMICAL CARBON DIOXIDE CONCENTRATOR SUBSYSTEM MATH MODEL Final Report
R. D. Marshall, J. N. Carlson, and F. H. Schubert Sep. 1974 210 p refs
(Contract NAS2-6478)
(NASA-CR-137565; LSI-ER-220-6) Avail: NTIS HC $7.25 CSCL 06K

A steady state computer simulation model has been developed to describe the performance of a total six man, self-contained electrochemical carbon dioxide concentrator subsystem built for the space station prototype. The math model combines expressions describing the performance of the electrochemical depolarized carbon dioxide concentrator cells and modules previously developed with expressions describing the performance of the other major CS-6 components. The model is capable of accurately predicting CS-6 performance over EDC operating ranges and the computer simulation results agree with experimental data obtained over the prediction range. Author

N75-14468*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TESTS OF PROTECTIVE CLOTHING FOR THE SAFE HANDLING OF PRESSURIZED LAMPS
John G. Ewashinka Washington Jan. 1975 20 p ref
(NASA-TM-X-3147; E-7933) Avail: NTIS HC $3.25 CSCL 06Q

Tests were made to find a clothing material combination for use in handling high-pressure lamps. Monofilament nylon, ballistic nylon, and ballistic felt grouped into various multilayer combinations and chromed leather were positioned around and 30 cm (12 in.) away from exploding high-pressure lamps of different manufacturers and wattages. The results are: (1) 5024 nylon/ballistic felt/5024 nylon in a layered configuration was not penetrated by fragments of lamps as large as 6.5 kW; (2) this layered combination is lightweight and pliable and offers greater mobility and comfort to the user than previous protective clothing; and (3) Lexan plastic 1.6 mm (1/6 in.) thick to be used for face shield material showed no penetration for lamps as large as 20 kW. Author

N75-14469# Centraal Instituut voor Voedingsonderzoek TNO, Zeist (Netherlands).
PRESERVING TESTS WITH OILS AND FATS IN THE FIRA-ASTELL OXYGEN ABSORPTION APPARATUS 1 [HOUDBAARHEIDSPROEVEN MET OLIEN EN VETTEN IN HET FIRA-ASTELL OXYGEN ABSORPTION APPARATUS 1]
C. Vinkenborg, comp. and H. Haman, comp. Aug. 1974 12 p In DUTCH
(R-4439; TDCK-65122) Avail: NTIS HC $3.25

First results of tests with the Fira-Astell oxygen absorption apparatus for determining the keeping qualities of oils and fats are presented. Tests were carried out with fats and soybean oil; results correlated with complicated swift and/or scale tests. ESRO

N75-14470# School of Aerospace Medicine, Brooks AFB, Tex.
OXYGEN CONTAMINANT DETECTION: PROCEDURES FOR FIELD ANALYSIS OF AVIATOR'S BREATHING OXYGEN Interim Report, Oct. 1972 - Oct. 1973
Walter L. Crow and Kenneth G. Ikels Sep. 1974 39 p ref
(AF Proj. 7164)
(AD-786916; SAM-TR-74-24) Avail: NTIS CSCL 01/2

Until recently, no instrument displayed the sensitivity, stability, and portability necessary for on-site field analysis of trace contaminants in aviator's breathing oxygen (ABO). A solid-state portable infrared gas analyzer became commercially available in 1971, which led to development of an instrument package capable of analyzing ABO at the base level. Procedures for field analysis of ABO are given as a guide for Air Force personnel using the ABO contaminant detector system developed by USAFSAM. Author (GRA)

N75-14471# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
HEARING PROTECTION OF EARMUFFS WORN OVER EYEGLASSES Final Report
Charles W. Nixon and W. C. Knoblach Jun. 1974 32 p refs
(AF Proj. 7231)
(AD-785386; AMRL-TR-74-61) Avail: NTIS CSCL 06/17

The hearing protection ordinarily provided by earmuffs is reduced when worn by persons who also wear eyeglasses because sound enters the device through air leaks around the eyeglass temple - earmuff cushion interface. This study examined the acoustic fit of different earmuff protectors and various types of eyeglass frames found in a population, measured the loss of attenuation due to programmed air leaks and measured differences in earmuff protection for subjects while wearing and not wearing eyeglasses. Results demonstrated that earmuffs worn over eyeglasses lose from 1 db to 10 db of attenuation at individual frequencies. The amount of loss is related to type of earmuff, type of eyeglasses as well as frequency of the sound. Two remedial approaches were identified as authorizing for use by eyeglass wearers only earmuffs that demonstrate by test satisfactory sound protection with eyeglasses, and the use of an insert or pad at the eyeglass temple - earmuff cushion interface to minimize and eliminate the acoustic leak. Author (GRA)

N75-15261*# Food and Drug Administration, Cincinnati, Ohio. Div. of Microbiology.
ECOLOGY AND THERMAL INACTIVATION OF MICROBES IN AND ON INTERPLANETARY SPACE VEHICLE COMPONENTS Quarterly Progress Report
J. E. Campbell, A. L. Reyes, A. J. Wehby, R. G. Crawford, J. C. Wimsatt, and J. T. Peeler Oct. 1974 10 p
(NASA Order W-13411)
(NASA-CR-141122; QPR-37) Avail: NTIS HC $3.25 CSCL 06M

Dry heat sterilization of spacecraft was investigated by studying the production of spore crops, and thermal inactivation of the spores, and bacillus subtillus. Spore assays were made by conventional plate count methods, and survival curves for the spores are presented. The results indicate that the inherent resistance of spores from a parent cell can be maintained. F.O.S.

N75-15262*# Texas Univ., Houston. Dept. of Biomathematics.
[METHOD AND DATA EVALUATION AT NASA ENDOCRINE LABORATORY] Final Report, 1 Jul. 1972 - 30 Nov. 1974
Dennis A. Johnston Dec. 1974 9 p refs
(Contract NAS9-13042)
(NASA-CR-141469) Avail: NTIS HC $3.25 CSCL 06A

The biomedical data of the astronauts on Skylab 3 were analyzed to evaluate the univariate statistical methods for comparing endocrine series experiments in relation to other medical experiments. It was found that an information storage and retrieval system was needed to facilitate statistical analyses. M.J.S.

N75-15263*# Techtran Corp., Glen Burnie, Md.
DOES IMMOBILIZATION AND PRESSURE BEARING OF A JOINT RESULT IN OSSIFICATION IN AN ANIMAL EXPERIMENT?
K. Walcher and H. Stuerz Washington NASA May 1974 47 p refs Transl. into ENGLISH from Arch. Orthopaed. Unfallchir. (West Germany), v. 71, May 1971 p 216-247
(Contract NASw-2485)
(NASA-TT-F-15562) Avail: NTIS HC $3.75 CSCL 06S

In an animal experiment the complete immobilization and a pressure bearing applied in doses results in a progressive joint-change which leads to an ossification of the joint if the experiment is extended up to 6 months and the compression on the joint has reached and exceeded the limit of the mechanical pressure capacity of the articular cartilage. The transfixion of the knee-joint of a rabbit with the aid of a pressure bolt enabled the application of compressions up to 24 kp which produced pressures on the cartilage of up to 120 kp/sq cm. Five or six joints having been exposed to this pressure bearing showed a through-ossification while of 9 less compressed joints only in 2 cases an ossified ankylosis of the joint was beginning or just in progress. Author

N75-15264*# Smithsonian Institution, Washington, D.C.
SATELLITE ANIMAL TRACKING FEASIBILITY STUDIES Final Report, 31 Dec. 1974
Helmut K. Buechner 8 Jan. 1975 16 p
(Grant NGR-09-015-163)
(NASA-CR-141134) Avail: NTIS HC $3.25 CSCL 06C

A study was initiated in Tsavo National Park to determine movements and home ranges of individual elephants and their relations to overall distribution patterns and environmental factors such as rainfall. Methods used were radio tracking and observations of visually identifiable individuals. Aerial counts provided data on overall distribution. Two bulls and two cows were radio-tagged in Tsavo West and two bulls and four cows in Tsavo East, providing home range and movement data. The movements of individuals were useful in interpreting relatively major shifts in elephant distribution. Results point to the following preliminary conclusions: (1) elephants in the Tsavo area undertook long distance movements in fairly direct response to localized rainfall; (2) a subdivision of the overall population into locally distinct units may exist during the dry season but did not occur after significant rainfall; and (3) food appears to be the primary factor governing movements and distribution of elephants in the area. Author

N75-15265# National Research Council of Canada, Ottawa (Ontario).
SECONDARY EFFECTS OF SYNERESIS ON THE GAS METABOLISM OF CRUSTACEOUS LICHENS
A. Ried 1974 31 p refs Transl. into ENGLISH from Biol. Zentral., (E. Ger.) v. 79, no. 6, 1960 p 657-678
(NRC-TT-1776) Avail: NTIS HC $3.75

Experiments were carried out on crustaceous lichens to study the affect of the secondary effects of syneresis on the ecological limits of propagation. Factors found to be responsible for lichen zones on the shores of brooks and lakes are: (1) variation in the syneresis conditions from one; and (2) differences in the syneresis resistance of the inhabitants of the flood zone. Results show that (1) only in rare cases could periods of dehydration of the degree found in climatic conditions directly lead to the death of lichen; (2) the reversible secondary effects of syneresis may cause the metabolic balance of lichens to become negative; and (3) moisture and precipitation conditions in the habitat are of critical importance for the propagation of the lichens. J.M.S.

N75-15266*# California Univ., Berkeley. School of Public Health.
POSSIBILITY OF GROWTH OF AIRBORNE MICROBES IN OUTER PLANETARY ATMOSPHERES
R. L. Dimmick and M. A. Chatigny [1975] 35 p refs Sponsored in part by ONR Prepared in cooperation with Naval Biomedical Research Lab.
(Contract NASA Order W-13450)
(NASA-CR-141958) Avail: NTIS HC $3.75 CSCL 06M

It is shown that airborne bacteria can maintain metabolic functions in a suitable atmosphere. It is theorized that particles in the Jovian atmosphere would have physical half-lives of 10 to 1500 years, depending upon which of two turbulent models is chosen. Author

N75-15267# Commission of the European Communities, Brussels (Belgium).
PROGRAMME BIOLOGY: HEALTH PROTECTION Annual Report, 1973
1973 794 p refs In DANISH, GERMAN, ENGLISH, FRENCH, ITALIAN, and DUTCH
(EUR-5138) Avail: AEC Depository Libraries HC $42.75

The 1971 to 1975 program on biology and health protection was adapted to the situation of 3 new states. The program includes a radiation protection (common program) sector and an applications (supplementary program) sector whose fields of research and objectives include measurement and evaluation of the radiation exposure of man and the various components of the ambient environment to ionizing radiation, such as radiation measurements and their interpretation and the study of the transfer and accumulation of radionuclides in the constituents of the environment and in man. Research summaries and lists of publications are included. Author (NSA)

N75-15268# Oak Ridge National Lab., Tenn.
ENVIRONMENTAL SCIENCES DIVISION PUBLICATIONS 1-500: AN ABSTRACTED, INDEXED BIBLIOGRAPHY
Mar. 1974 177 p refs
(Contract W-7405-eng-26)
(ORNL-TM-4545) Avail: NTIS HC $7.00

Indexes are provided by author, keywords, and publication description. Author (NSA)

N75-15269# Louisiana State Univ., New Orleans. Dept. of Surgery.
ANTIBACTERIAL EFFECTS OF HYPERBARIC OXYGEN Final Report, 1 May 1966 - 30 Sep. 1974
George H. Bornside 30 Sep. 1974 15 p refs
(Contract N00014-66-C-0189; NR Proj. 136-664)
(AD-785860) Avail: NTIS CSCL 06/13

The research was concerned with inhibitory effects of an environment of hyperbaric oxygen on bacterial growth. A portion of the effort was directed to experimental epidemiological studies of the development and transfer of antibiotic-resistant bacteria in gnotobiotic mice. Hyperbaric oxygen (3 atm absolute) was a bactericidal agent for bacteria exposed either in vitro or in vivo. The bactericidal effect was dependent upon the duration and intensity of exposure, and was independent of common taxonomical characteristics of bacteria. Exposure of broth cultures to hyperbaric O2 and an antibiotic enhanced antibiotic activity 3-fold. Significantly less killing occurred when bacteria were exposed to high pressure O2 enriched with CO2. Survival of rats with experimental burn wound sepsis was not enhanced by exposure to hyperbaric O2. However, an in vivo bactericidal effect was demonstrated in the colonic flora of rats breathing 100% O2 at

3 atm. Exposure of susceptible bacteria to an antibiotic (tetracycline or kanamycin) in the intestinal tract of germfree mice monoassociated with either Staphylococcus aureus or Serratia marcescens was accompanied by bacterial mutation to resistance to the specific drug. Author (GRA)

N75-15270* National Aeronautics and Space Administration. Pasadena Office, Calif.
REDUCTION OF BLOOD SERUM CHOLESTEROL Patent
Milton Winitz, inventor (to NASA) (Med. Sci. Res. Found.) Issued 19 Nov. 1974 6 p Filed 28 Jul. 1969 Continuation-in-part of abandoned US Patent Appl. SN-510778, filed 1 Dec. 1965 Sponsored by NASA
(NASA-Case-NPO-12119-1; US-Patent-3,849,554; US-Patent-Appl-SN-847815; US-Patent-Class-424-180) Avail: US Patent Office CSCL 06E

By feeding a human subject as the sole source of sustenance a defined diet wherein the carbohydrate consists substantially entirely of glucose, maltose or a polysaccharide of glucose, the blood serum cholesterol level of the human subject is substantially reduced. If 25 percent of the carbohydrate is subsequently supplied in the form of sucrose, an immediate increase from the reduced level is observed. The remainder of the defined diet normally includes a source of amino acids, such as protein or a protein hydrolysate, vitamins, minerals and a source of essential fatty acid. Official Gazette of the U.S. Patent Office

N75-15271# Joint Publications Research Service, Arlington, Va.
SPACE BIOLOGY AND AEROSPACE MEDICINE, VOLUME 8, NO. 6, 1974
10 Jan. 1975 150 p refs Transl. into ENGLISH of Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 3-83
(JPRS-63856) Avail: NTIS HC $5.75

Biomedical research for manned space flight covers the effects of magnetic fields, radiation, hypodynamia, hypoxia, confined environments, and acceleration on human and animal systems.

N75-15272 Joint Publications Research Service, Arlington, Va.
BIOLOGICAL EFFECT OF PERMANENT MAGNETIC FIELDS
Z. N. Nakhilnitskaya *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 1-25 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 3-15

The aftereffects of man's presence in a low strength magnetic field are examined in relation to exobiology and aerospace medicine. Various magnetobiological studies are reviewed for their interaction mechanisms and prevention of unfavorable effects. The different magnetic sensitivity of man of MF changes and the high magnetic sensitivities of different individuals are of special interest. G.G.

N75-15273 Joint Publications Research Service, Arlington, Va.
EFFECT OF 50-MeV PROTONS ON THE TESTES OF MICE

B. S. Fedorenko, V. G. Kondratenko, V. A. Stakanov, A. Bayrakova, I. Babayev, and V. F. Khlaponina *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 26-32 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 16-19

The biological effect of 50-MeV protons and Co-60 gamma rays on the testes of mice has been studied pathomorphologically, cytogenetically and cytofluorimetrically. The results show that both types of penetrating radiations in similar doses induce responses and pathological processes. The dose dependence of cytogenetic effects and nuclear changes in spermatogenic cells was discovered in a later research stage. These changes were followed by poorly expressed pathomorphological disorders. In comparison with gamma irradiation, protons with an energy of 50-MeV exhibit a lesser biological effectiveness. Author

N75-15274 Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF TUMORS IN DOGS EXPOSED OVER A LONG PERIOD TO LOW DOSES OF EXTERNAL GAMMA IRRADIATION
V. I. Yakovleva *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 33-40 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 20-24

Over a six year period 150 dogs were exposed to chronic and combined gamma irradiation. An autopsy of 74 irradiated animals revealed malignant neoformations in five dogs, benign neoformations in five animals. The greatest number of neoformations was found in those animals which had been exposed to chronic irradiation with the highest dose rate and in the animals which had received the highest total doses during chronic irradiation. Author

N75-15275 Joint Publications Research Service, Arlington, Va.
MODIFICATION OF THE CYTOGENETIC EFFECT OF IONIZING RADIATION UNDER THE INFLUENCE OF PERMANENT MAGNETIC FIELDS
G. V. Galaktionova and A. D. Strzhizhovskiy *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 41-46 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 25-28

The modifying effect of a permanent magnetic field of 1,000 to 4,500 oe on post radiation changes in the mitotic index and the frequency of aberrant mitoses in the corneal epithelial cells of mice was investigated. A three hour exposure to a permanent magnetic field of 4,500 oe immediately before or after irradiation in a dose of 400 rad exerted an insignificant effect on the cytogenetic effect of ionizing radiation. A five day exposure of animals to a permanent magnetic field of 1,000 oe after irradiation produced no modifying influence on the radiation effect. Irradiation of mice after their 15-day exposure to a permanent magnetic field of 1,000 oe did not alter the post-radiation inhibition of mitotic activity and increased the level of its recovery. Author

N75-15276 Joint Publications Research Service, Arlington, Va.
INFLUENCE OF THE CALCIUM-MAGNESIUM RATIO IN THE NUTRIENT SOLUTION ON THE AFTEREFFECT OF GAMMA IRRADIATION OF CABBAGE SEEDS
Yu. I. Shaydorov *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 47-52 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 28-32

The influence of the calcium-magnesium ratio in nutrient solution on the manifestation of the radiobiological effect of gamma irradiation was investigated. Cultivation of plants from irradiated seeds on solutions with a similar concentration and anion composition and a different calcium-magnesium ratio altered the radiobiological effect. An increased calcium content decreased the biological effectiveness of radiation, whereas an increased magnesium content enhanced it. Author

N75-15277 Joint Publications Research Service, Arlington, Va.
TOXICOLOGICAL-HYGENIC EVALUATION OF WATER EXTRACTS OF F-26 POLYMER FILM
Z. P. Pak, I. L. Krynskaya, Yu. S. Koloskova, and A. A. Ballod *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 53-58 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 32-35

Sanitary-chemical and toxicological investigations are reported on a representative of polymer materials containing fluorine -- F-26 fluoroplastic. A toxicological evaluation of the material which was used by warm blooded animals for drinking in the form of water extracts revealed no adverse effect of it on the experimental

animals. Results of the toxicological and hygienic evaluation of the polymer film F-26 indicate the possibility of its utilization in contact with drinking water. Author

N75-15278 Joint Publications Research Service, Arlington, Va.
TIMELY PROBLEMS IN AVIATION MEDICINE
P. K. Isakov *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 59-67 Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 35-41

Flight personnel must show high performance from the takeoff to the landing of the aircraft. The up-to-date methods of preflight medical monitoring therefore require still further improvement. It is necessary to develop special tests which will make possible the prediction of stable performance and a capability for flying during unexpectedly complicated situations. It is important to continue investigations which may help in identifying the most stressful elements of flight activity, to predict resistance to mental stress, to develop methods for the psychophysiological training of flight personnel for the performance of flight tests of great complexity, to formulate medical criteria for the employment of trainers, and to use tape recordings of voice communications for evaluating the in-flight health of pilots. Author

N75-15279 Joint Publications Research Service, Arlington, Va.
INDICES OF THE WORK QUALITY OF A MAN OPERATOR IN SPACESHIP CONTROL
V. V. Lebedev and V. A. Krutov *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 68-73 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 42-45

Probability parameters of the quality of man operator performance in spacecraft control have been formulated. The parameters can be applied in the design of a spacecraft as a man machine system, in the training of operators and in spaceflight planning. Author

N75-15280 Joint Publications Research Service, Arlington, Va.
CONTRACTILE FUNCTION OF THE MYOCARDIUM DURING HYPODYNAMIA
G. M. Pruss and V. I. Kuznetsov *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 74-81 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 45-49

The contractile function of the myocardium was studied on rats exposed to 60-day hypodynamia in relation to the intensity and rate of heart muscle contractions under isotonic and isometric conditions. The contractile function of the myocardium varied physically during hypodynamia. During the first five days the intensity and rate of the myocardial contractions diminished. By the 15th day the contractile function of the myocardium improved and on the 30th day of hypodynamia the basic parameters did not differ from those in the control rats. On the 45th and 60th days the parameters of the contractile function of the myocardium increased slightly. However, beginning with the 30th day of hypodynamia the functional reserve of the heart had decreased, which may lead to cardiac failure. Author

N75-15281 Joint Publications Research Service, Arlington, Va.
STUDY OF THE QUALITY OF REGULATION OF THE CARDIOVASCULAR SYSTEM DURING A PHYSICAL LOAD (BASED ON ECG DATA)
T. V. Benevolenskaya, O. I. Boykova, T. N. Krupina, N. P. Onufriyeva, and Kh. Kh. Yarullin *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 82-89 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 49-54

In order to evaluate the quality of cardiovascular regulation, particularly cardiac regulation, the transient processes were examined on the basis of ECG parameters. The experiments were carried out with 109 healthy male test subjects with different tolerances to physical exercises. The experiments demonstrated that the curves of the transient processes for the heart rate, QRST complex, time of the T wave and the ST interval during physical exercises and in the aftereffect had an exponential shape. Those for the amplitude of the T wave had an oscillatory shape. Mathematical analysis revealed distinct differences in the cardiovascular control in test subjects with a different tolerance to physical exercises; high tolerance gave evidence for a good adaptive capability of the heart. Author

N75-15282 Joint Publications Research Service, Arlington, Va.
THRESHOLD RESPONSE OF THE VESTIBULAR ANALYZER DURING HYPOXIA
I. A. Sidelnikov and S. S. Markaryan *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 90-95 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 55-58

In order to determine the pattern of changes in thresholds to angular accelerations by the nystagmus method and illusions of counterrotation during hypoxia and to compare them with vestibular stability, experiments with 40 test subjects were performed. Moderate hypoxia was achieved during 30 minutes of breathing of a gas mixture of 10.5% oxygen and 89.5% nitrogen simulating an altitude of 5,000 m. Sensitivity thresholds and vestibular stability were measured before and at the end of 30 minutes of breathing. During hypoxia sensitivity thresholds of the vestibular analyzer to angular accelerations increased and vestibular stability decreased significantly. This helps to reveal latent forms of vestibular-autonomic instability. Author

N75-15283 Joint Publications Research Service, Arlington, Va.
EFFECT OF A MODIFIED ATMOSPHERE AND INCREASED TEMPERATURE ON THE BREATHING AND METABOLISM OF MAN IN A RESTRICTED CLOSED SPACE
V. G. Deynega and A. F. Isakin *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 96-103 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 58-62

Changes in pulmonary ventilation and metabolism in ten test subjects are described who for ten days remained at rest in a small enclosure with a CO2 content of 1.2-3.0%, an O2 content of 17.1-19.6%, a temperature of 29.2-32.0 C, a relative humidity of 80-90% and with the caloric intake limited to 1,600 Cal/day. Variations in respiration rate, minute volume of respiration, vital lung capacity, respiratory volume, oxygen consumption, carbon dioxide production, respiratory quotient, energy expenditures and respiratory equivalent were analyzed. The exposure of the test subjects to a modified atmosphere and temperature led to an enhancement of pulmonary ventilation and a reduction in energy expenditures. A mathematical correlation was found between carbon dioxide concentration in inhaled air and minute volume of respiration. Author

N75-15284 Joint Publications Research Service, Arlington, Va.
SEMICONDUCTOR THERMOSTATS FOR SPACEFLIGHT BIOLOGICAL INVESTIGATIONS
L.S. Stilbans, Ye. K. Iordanishvilli, F.V. Sushkov, A.L. Mashinskiy, E.A. Izupak, and L.M. Gladkikh *in its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 104-107 Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec.1974 p 63-65

For the purpose of active thermostating, satisfying all the requirements imposed on biological thermostats, it is most desirable to use semiconductor thermoelectric cells as the cooling-heating elements; their action is based on use of the Peltier effect. The degree of heating or cooling in them, and accordingly, the necessary temperature, is easily set by regulating the current strength. Author

N75-15285 Joint Publications Research Service, Arlington, Va.
OPHTHALMOLOGICAL ASSISTANCE DURING PROLONGED SPACE FLIGHTS

I. A. Kolosov, A. V. Kaliberdin, V. A. Baturenko, and Yu. F. Maychuk *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 108-110 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 65-66

The possibility of using eye drug films for ophthalmological purposes during weightlessness conditions is studied. EDF are elastic platelets impregnated with neomycin, sulfapyridazine, pilocarpine, atropine, dicaine or dexametazone. It is concluded that eye ointments and EDF prepared by using a biologically soluble polymer base and impregnated with the necessary drugs are suitable for astronauts during prolonged space flight and for inclusion into spacecraft pharmacies. G.G.

N75-15286 Joint Publications Research Service, Arlington, Va.
PECULIARITIES OF THE HUMAN AUDITORY ANALYZER IN A MODIFIED ATMOSPHERE
E. I. Matsnev and A. V. Sergiyenko *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 111-114 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 67-68

The influence of hypoxia on the function of human hearing was studied in a pressure chamber containing a modified atmosphere (PO2-105-125 mm Hg; PC02 1-12 mm Hg) with reduced barometric pressure. The functional state of the auditory analyzer was evaluated on the basis of interrogation data and otoscopic data, together with tonal and supra-threshold audiometry. Results show that an increase in hearing threshold from 15 to 30 db had a transient nature and was normalized immediately after the end of the experiment. G.G.

N75-15287 Joint Publications Research Service, Arlington, Va.
CONTROLLED STARVATION AS A BIOLOGICAL FACTOR FAVORING AN INCREASE IN ADAPTABILITY OF THE HUMAN BODY
G. I. Babenkov, V. B. Gurvich, and Ya. Ya. Rudakov *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 115-119 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 68-72

Biological shifts in the human body under the influence of controlled starvation were studied in relation to their therapeutic effects in adaptation diseases. Statistical analysis of changes in body indices during the process adaptation, first to starvation and then to subsequent exogenic feeding, shows that this method intensifies the adaptation possibilities of the human body to prolonged exposure of space flight stress. G.G.

N75-15288 Joint Publications Research Service, Arlington, Va.
ADAPTATION OF THE HUMAN BODY TO THE EARTH'S HEAT REGIME
V. I. Arabadzhi *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 120-121 Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 72-73

The human body relates its activity to the earth's heat regime through the structural degradation of processed substances. Exchange of entropy with the surrounding medium ensures the necessary body adaptation. Author

N75-15289 Joint Publications Research Service, Arlington, Va.
CHANGE IN BIOELECTRIC ACTIVITY OF SPINAL CORD ROOTS AND IN THE SKELETAL MUSCLES OF DOGS DURING TRANSVERSE ACCELERATION
In its Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 122-128 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 73-76

Total afferent and efferent fluxes of potentials were studied for the frontal and posterior roots of the spinal cord and the muscles of the rear extremities of dogs under the influence of transverse accelerations. Investigations were carried out in chronic experiments on dogs with preliminary embedding of bipolar electrodes in the roots of the spinal cord and muscles of the rear extremities. A phasic nature of changes in the intensity of afferent and efferent fluxes is noted during exposure to accelerations with marked fluctuations at times of transition from one level to another. Author

N75-15290 Joint Publications Research Service, Arlington, Va.
RESULTS OF CYTOGENETIC INVESTIGATIONS OF THE INFLUENCE OF ACCELERATIONS OF 4-10 g ON MAN
N. N. Bobkova *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 129-132 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 77-78

Cytogenetic investigations on the influence of transverse accelerations in the range of 4 to 10 g on human chromosomes in vitro, and lasting for 120 to 20 seconds, did not establish any abnormalities of the somatic cells. G.G.

N75-15291 Joint Publications Research Service, Arlington, Va.
PECULIARITIES IN THE CHANGE OF MOTOR ACTIVITY OF RATS UNDER CONDITIONS OF HYPO AND HYPERDYNAMIA
B. I. Kogan *In its* Space Biol. Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 133-135 Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 78-79

Experiments show that hypo- and hyperdynamia exert a considerable effect on the level of subsequent motor activity of rats. After a period of hypodynamia the motor activity decreases, whereas after hyperdynamia it increases. Statistically reliable differences in the motor activity of rats of different blood lines detected in controls also persisted in the animals under conditions of hypo- and hyperdynamia. Author

N75-15292 Joint Publications Research Service, Arlington, Va.
WATER LOAD AS A METHOD FOR CHANGING THE ORTHOSTATIC REACTION IN MAN AFTER BRIEF HYPODYNAMIA
B. F. Asyamolov, V. S. Panchenko, and I. D. Pestov *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 136-140 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 80-82

The possibility of a decrease in human orthostatic reactions by means of hyperhydration of the body is demonstrated under conditions of ordinary motor activity and especially after brief clinostatic hypodynamia. The greatest effects are obtained 30 minutes after a water load. A direct dependence between excess volume of fluid in the body and the degree of change in pulse rate during orthostatic tests is established, as is a training effect of a number of orthostatic tests after hypodynamia on man's tolerance of vertical posture. Author

N75-15293 Joint Publications Research Service, Arlington, Va.
SECOND SYMPOSIUM ON INFLUENCE OF VIBRATIONS ON THE HUMAN BODY AND THE PROBLEM OF PROTECTION AGAINST VIBRATION
K. V. Frolov, S. V. Petukhov, and B. A. Potemkin *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 141-144 Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 82-83

In connection with the development of high speed transportation, the widespread introduction of machines, tools and mechanisms based on the vibration principle, man every day and systematically is experiencing the action of a wide variety of vibration disturbances which vary in form and intensity. Study of occupational vibrational diseases and contending with them is becoming a serious problem. Great attention is being devoted to the effect of mechanical oscillations on a man-operator as a control link in the man machine system. This symposium was devoted to a discussion of the results of investigations carried

out during recent years on these problems in the fields of mechanics and biomechanics, biology and biophysics, medicine and engineering. Author

N75-15294 Institut National de la Sante et de la Recherche Medicale, Paris (France).
SEMICONDUCTOR MICRODETECTOR STUDIES OF CARDIOVASCULAR AND RENAL HEMODYNAMICS Final Report [APPLICATIONS DE MICROCAPTEURS A SEMICONDUCTEUR A L'ETUDE DE L'HEMODYNAMIQUE CARDIOVASCULAIRE ET RENALE]
J. P. Gruenfeld, J. Assailly, and S. Seroussi 10 Dec. 1973 20 p refs In FRENCH; ENGLISH summary
(Contract DGRST-72-7-0252)
Avail: Issuing Activity

A 2.5 mm outer diameter semiconductor detector mounted at the tip of a red Kifa catheter was devised. The detector is easily placed into either the venous coronary sinus or the left renal vein. Cardiac output and myocardial and renal blood flow were measured in dogs with Krypton 85. Kr-85 solution was injected either as a bolus into the left coronary artery or the left renal artery, or by constant infusion into the left ventricle or right atrium. The renal washout curves were recorded simultaneous by external counting and with the semiconductor. They demonstrated identical initial slopes, which validates Kety's theoretical assumptions. These preliminary results open new perspectives in the field of monitoring of cardiac output and provide new insight into the measurement of regional blood flow with in vivo beta counting. Author (ESRO)

N75-15295*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
STARPAHC. PART 1: FINAL SUMMARY REPORT
F. E. Riley Jun. 1974 45 p refs
(Contract NAS9-13170)
(NASA-CR-141459; LMSC-A334458-Pt-1) Avail: NTIS HC $3.75 CSCL 06E

A ground-based demonstration of IMBLMS Space Technology was conducted in a remote geographical area of the U.S. The STARPAHC program, designed to improve the capability for delivering health care to the Papago Indians, is divided into three areas: (1) design and definition; (2) system assembly, test, installation, checkout, and training; and (3) operations and evaluation. The accomplishments achieved in the program are summarized emphasizing system requirements in the areas of communication, specialized medical equipment, display, and computer software. Budgetary history and future cost plans are presented and planned activities are summarized. J.M.S.

N75-15296# Civil Aeromedical Inst., Oklahoma City, Okla.
A SEX COMPARISON OF REASONS FOR ATTRITION OF NON-JOURNEYMAN FAA AIR TRAFFIC CONTROLLERS
John J. Mathews, William E. Collins, and Bart B. Cobb Mar. 1974 17 p refs
(AD-780558; FAA-AM-74-2) Avail: NTIS HC $3.00

Recent A attrition rates showed no sex differences in the proportion of trainees who completed FAA Academy training; however, the percentage of females who subsequently left ATC work was over twice that of male trainees. Reasons for attrition were obtained from job-exit forms, telephone interviews, and a questionnaire. More than 80 per cent of trainee attritions could be accounted for by four reasons: training, family, other employment, and perceived discrimination on the job. Reasons for attrition given at the time of job-exit which cited another job or personal matters lacked statistical reliability during the follow-ups; reasons relating to family matters were comparatively stable. Reasons concerning perceived inadequate training and job discrimination were absent in job-exit data but were mentioned occasionally in the follow-ups. Author

N75-15297# Civil Aeromedical Inst., Oklahoma City, Okla.
EXPERIMENTAL TRAUMA OF OCCIPITAL IMPACTS
Joseph W. Young, Robert G. Fisher, G. Townley Price, and Richard F. Chandler Mar. 1974 16 p refs
(AD-780668; FAA-AM-74-4) Avail: NTIS HC $3.00

Clinical observations, physiological data, and pathological findings are presented on a series of baboons exposed to controlled occipital impacts under local anesthesia. This was accomplished in order to establish trauma mechanisms and compare the relative effects of impact with supported heads and heads capable of responding to impact in a controlled horizontal A-P plane. Fourteen laboratory-conditioned test subjects were surgically instrumented to obtain EEG, bilateral carotid blood flow, and aortic and venous blood pressures. Standard ECG and pulse and respiration rates were recorded in addition to the clinical observations of pupillary responses and corneal reflexes that were documented with high-speed movies. Occipital blows were delivered in the midsagittal plane (parallel to the Frankfort plane) with a pneumatic piston containing load cells and accelerometers. Test results are discussed. Author

N75-15298# Rochester Univ., N.Y. Dept. of Radiation Biology and Biophysics.
BEHAVIORAL METHODS FOR INVESTIGATING ENVIRONMENTAL HEALTH EFFECTS
B. Weiss 1974 25 p refs Presented at the Intern. Symp. of Recent Advan. in the Assessment of the Health Effects of Environ. Pollution, Paris, 24 Jun. 1974
(UR-3490-541; Conf-740638-1) Avail: NTIS HC $3.25

A survey was made of behavioral changes induced by environmental contaminants as well as techniques by which such changes are assessed. Data cover: (1) the screening process during which a search is made for general CNS effects, (2) specific functions that are effected as sensory and motor functions and complex discriminative processes, and (3) human susceptibility and its parameters. Author

N75-15299# Naval Postgraduate School, Monterey, Calif.
SIGNAL PROCESSING AND CHARACTERIZATION OF THE AUDIO EVOKED CORTICAL RESPONSE M.S. Thesis
Russell Eugene McWey Jun. 1974 71 p refs
(AD-784768) Avail: NTIS CSCL 06/16

The audio evoked cortical response to stimuli consisting of audio clicks of varied frequency was analyzed. Analysis of the encephalogram was accomplished through the use of a computer based signal processor which used signal averaging as the primary processing mode to produce a signal for analysis. A unit response wave form was identified and its relationship to the composite response to multiple stimuli was investigated. Using the unit response as a criterion with multiple audio click stimuli, concepts of initial reaction time and integrative processing were identified. Author (GRA)

N75-15300# Naval Aerospace Medical Research Lab., Pensacola, Fla.
ANNOTATED BIBLIOGRAPHY OF REPORTS, SUPPLEMENT NO. 6, 1 JULY 1973 - 30 JUNE 1974
Rita S. McAllister 30 Jun. 1974 30 p refs
(AD-785851) Avail: NTIS CSCL 06/19

Contents: Predicting motivational change and aeronautical adaptability among Navy and Marine Corps aviation trainees; Improving fleet effectiveness of Navy and Marine Corps pilots and flight officers; Analysis of operational functions and unique characteristics of the naval flight officer; Investigation of pilot background factors in naval aviation accidents; The effects of extremely low frequency (E.L.F.) radiation on man; Performance in non-human primates as influenced by low frequency electromagnetic fields; Anthropometric data; Determination of human dynamic response to impact acceleration. GRA

N75-15301# Naval Submarine Medical Research Lab., Groton, Conn.
THE VISUAL EVOKED CORTICAL POTENTIAL AS A MEASURE OF STRESS IN NAVAL ENVIRONMENTS. 3: THE RESPONSE TO PATTERN AND COLOR Medical Progress Report

Jo Ann S. Kinney and Christine L. McKay 19 Mar. 1974 25 p refs
(AD-786322; NSMRL-778; PR-9) Avail: NTIS CSCL 06/19

Previous research has shown that it is possible to isolate a response to pattern from the visual evoked cortical potential. This study investigated the optimum conditions for yielding a pattern response and then applied the pattern response to a test of color vision. The results showed that individuals with normal color vision will give a response to pattern when the pattern is formed of either hue differences or luminance differences. Color defective individuals, however, respond only to luminance differences and not to hue differences that they cannot discriminate. The technique thus can be used as an objective measure of color vision. Author (GRA)

N75-15302# School of Aerospace Medicine, Brooks AFB, Tex.
THRESHOLD DAMAGE EVALUATION OF LONG-TERM EXPOSURES TO ARGON LASER RADIATION Final Report, Sep. 1973 - May 1974
William D. Gibbons Aug. 1974 14 p refs
(AD-786446; SAM-TR-74-29) Avail: NTIS CSCL 06/18

The maculae of rhesus monkeys were exposed to an argon-ion laser operated in the TEMoo continuous wave (CW) mode at a wavelength of 514.5 nm. Damage thresholds (ED50) were determined for exposure times of 0.5, 5, 30, and 120 sec. Retinal damage was assessed at both 1-hr and 24-hr postexposure. With increasing exposure times, a 24-hr threshold criterion resulted in significantly lower threshold values, compared to a 1-hr criterion. Threshold values of 0.5 sec using 1-hr and 24-hr evaluation criteria were determined to be 9.4 and 9.0 mW, respectively; for 5 sec, 6.4 and 5.6 mW; for 30 sec, 5.4 and 2.5 mW; and for 120 sec, 4.4 and 0.54 nW. Author (GRA)

N75-15303# Naval Aerospace Medical Research Lab., Pensacola, Fla.
ELICITATION OF VESTIBULAR SIDE EFFECTS BY REGIONAL VIBRATION OF THE HEAD
James R. Lackner and Ashton Graybiel 29 Jul. 1974 16 p refs
(AD-786288; NAMRL-1204) Avail: NTIS CSCL 06/19

Vestibular side effects including visual and postural illusions, nystagmus, and motion sickness were elicited using a vibrator applied tc different regions of the head. Although a commercially available vibrator (60 Hz, 120 pulses/sec) can elicit side effects, its use was enhanced by varying the vibration frequency and optimizing the stimulus conditions for perception of illusions and elicitation of motion sickness. Both horizontal and vertical nystagmus were elicited, the latter inconsistently. A strong apparent movement (and displacement) of a dimly lighted target that resembled the oculogyral illusion and apparent self-motion were consistently elicited. Motion sickness was readily elicited in some subjects but in other subjects even stimulation during rotation failed. The findings indicate that the use of vibratory stimulation should be exploited to determine whether, in addition to its use in the laboratory as a research device, it has a place in the clinic as a means of evaluating canalicular function. (Modified author abstract) GRA

N75-15304# Virginia Commonwealth Univ., Richmond. Dept. of Biophysics.
EFFECTS OF LOW INTENSITY MICROWAVE RADIATION ON MAMMALIAN SERUM PROTEINS Annual Summary Report, Jul. 1973 - Jun. 1974
Stephen F. Cleary Jun. 1974 84 p refs
(Contract DADA17-72-C-2144)
(AD-785739; ASR-2) Avail: NTIS CSCL 06/18

The effect of 1.7 GHz CW microwave radiation on rabbit serum proteins and blood chemistry were investigated. Intensities of 5 to 25 mW/sq cm for periods of up to two hours were employed in this study. Acrylamide gel electrophoresis was used to compare thermally treated serum proteins with microwave treated samples. Mechanisms for the alteration in drug-induced sleeping time in the Dutch rabbit exposed to 1.7 GHz microwave radiation are discussed. In vitro studies of the thermal denaturation of proteins are described. Author (GRA)

N75-15305# Universidad Peruana de Ciencias Medicas y Biologicas, Lima (Peru). Inst. de Investigaciones de la Altura.
ALVEOLAR GAS EXCHANGE AT ALTITUDE Final Report, 1 Jul. 1973 - 30 Jun. 1974
Julio C. Cruz-Jibata Jun. 1974 29 p refs
(Grant DAMD17-74-G-9383; DA Proj. 3A7-62758-A-827)
(AD-786688) Avail: NTIS CSCL 06/19

Apparent CO Diffusing capacity (DLCO) and alveolar-arterial O2 and CO2 tension differences have been measured at four levels of oxygenation. Seven sea level subjects (SLS) were studied at sea level (SL) and after 10 days of exposure to high altitude (HA), 4350 m. Six high altitude subjects (HAS) were studied at HA. HAS showed larger DLCO than SLS but only breathing normal or low oxygen. On the other hand SLS did not modify their DLCO with altitude exposure, however they showed an increase in membrane diffusing capacity (DM) and a decrease in pulmonary capillary volume (Vc). HAS showed these parameters similar to SLS at HA. A new criteria is presented to estimate O2 diffusing capacity (DLO2) using the equation given by Staub, Bishop and Forster. No statistical significant difference was found between DLO2 and DLCO x 1.23 breathing normal or low oxygen either at SL or at HA. From the A-a oxygen and CO2 differences it is concluded that SLS showed more uneven distribution of ventilation/perfusion ratios (VA/Qc) with altitude exposure. On the other hand, HAS showed a more efficient gas exchange at altitude because of more even VA/Qc ratios and a larger diffusing capacity. (Modified author abstract) GRA

N75-15306# Advisory Group for Aerospace Research and Development, Paris (France).
ORIENTATION/DISORIENTATION TRAINING OF FLYING PERSONNEL: A WORKING GROUP REPORT
A. J. Benson, ed. Nov. 1974 62 p refs
(AGARD-R-625) Avail: NTIS HC $4.25

Orientation/disorientation training is reviewed of military and civilian aircrew in NATO countries. Deficiencies in current programs are discussed and 24 recommendations made for improvement of ground and in-flight training. Sections of the report review ground based training techniques, the use of familiarization devices, more complex trainers, and aspects of in-flight training. Descriptions of the conduct of ground and in-flight demonstrations, a specimen lecture syllabus, and a specification for a familiarization device, are given. Topics requiring further research or development are identified. Author

N75-15307*# Western Michigan Univ., Kalamazoo.
THE EFFECTS OF CHANGES IN RESPONSE-INDEPENDENT PAY UPON HUMAN MASSETER EMG M.A. Thesis
Tullio J. Proni Dec. 1973 43 p refs
(Grant NGR-23-014-002; Contract N00014-70-A-0183-0001; Grant NSF GB-33620-X1)
(NASA-CR-141276) Avail: NTIS HC $3.75 CSCL 05E

Electromyographic activity of the masseter muscle was recorded in five human subjects who were presented with systematically varied rates of non-contingent pay. Rates of pay were varied between sessions in either a descending or an ascending series. The number of masseter contractions was found to be greater during the descending series than during the ascending series, especially when a descending series of pay changes followed an ascending series. Verbal physical displays of anger and aggression were noted during descending series. These data indicated a possible relation between masseter contractions and aggression. Aut hor

N75-15308*# George Washington Univ. Medical Center, Washington, D.C. Science Communication Div.
STUDIES OF SOCIAL GROUP DYNAMICS UNDER ISOLATED CONDITIONS. OBJECTIVE SUMMARY OF THE LITERATURE AS IT RELATES TO POTENTIAL PROBLEMS OF LONG DURATION SPACE FLIGHT
Sherman P. Vinograd Washington NASA Dec. 1974 288 p refs
(Contract NSR-09-010-027)

(NASA-CR-2496; GW-SCD-74-01R) Avail: NTIS HC $8.75 CSCL 05J

Scientific literature which deals with the study of human behavior and crew interaction in situations simulating long term space flight is summarized and organized. A bibliography of all the pertinent U.S. literature available is included, along with definitions of the behavioral characteristics terms employed. The summarized studies are analyzed according to behavioral factors and environmental conditions. The analysis consist of two matrices. (1) The matrix of factors studied correlates each research study area and individual study with the behavioral factors that were investigated in the study. (2) The matrix of conclusions identifies those studies whose investigators appeared to draw specific conclusions concerning questions of importance to NASA.

J.M.S.

N75-15309# Southwest Foundation for Research and Education, San Antonio, Tex.

A PROPOSAL TO STUDY THE ADRENAL CORTEX IN MAINTAINING THE ANDROGENIC-ANABOLIC STATUS IN HUMANS UNDER NORMAL AND STRESSFUL EXPERIMENTAL CONDITIONS

J. W. Goldzieher 31 Jan. 1974 10 p

(Contract F44620-72-C-0030; AF Proj. 9777; AF Proj. 6813) (AD-784842; AFOSR-74-1340TR) Avail: NTIS CSCL 06/1

An antiserum for each of the three compounds, androstenedione, testosterone, and 11-Beta-hydroxyandrostendione, is now available permitting their measurement by highly sensitive, accurate radiommunoassay. However, the specificity of androstenedione antiserum is not sufficient to allow direct measurement with untreated plasma, thus preliminary chromatography is still required. The chromatography system has been scaled down so that samples obtained from one ml or less of plasma can be processed. There has been no loss in resolution or in sample recovery with the smaller column. Problems associated with the crucial first step extraction of the steroids from plasma have been successfully overcome. The laboratory personnel have gained considerable experience, expertise, and confidence in this period of methods development and are now prepared to perform analyses of many samples in a routine manner but with the scrupulous attention to detail that these assays demand. Author (GRA)

N75-15310# Naval Aerospace Medical Research Lab., Pensacola, Fla.

DISORIENTATION PHENOMENA IN NAVAL HELICOPTER PILOTS

Felix R. Tormes and Fred E. Guedry, Jr. 29 Jul. 1974 28 p refs

(MF51524005)

(AD-786370; NAMRL-1205) Avail: NTIS CSCL 06/19

The incidence of pilot disorientation in fixed and rotary wing aircraft has been previously investigated, but special orientation problems of naval helicopter pilots engaged in operations at sea and landing on moving platforms have not been previously reported. A questionnaire concerning disorientation was answered anonymously and individually by 104 active naval helicopter pilots. Fifty-six percent indicated one or more episodes of severe disorientation and 8.5 percent indicated having experienced severe disorientation five or more times while piloting helicopters. A number of factors conducive to disorientation were identified. Some precipitating factors appear to be specific to operations over water or over a moving deck, although some of these may well have their counterparts in special operations over land. Other factors are common to land- and sea-based operations and some are common to fixed-wing as well as rotary-wing aircraft. A number of potential countermeasures for various precipitating factors are discussed. Author (GRA)

N75-15311# New Mexico State Univ., University Park. Dept. of Psychology.

SELECTIVE REACTION AND SHORT-TERM MEMORY IN HIGH SPEED INFORMATION PROCESSING Interim Report

Warren H. Teichner Feb. 1974 16 p refs

(Contract F44620-71-C-0072; AF Proj. 9778) (AD-784878; NMSU-AFOSR-TR-74-2; AFOSR-74-1331TR) Avail: NTIS CSCL 05/10

The study attempted to distinguish experimentally between stimulus acquisition and short-term memory in a task requiring high speed processing of information. Subjects were required to respond selectively to positionally defined arrays of lights and, following their selective reactions, on infrequent occasions to report on the positions of the lights. Analysis of the results suggested that there are differences between selective reactions to pattern and short-term pattern memory with regard to reaction times, accuracy, response blocking, and susceptibility to practice. Author (GRA)

N75-15312# Human Engineering Labs., Aberdeen Proving Ground, Md.

AIR SCOUT NIGHT GOGGLE TEST Final Report

Robert W. Bauer and George D. Pettit Jul. 1974 30 p refs (AD-785542; HEL-TM-14-74) Avail: NTIS CSCL 06/16

A night target detection/recognition test was developed to follow a daylight air reconnaissance test. The night flights were flown in a modified OH-58 helicopter about 30 meters above ground level by pilots trained to use night vision goggles. Detection/recognition scores and ranges are compared among day flights, night flights with no visual aids for the copilot-observers and night flights with observations aided by night vision goggles. User comments on the total system are reported in some detail. (Modified author abstract) GRA

N75-15313# Louisville Univ., Ky. Performance Research Lab.

BEHAVIORAL EFFECTS OF PROLONGED EXPOSURE TO CONTINUOUS AND INTERMITTENT NOISE Interim Technical Report, 1 Jul. 1971 - 30 Jun. 1972

John D. Repko, Bill R. Brown, and Michel Loeb Jun. 1974 142 p refs

(Contract DAHC19-69-C-0009; DA Proj. 2T0-14501-B-81B) (AD-785740; ITR-74-29) Avail: NTIS CSCL 06/10

The purpose of this investigation was to assess man's performance in a work situation wherein 90 db continuous and periodic 96 db intermittent noise were separately presented as environmental or work-situation stressors. The present study employed a synthetic-work approach in which several tasks were combined into a multiple-task performance battery (MTPB) consisting of six tasks selected to test both individual- and small-group (crew) performance. The results, showed that the mean percentage of baseline performance was enhanced by a periodic 96 db intermittent noise. On the other hand, since continuous noise may be considered as containing fewer stimulus elements than intermittent noise, it was expected that general performance during continuous noise would be less than during intermittent noise. (Modified author abstract) GRA

N75-15314# URS/Matrix Co., Falls Church, Va.

DEVELOPMENT AND EVALUATION OF VIDEO SYSTEMS FOR PERFORMANCE TESTING AND STUDENT MONITORING Final Report

John Hayes and Robert Pulliam Jul. 1974 214 p refs

(Contract F41609-72-C-0021; AF Proj. 1121) (AD-786891; AFHRL-TR-74-67) Avail: NTIS CSCL 05/9

Performance testing and student monitoring in individualized training are frequently labor intensive activities. The overall objective of this project was to investigate the feasibility of using low-cost video monitoring and recording equipment to extend the instructor's capabilities in both testing and monitoring activities. Technical training activities at an air force base were evaluated, and testing activities in jet aircraft training, power production, and instructor training were selected for study. The findings are reported and discussed. (Modified author abstract) GRA

N75-15315*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
GENERALIZED ENVIRONMENTAL CONTROL AND LIFE SUPPORT SYSTEM COMPUTER PROGRAM (G189A) CONFIGURATION CONTROL, PHASE 2 Final Report
R. L. Blakely 3 Dec. 1974 19 p refs
(Contract NAS9-13404)
(NASA-CR-141468; MDC-G5579) Avail: NTIS HC $3.25 CSCL 06K

A method for updating and maintaining the G189A program library and documentation for all program users is provided. The effort also involves: (1) providing instruction and recommendations for the use and application of the program, (2) developing new subroutines and the logic required for new simulations, (3) supporting special analyses required by CSD, and (4) conduct studies to define and understand the interaction of the shuttle ECLSS and propose payload ECLSS and ECS designs. Author

N75-15316*# Midwest Research Inst., Kansas City, Mo.
LIQUID COOLED GARMENTS Final Report
Washington NASA Jan. 1975 54 p
(Contract NASw-2454)
(NASA-CR-2509) Avail: NTIS HC $4.25 CSCL 06Q

Liquid cooled garments employed in several applications in which severe heat is encountered are discussed. In particular, the use of the garments to replace air line cooling units in a variety of industrial processing situations is discussed. Author

N75-15317*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SKYLAB ATMOSPHERIC CONTAMINATION CONTROL
C. D. Ray Nov. 1974 46 p refs
(NASA-TM-X-64900) Avail: NTIS HC $3.75 CSCL 06K

The Skylab contamination removal systems, preflight analysis and testing, and flight results are described. Results indicate that the combination of materials selection, the onboard removal devices, and the offgassing tests proved to be an effective means of controlling spacecraft contaminant levels. Author

N75-15318*# Midwest Research Inst., Kansas City, Mo.
POLAROGRAPHIC OXYGEN SENSORS Final Report
Washington NASA Jan. 1975 26 p
(Contract NASw-2454)
(NASA-CR-2505) Avail: NTIS HC $3.75 CSCL 06K

Polarographic oxygen sensors, which were originally developed for measuring oxygen in space cabin atmospheres, are examined for their use in medical, scientific, and industrial applications. N.E.R.

N75-15319*# Midwest Research Inst., Kansas City, Mo.
BRUSHLESS dc MOTORS Final Report
Washington NASA Jan. 1975 44 p
(Contract NASw-2454)
(NASA-CR-2506) Avail: NTIS HC $3.75 CSCL 06K

Brushless dc motors were intensively developed and tested over several years before qualification as the prime movers for Apollo Spacecraft life support blowers, and for circulating oxygen in the lunar portable life support system. Knowledge gained through prototype development and critical testing has significantly influenced the technology employed, broadened markets and applications, and reduced the cost of present day motors. Author

N75-15320*# Midwest Research Inst., Kansas City, Mo.
HEAT PIPES Final Report
Washington NASA Jan. 1975 52 p
(Contract NASw-2454)
(NASA-CR-2508) Avail: NTIS HC $4.25 CSCL 20M

The development and use of heat pipes are described, including space requirements and contributions. Controllable heat pipes, and designs for automatically maintaining a selected constant temperature, are discussed which would add to the versatility and usefulness of heat pipes in industrial processing, manufacture of integrated circuits, and in temperature stabilization of electronics. M.C.F.

N75-15321*# Life Systems, Inc., Cleveland, Ohio.
SPACECRAFT NITROGEN GENERATION Final Report
R. D. Marshall, J. N. Carlson, J. D. Powell, and K. K. Kacholia Dec. 1974 106 p refs
(Contract NAS2-7057)
(NASA-CR-137576; LSI-ER-198-5) Avail: NTIS HC $5.25 CSCL 06K

Two spacecraft nitrogen (N2) generation systems based on the catalytic dissociation of hydrazine (N2H4) were evaluated. In the first system, liquid N2H4 is catalytically dissociated to yield an N2 and hydrogen (H2) gas mixture. Separation of the N2/H2 gas mixture to yield N2 and a supply of H2 is accomplished using a polymer-electrochemical N2/H2 separator. In the second system, the N2/H2 gas mixture is separated in a two-stage palladium/silver (Pd/Ag) N2/H2 separator. The program culminated in the successful design, fabrication, and testing of a N2H4 catalytic dissociator, a polymer-electrochemical N2/H2 separator, and a two-stage Pd/Ag N2/H2 separator. The hardware developed was sized for an N2 delivery rate of 6.81 kg/d (15lb/day). Experimental results demonstrated that both spacecraft N2 generation systems are capable of producing 6.81 kg/d (15lb/day) of 99.9% pure N2 at a pressure greater than or equal to 1035 kN/m(2) (150 psia). Author

N75-15322# Naval Postgraduate School, Monterey, Calif.
COMPUTER MODELING OF THE ELECTROENCEPHALOGRAM M.S. Thesis
William Eby Stockslager Jun. 1974 95 p refs
(AD-784765) Avail: NTIS CSCL 06/2

A computer modeling of the electroencephalogram (EEG) is described based on current research in the field of EEG analysis using the digital computer. The tegule is defined and possible sources are discussed. The EEG is modeled both in the time and frequency domains. Modeling revealed that patterns of tegules may be detected in the frequency domain. Sinusoids enclosed in a flat-topped cosine envelope are the most commonly observed tegule shape found in processed EEG data. Author (GRA)

N75-15323# Aerospace Guidance and Metrology Center, Newark Air Force Station, Ohio.
THE FUTURE ROLE OF MAN IN THE REPAIR OF NAVIGATION SYSTEMS Final Report
Russell M. Genet 1974 10 p refs
(AD-787219; AGMC-74-025) Avail: NTIS CSCL 15E

Human factors involved in the repair of navigation systems are discussed. The human factors in fault diagnoses, repair action decisions, making repairs, and performance evaluation after repair are discussed. The paper was presented by the author at the Institute of Navigation's 25th Anniversary Symposium at the U.S. Air Force Academy in Colorado in 1971. Author (GRA)

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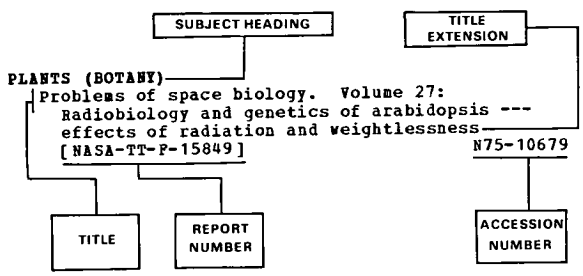

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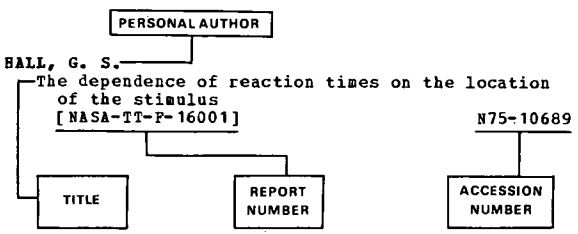

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