NASA SP-7011 (93)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY

WITH INDEXES

(Supplement 93)

SEPTEMBER 1971

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ACCESSION NUMBER RANGES

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NASA SP-7011 (93)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 93)

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA Scientific and Technical Information System during August, 1971.

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INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* (NASA SP-7011) lists 328 reports, articles, and other documents announced during August 1971 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*. The first issue of the bibliography was published in July 1964; since that time, irregular supplements have been issued.

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

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

Two indexes—subject and personal author—are included.

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1971 Supplements.

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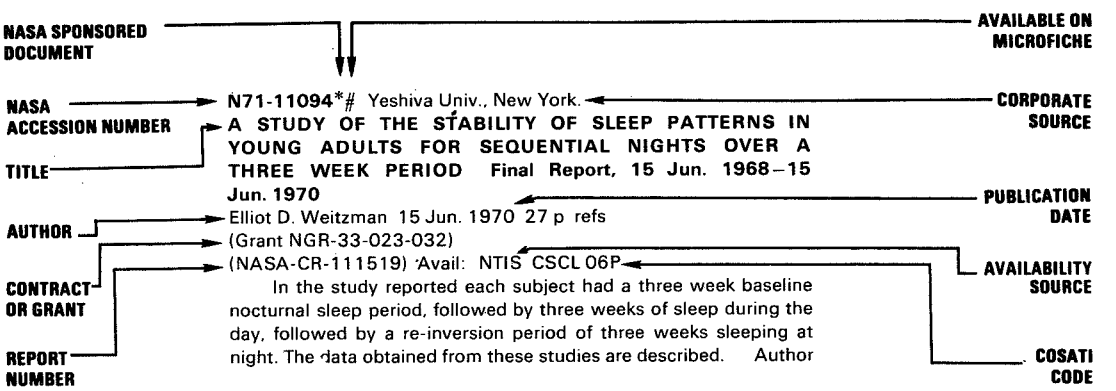

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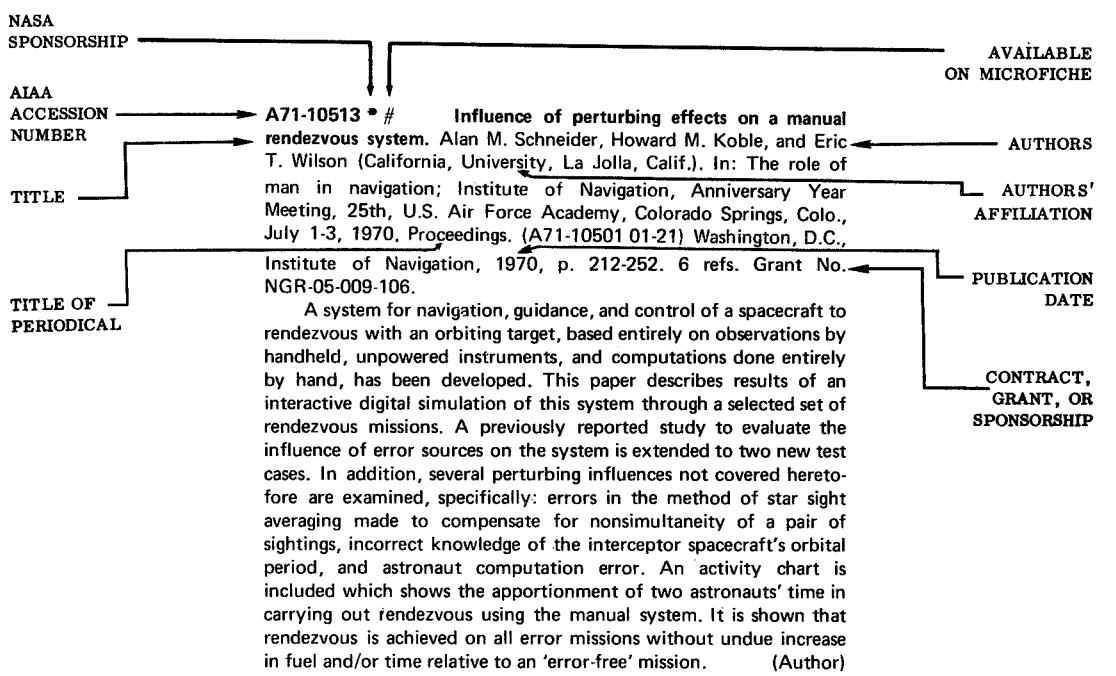

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 93) SEPTEMBER 1971

IAA ENTRIES

A71-31195 **The behavior of the pulse frequency during the acquisition of sensomotoric skills giving particular attention to the effect of pauses (Über das Verhalten der Pulsfrequenz während des Erlernens sensumotorischer Fertigkeiten unter besonderer Berücksichtigung der Pausenwirkung).** Joseph Rutenfranz (Giessen, Universität, Giessen, West Germany), Walter Rohmert (Darmstadt, Technische Hochschule, Darmstadt, West Germany), and Amin Iskander. *Internationale Zeitschrift für angewandte Physiologie einschliesslich Arbeitsphysiologie,* vol. 29, no. 2, 1971, p. 101-118. 30 refs. In German.

Altogether 188 subjects took part in the experiments. Several tracking tasks have been learned under different training conditions. The experiments showed that pulse frequency was raised in a different manner under the various training conditions. The causes of pulse frequency increases observed include rest in sitting position, intentional basic tension, dynamic work, static work, and psychogenic reactions. Some criteria for optimalizing psychomotor learning were derived from the behavior of pulse frequency. G.R.

A71-31201 **Performance after awakening at different times of night.** R. T. Wilkinson and M. Stretton (Medical Research Council, Cambridge, England). *Psychonomic Science,* vol. 23, May 25, 1971, p. 283-285. 10 refs.

Naval ratings were roused during the night and presented themselves, dressed, for testing in a nearby room within 4 min. During the next 11 min, they were given tests of reaction time, calculation, and muscular coordination and steadiness. In all three tests, performance was well below the normal level achieved during the day. On different occasions, the men were roused at different times of night, and this factor influenced which task was affected most. Reaction time, with its intermittent call for rapid response, was impaired most in the early part of the night; the adding and coordination tasks, which demanded more continuous performance, were more affected later in the night. It is suggested that the early effects may be due to the depth of the preceding sleep, while the later ones may be influenced more by the trough in the circadian cycle of physiological activity. (Author)

A71-31248 # **Conditioned reflexes developed in two different genetic strains by massive and prolonged training in the process of adaptation to altitude hypoxia (Uslovnye refleksy pri massirovannom i rastianutom obuchenii zhivotnykh dvukh razlichnykh geneticheskikh linii v protsesse adaptatsii k vysotnoi gipoksii).** F. Z. Meerson, V. A. Isabaeva, A. Z. Ivanshina (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR), R. I. Kruglikov, and G. M. Glumov (Ministerstvo Zdravookhraneniia Kirgiz SSR, Meditsinskii Institut, Frunze, Kirgiz SSR). *Zhurnal Vysshei Nervnoi Deiatel'nosti,* vol. 21, Mar.-Apr. 1971, p. 470-477. 28 refs. In Russian.

Conditioned defense reflex of active avoidance was developed in mice of the BALB/c and C57BL6 strains by training them to escape electrical current in a T-shaped duct partially lighted and partially put under current. The length of training events was kept at 20 or 90 sec in two series of experiments under normal atomospheric pressure and at an altitude of 3200 m. The development of a persisting reflex was generally much faster in BALB/c mice than in C57BL6 mice and was not affected much during the adaptation to hypoxia. V.Z.

A71-31249 # **Alteration of higher nervous activity under acceleration in rats during ontogeny (Izmenenie vysshei nervnoi deiatel'nosti pod vliianiem uskorenii u krys v ontogeneze).** S. I. Nudman (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). *Zhurnal Vysshei Nervnoi Deiatel'nosti,* vol. 21, Mar.-Apr. 1971, p. 502-508. 43 refs. In Russian.

Conditioned auditory reflexes were studied in 25-day-old and 1.5- to 18-month-old rats under accelerations of 0.6 and 10 g. The age differences in reflex activity were insignificant at 0.6 g in all groups of rats while at 10 g the frequency of erroneous reactions was sharply up in 25-day-old rats, and the reflexes were not appreciably affected in mature rats. V.Z.

A71-31250 # **Application of EEG spectral characteristics and derivative in aviation physiology practices (K ispol'zovaniiu spektral'nykh kharakteristik EEG i ee proizvodnoi v praktike aviatsionnoi fiziologii).** A. M. Klochkov, P. A. Elkin, and V. D. Zhelezniakov. *Zhurnal Vysshei Nervnoi Deiatel'nosti,* vol. 21, Mar.-Apr. 1971, p. 560-565. In Russian.

It is found that changes in EEG caused by the pilot's mental activity cannot be determined by EEG spectrum power measurements on a background of emotions during flight. More effective for this purpose is shown to be the measurement of the spectral characteristic of the first derivative of EEG. V.Z.

A71-31251 # **Separation of spikes and low-frequency components from noise (Vydelenie spaikov i nizkochastotnykh sostavliaiushchikh iz shuma).** V. G. Volkov, R. M. Meshcherskii, and V. S. Rusnak (Akademiia Nauk SSSR, Institut Vysshei Nervnoi Deiatel'nosti i Neirofiziologii, Moscow, USSR). *Zhurnal Vysshei Nervnoi Deiatel'nosti,* vol. 21, Mar.-Apr. 1971, p. 620-622. In Russian.

A circuit for separation of neural spikes and lf signal oscillations on a noise background is described. The key feature of the circuit is a set of four switch-on monophase noninversion amplifiers using triodes of different conductivities. The amplifiers form a monolith feedback circuit with a high input resistance and a low output resistance. Amplified spikes and a lf signal, purified from noise, are mixed at the input of the terminal amplifier which operates as a matching cascade of the circuit. V.Z.

A71-31288 # **The effect of ultrasonic vibrations on nucleic acid content in organs of albino rats (Vliianie ul'trazvukovykh kolebanii na soderzhanie nukleinovykh kislot v organakh belykh krys).** A. A. Chirkin, I. A. Chirkina, and O. N. Detinkin (Vitebskii Meditsinskii Institut, Vitebsk, USSR). *Biulleten' Eksperimental'noi Biologii i Meditsiny,* vol. 71, Apr. 1971, p. 58-61. 20 refs. In Russian.

The effect was investigated of ultrasonic vibrations of 830 kHz frequency and 0.2-1.8 W/sq cm intensity on the DNA and RNA content in the skin, abdominal muscles, and kidneys of albino rats. A complex fluctuating variation pattern was established in the level of tissular nucleic acids. M.V.E.

A71-31289 # **The effect of partial adaptation to hypoxia on the immunobiological reactivity of the organism (Vliianie drobnoi adaptatsii k gipoksii na immunobiologicheskuiu reaktivnost' organizma).** A. S. Kaplanskii and G. N. Durnova. *Biulleten' Eksperimental'noi Biologii i Meditsiny,* vol. 71, Apr. 1971, p. 68-70. 12 refs. In Russian.

An inhibition of the immunobiological reactivity of the organism was observed in mice subjected to partial adaptation to hypoxia for one month, 6 h daily, in a chamber decompressed to a 5000 m altitude. The inhibition was characterized by a lowered phagocytic activity of the neutrophils, a decrease in antibody production, hypoplasia of lymph nodes, and a reduction in the number of immunocompetent cells in lymph nodes. These changes are less pronounced than under complete (24-h) adaptation to hypoxia. M.V.E.

A71-31290 # **Diurnal variations of mitotic activity in thyroid cells of different follicle size (Sutochnye izmeneniia mitoticheskoi aktivnosti v tireoidnykh kletkakh follikulov razlichnoi velichiny).** Iu. A. Romanov (II. Moskovskii Meditsinskii Institut, Moscow, USSR). *Biulleten' Eksperimental'noi Biologii i Meditsiny,* vol. 71, Apr. 1971, p. 96-98. In Russian.

The mitotic activity in epithelial cells of thyroid follicles of various sizes was investigated. The results obtained indicate that cells of large follicles are characterized by a drop in mitotic activity in comparison to cells of small and medium follicles. M.V.E.

A71-31291 # **Investigation of the possibility of local action by means of focused ultrasound through various skull areas in animals and man (Issledovanie vozmozhnosti lokal'nogo vozdeistviia fokusirovannym ul'trazvukom cherez uchastki cherepa zhivotnykh i cheloveka).** Iu. S. Inin, M. G. Sirotiuk, and S. I. Tiurina (Akademiia Meditsinskikh Nauk SSSR; Akademiia Nauk SSSR, Akusticheskii Institut, Moscow, USSR). *Biulleten' Eksperimental'noi Biologii i Meditsiny,* vol. 71, Apr. 1971, p. 120-122. 14 refs. In Russian.

Experiments of ultrasound field visualization while ultrasonic beams penetrate limited areas of an animal or human skull show the possibility of localized ultrasonic action on selected portions of the brain without skull trepanation. The visualization of the ultrasonic field was obtained by means of Tepler's effect. M.V.E.

A71-31304 # **Human motion under lunar gravity conditions (Dvizheniia cheloveka v usloviiakh lunnogo tiagoteniia).** V. A. Bogdanov, V. S. Gurfinkel', and V. E. Panfilov. *Kosmicheskaia Biologiia i Meditsina,* vol. 5, Mar.-Apr. 1971, p. 3-13. 67 refs. In Russian.

Survey of published information about the features of human performance in various locomotive tasks under simulated reduced-gravity conditions. Various test stands and equipment for reduced-gravity experiments are classified in general categories, and their operation is analyzed and evaluated for relative merits and disadvantages. An attempt is made to correlate data from lunar gravity simulation experiments with published accounts of the experiences of Apollo 11 crewmembers on the lunar surface. T.M.

A71-31305 # **Influence of restricted mobility on the intensity of formation and excretion of certain gaseous products of vital activity in animals (Vliianie ogranicheniia podvizhnosti zhivotnykh na intensivnost' obrazovaniia i vydeleniia nekotorykh gazoobraznykh produktov zhiznedeiatel'nosti).** V. V. Kustov, V. I. Belkin, B. I. Abidin, T. A. Lekareva, L. T. Poddubnaia, and O. F. Ostapenko. *Kosmicheskaia Biologiia i Meditsina,* vol. 5, Mar.-Apr. 1971, p. 14-17. 15 refs. In Russian.

Tests with albino rats showed that 15-day hypokinesia has no significant influence on the elimination of ketones and aldehydes but does enchance the production of carbon monoxide and ammonia. The dynamics of carbon monoxide and ammonia discharge into the atmosphere of the small sealed confinement chamber coincided with their growth rates in the blood of the animals. The hypokinesia apparently causes metabolic changes which can enhance the degradation of hemoglobin; increased production and elimination of ammonia may be associated with enhanced degradation of muscle proteins. T.M.

A71-31306 # **Influence of hypoxic hypoxia and hypercapnia on the calcium, inorganic phosphorus, and total protein in the blood of rats during a hypodynamic syndrome (Vliianie gipoksicheskoi gipoksii i giperkapnii na kal'tsii, neorganicheskii fosfor i obshchii belok krovi krys pri gipodinamicheskom sindrome).** A. I. Volozhin. *Kosmicheskaia Biologiia i Meditsina,* vol. 5, Mar.-Apr. 1971, p. 17-22. 15 refs. In Russian.

The effects of adaptation to intermittent hypoxic hypoxia (corresponding to the oxygen level at 7000 m) and of adaptation to hypercapnia (5% carbon dioxide in the inspired air) were studied in rats with normal and restricted mobility. The rats with a hypodynamic syndrome exhibited a tendency toward increased calcium levels in the blood, while the amounts of inorganic phosphorus and total protein were substantially reduced. The use of hypoxic hypoxia as a factor which would increase the stability of the organism did not lead to normalization of the blood calcium, phosphorus, and protein levels in hypodynamic rats. The results show that hypercapnia positively affects these blood indices in hypodynamic rats; the protein and inorganic phosphorus levels were much higher when hypodynamia was combined with hypercapnia than when the rats were subjected only to hypodynamia. T.M.

A71-31307 # **State of erythropoiesis in dogs subjected to gamma irradiation in doses simulating prolonged spaceflight conditions (Sostoianie eritropoeza u sobak pri gamma-obluchenii va dozakh, modeliruiushchikh usloviia dlitel'nogo kosmicheskogo poleta).** L. L. Semashko, A. V. Iliukhin, and B. A. Markelov. *Kosmicheskaia Biologiia i Meditsina,* vol. 5, Mar.-Apr. 1971, p. 22-24. 5 refs. In Russian.

The life span of erythrocytes, their bone-marrow production, and some other features of erythropoiesis were studied in dogs subjected over a period of 2.5 years to gamma irradiation from a Co-60 source. Chronic irradiation in a dose of 62.5 rad/year, combined with three additional doses of 42 rad each every year, shortened the half-life of erythrocytes to two years of irradiation. The absence of anemia, an increased number of erythroid elements in the bone marrow, and intensified erythrogenesis indicate compensation of radiation damage by activation of erythroid hemopoiesis. Changes produced by chronic irradiation alone were of similar nature but less distinct. T.M.

A71-31308 # **Hematological effects in dogs under the action of chronic and repeated gamma irradiation (Gematologicheskie effekty u sobak pri deistvii khronicheskogo i povtornykh gamma-obliuchenii).** T. E. Burkovskaia. *Kosmicheskaia Biologiia i Meditsina,* vol. 5, Mar.-Apr. 1971, p. 25-28. In Russian.

Study of the morphological composition of the peripheral blood and bone marrow in dogs subjected to gamma radiation over a

one-year period in a chronic dose of 0.17 rad/day and in acute doses of 42 and 8 rad at four-month intervals. The results give no evidence of serious hemopoietic disturbances. A reaction to acute irradiation in 42 rad doses was evident only in the myelopoiesis, and it became less pronounced with increased overall dosage. Myelogenesis is apparently more sensitive than the formation of other blood corpuscules. T.M.

A71-31309 # **Artificial mineralization of regenerated water in spaceflight (Iskusstvennaia mineralizatsiia regenerirovannoi vody v kosmicheskom polete).** M. I. Shikina, S. V. Chizhov, V. V. Krasnoshchekov, T. I. Aladinskaia, N. A. Golikova, and Iu. F. Khnykin. *Kosmicheskaia Biologiia i Meditsina,* vol. 5, Mar.-Apr. 1971, p. 28-31. 23 refs. In Russian.

A survey of published data indicates the necessity for artificial mineralization of water regenerated from human waste products under spaceflight conditions. Experimental data are given for mineralization of reclaimed water by using a granulated calcium orthosilicate filter in the flow duct, with subsequent addition of salt tablets. In comparison with other mineralization procedures, the proposed technique yields water with better organoleptic properties and improved physicochemical composition. T.M.

A71-31310 # **Cellular respiration during high-altitude adaptation of rats (Kletochnoe dykhanie pri vysotnoi adaptatsii krys).** V. I. Dedukhova and E. N. Mokhova. *Kosmicheskaia Biologiia i Meditsina,* vol. 5, Mar.-Apr. 1971, p. 31-38. 14 refs. In Russian.

Experimental study of the influence of high-altitude (7000 m) adaptation on the cytochrome content and on the parameters characterizing the oxidation and oxidative phosphorylation of brain homogenates in rats. For purposes of comparison, corresponding parameters were measured on liver mitochondria. The results obtained show no changes in the oxidation and oxidative phosphorylation parameters of isolated liver mitochondria and brain homogenates after a period corresponding to maximum adaptation to the high-altitude environment. T.M.

A71-31311 # **Change in the state of the sympathoadrenal system of the organism under the influence of a constant magnetic field (Ob izmeneii sostoianiia simpato-adrenalovoi sistemy organizma pod vliianiem postoiannogo magnitnogo polia).** B. M. Fedorov and V. S. Nevstrueva. *Kosmicheskaia Biologiia i Meditsina,* vol. 5, Mar.-Apr. 1971, p. 38-42. 34 refs. In Russian.

Experiments on rabbits showed a stimulating influence of a dc magnetic field on the sympathetic nervous system. A 24-hr hypokinesia sharply reduced the noradrenalin level in hypothalamus and myocardium tissues, without affecting the adrenalin content in the adrenal medulla. A 1000-Oe dc magnetic field applied over the 24-hr period prevented the reduction of noradrenalin levels in the hypothalamus and myocardium. T.M.

A71-31312 # **Influence of amytetravite and ATP on hemopoiesis in dogs subjected to repeated exposures on a background of chronic gamma irradiation (Vliianie amitetravita i ATF na gemopoez sobak pri povtornykh vozdeistviiakh na fone khronicheskogo gamma-obluchenija).** V. D. Rogozkin, N. I. Gvozdeva, M. F. Sbitneva, B. A. Markelov, T. M. Zukhbaia, and T. E. Burkovskaia. *Kosmicheskaia Biologiia i Meditsina,* vol. 5, Mar.-Apr. 1971, p. 42-46. 5 refs. In Russian.

In a two-year experiment, two groups of dogs were subjected to chronic (22 hours each day) gamma irradiation comprising a total yearly dose of 62.5 rad. Supplementary doses of 42 rad each were given three times each year. The total dose over the two-year period comprised 377 rad. One of these two groups systematically received antiradiation medicines consisting of amytetravite and adenosine triphosphate. A third group of dogs served for control puposes. Dogs treated with the drugs showed higher stability of hemopoietic parameters. T.M.

A71-31313 # **Simulation of radiation effects under prolonged spaceflight conditions (Modelirovanie radiatsionnykh vozdeistvii primenitel'no k usloviiam dlitel'nogo kosmicheskogo poleta).** V. I. Popov, A. V. Shafirkin, and V. V. Iurgov. *Kosmicheskaia Biologiia i Meditsina,* vol. 5, Mar.-Apr. 1971, p. 46-50. In Russian.

Description of chronic and acute gamma-irradiation facilities used in animal experiments simulating steady cosmic radiation and powerful solar flare radiation expected in prolonged spaceflight. The 'Liustra' chronic-irradiation facility utilizes a Co-60 source in a lead holder-collimator unit that ensures uniform irradiation of the entire pen where animals are confined. Fifty-two such facilities are arranged in a large complex permitting servicing of the animals without danger of exposure to the personnel. Depending on the irradiation program and the filters employed, yearly doses absorbed by biological tissues can be 25, 75, or 150 rad. The 'Kobalt' acute-irradiation facility has four Co-60 sources enclosed in a lead holder-collimator unit that focuses gamma rays into a concrete enclosure holding up to 12 dogs. Absorbed doses can be varied from 8 to 42 rad. T.M.

A71-31314 # **Dosimetric measurements by nuclear emulsions on board a spacecraft (Dozimetricheskie izmereniia iadernymi emul'siiami na kosmicheskom korable).** V. A. Blashkovskii, S. S. Skvortsov, and L. N. Smirennyi. *Kosmicheskaia Biologiia i Meditsina,* vol. 5, Mar.-Apr. 1971, p. 50-53. In Russian.

Measurements of cosmic radiation doses on board the manned Soiuz 3 spacecraft were performed by using three different nuclear emulsions sensitive to (1) all charged particles including relativistic electrons, (2) particles with ionization losses greater than 7 MeV/cm, and (3) only heavy nuclei. Analysis of the exposed emulsions made it possible to distinguish between fluxes of singly and multiply charged particles and to separate doses of corpuscular radiation from the background gamma radiation. The average doses absorbed by tissues in various regions of the astronaut's body are given. T.M.

A71-31315 # **Principles of construction of a work/rest regime for humans in space (Printsipy postroeniia rezhima truda i otdykha cheloveka v kosmose).** B. S. Aliakrinskii. *Kosmicheskaia Biologiia i Meditsina,* vol. 5, Mar.-Apr. 1971, p. 53-58. 34 refs. In Russian.

Development of a series of principles appropriate for the organization of a work/rest schedule for astronauts during space flights. The effect of space flight factors on disturbances of the circadian rhythms is discussed, noting, in particular, the phenomenon of desynchronosis. Possible causes of this phenomenon are suggested, and a work/rest schedule in which the sleep/wakefulness cycle corresponds more fully to the natural (endogenic) diurnal rhythms of the organism is outlined. A.B.K.

A71-31316 # **The mechanism regulating the pH and gas composition of human blood in response to changes in the CO2 partial pressure in the inhaled air (K mekhanizmu reguliatsii pH i gazov krovi cheloveka pri izmenenii PCO2 vo vdykhaemom vozdukhe).** V. V. Zhuravlev. *Kosmicheskaia Biologiia i Meditsina,* vol. 5, Mar.-Apr. 1971, p. 59-63. In Russian.

Results of measurements of acid-base equilibrium, O2 partial pressure, and CO2 partial pressure in six volunteer subjects participating in a prolonged experiment conducted in a sealed chamber with varying CO2 partial pressures. The changes noted are found to be of an individual character and to be related to the respiratory factor. The changes were compensated for by the responses of the external respiration and renal systems. A.B.K.

A71-31317 # **Effect of space flight factors on the muscle tone of men (Vliianie faktorov kosmicheskogo poleta na myshechnyi tonus cheloveka).** L. I. Kakurin, M. A. Cherepakhin, and V. I. Pervushin. *Kosmicheskaia Biologiia i Meditsina,* vol. 5, Mar.-Apr. 1971, p. 63-68. 15 refs. In Russian.

Study of the effect of weightlessness on the muscle tone of Soyuz 3, 4, and 5 crewmembers, as determined by measuring the rigidity and bioelectric activity of the muscles. Before flight, the muscle rigidity of the cosmonauts was greater than that of their backups. After flight, a decrease in the rigidity and strength of posture muscles was noted, as well as an increase in reflex excitability at rest and bioelectric activity during work. The limb circumference remained unchanged. In response to a physical load the nervous and muscular systems showed a larger reduction of reflex excitability. A.B.K.

A71-31318 # **Problems of medical evaluation of atherosclerosis in civil aviation pilots (Voprosy vrachebnoi ekspertizy ateroskleroza u letnogo sostava grazhdanskoi aviatsii).** B. L. Gel'man, G. L. Strongin, and L. I. Kuznetsova. *Kosmicheskaia Biologiia i Meditsina,* vol. 5, Mar.-Apr. 1971, p. 69-72. In Russian.

Analysis of factors predisposing to atherosclerosis on the basis of examinations of 311 active civil airmen suspected of atherosclerosis and coronary insufficiency and 106 healthy aviators. Various methods required for early diagnosis of atherosclerosis are described. The most important methods are studies of lipid metabolism and electrocardiographic examinations using functional tests. Criteria for the evaluation of various indices are given. Recommendations for medical certification of airmen suffering from atherosclerosis are presented. Further steps in the development of certification procedures for atherosclerotic aviators are outlined. A.B.K.

A71-31319 # **Changes in certain hemodynamic parameters in flight personnel with excess weight (Izmenenie nekotorykh pokazatelei gemodinamiki u lits letnogo sostava s izbytochnym vesom).** V. M. Kondrakov. *Kosmicheskaia Biologiia i Meditsina,* vol. 5, Mar.-Apr. 1971, p. 73-76. In Russian.

Results of studies of the hemodynamics of healthy pilots with excess weight (ranging from 6 to 23 kg) performed with the aid of a Savitskii mechanocardiograph. The examinations, which involved 112 persons, 22 to 48 years old, 53 of whom were controls, showed distinct differences in the basic parameters of the total hemodynamics. As compared with pilots with normal weight, young and middle-aged pilots with excess weight displayed decreased cardiac output, decreased strength of the left ventricle, and decreased volume rate of cardiac output, all the changes being in proportion to the weight of the test subjects. The parameters of the vascular hemodynamics of the overweight pilots were found to be within normal limits. A.B.K.

A71-31320 # **Changes in cardiac activity during prolonged hypodynamia (Izmeneniia serdechnoi deiatel'nosti pri dlitel'nom ogranichenii dvigatel'noi aktivnosti).** T. N. Krupina, B. M. Fedorov, T. V. Benevolenskaia, O. I. Boikova, V. S. Nevstrueva, E. N. Kul'kov, R. S. Morozova, and V. S. Romanov. *Kosmicheskaia Biologiia i Meditsina,* vol. 5, Mar.-Apr. 1971, p. 76-81. 27 refs. In Russian.

Results of clinical and experimental investigations of animals and humans carried out to ascertain the mechanisms underlying the effects of hypodynamia on the cardiac function. Clinical examinations involving a 120-day bed rest experiment indicated that diminished activity deteriorated the autonomic function and resulted in asthenization of the body at later stages. Cardiac changes were traced in the ECG, mainly as a reduced amplitude of the T-spikes in the first standard and left sternal leads. Hypokinetic experiments on rabbits revealed a drastic reduction of the norepinephrine content in the hypothalamus and myocardium at early stages and an inhibition of the adrenal function at later periods. Ultrastructural investigations of myocardial cells displayed focal changes of contractile elements, trophic formations, and increased permeability of the capillary endothelium. A.B.K.

A71-31321 # **Certain patterns in the regulation of external respiration during physical exertion (Nekotorye zakonomernosti reguliatsii vneshnego dykhaniia pri fizicheskoi nagruzke).** A. S. Barer and N. K. Gnoevaia. *Kosmicheskaia Biologiia i Meditsina,* vol. 5, Mar.-Apr. 1971, p. 82-85. 11 refs. In Russian.

Examination of the relationship between the respiration rate and capacity, on the one hand, and the respiratory capacity per minute, on the other, during strenuous physical exertion. Test subjects wearing flying suits or space suits worked on a bicycle ergometer, and walked on a treadmill or on flat solid ground. The variations of respiration rate and capacity displayed a distinct relationship to the physical load - namely, the pulmonary ventilation increased due to different combinations of respiratory processes (either an increase in the respiration rate or in the respiration capacity). It is suggested that these phenomena are based on the principle of minimization of energy expenditures in achieving an optimal effect (of the respiration capacity per minute in this case) that is inherent in every biological control system. A.B.K.

A71-31322 # **Dynamics of uropepsin excretion in dogs subjected to certain extremal flight factors (Dinamika ekskretsii uropepsina u sobak pri vozdeistvii nekotorykh ekstremal'nykh faktorov poleta).** G. I. Gurvich and V. S. Lozinskii. *Kosmicheskaia Biologiia i Meditsina,* vol. 5, Mar.-Apr. 1971, p. 86, 87. In Russian.

Study of the excretion of uropepsin in dogs subjected to hypoxia, high temperatures, radial accelerations, and impact g-forces. It is found that extremal factors can have a twofold effect on the excretion of uropepsin. While stress factors cause a decrease in the excretion of uropepsin due to inhibition of urination (attributed to excess afferentation to the central nervous system), the heat factor causes an increase in the excretion of proferment, due to an increase in its concentration, with a slight decrease in the rate of diuresis per hour. Thirty to sixty minutes after the heat action the excretion of uropepsin intensifies, reaching a maximum by the end of the second hour. A.B.K.

A71-31323 # **Dependence of the rate of proprioceptive afferentation on the state of regional blood circulation (Zavisimost' intensivnosti proprioceptivnoi afferentatsii ot sostoianiia regionarnogo krovoobrashcheniia).** V. I. Savchuk and S. N. Antonov. *Kosmicheskaia Biologiia i Meditsina,* vol. 5, Mar.-Apr. 1971, p. 87, 88. In Russian.

Study of the bioelectric activity of the fine bundles of afferent fibers of a muscle branch of the femoral nerve in anesthetized cats under conditions of controlled blood circulation in the muscle. The proprioceptive afferentation activity is found to be determined to a considerable extent by the organic blood circulation level. It is concluded that the organic blood circulation level determines the functional activity level of each receptor. The activity of afferent systems is shown to depend not only on the degree of functional stress to which they are subjected but also on the state of the peripheral blood circulation. A.B.K.

A71-31443 **The energy output of the left ventricle and the mechanism of congestive heart failure.** Sidney Roston (Louisville, University, Louisville, Ky.). *Bulletin of Mathematical Biophysics,* vol. 33, June 1971, p. 195-201. 9 refs.

The average velocity of the blood in the aortic system is approximated by means of a mathematical model. An expression is then derived for the average kinetic energy of the column of blood in an equivalent aorta of pragmatically determined length, which represents the useful energy output of the heart. The theory yields a physiologically reasonable value for the maximal myocardial efficiency with the body at rest of about 0.06%. The expression for the kinetic energy clarifies cardiac behavior in health and in such abnormal states as orthopnea and paroxysmal nocturnal dyspnea.

The great increase in cardiac work which results from mobilization of edema fluid in dependent legs into the circulation in the supine position exceeds the limited reserve capacity of the failing heart. A cause of chronic congestive heart failure is also suggested. O.H.

A71-31444 Analysis of relative contributions to the alveolar-arterial oxygen gradient. B. A. Hills (Duke University, Durham, N.C.). *Bulletin of Mathematical Biophysics,* vol. 33, June 1971, p. 259-280. 22 refs.

A fundamental analysis has been undertaken of oxygen transmission across a static inert gas with simultaneous carbon dioxide diffusion in the reverse direction. The overall alveolar-arterial gradient has then been derived as the simple sum of four terms representing shunt, ventilation/perfusion inequalities, membrane diffusion, and airway diffusion. The expression provides a mathematical framework from which to isolate the net contribution of each process to the overall gradient. O.H.

A71-31451 Blood pressure and catecholamine responses to 'stress' in normotensive and hypertensive subjects. A. R. Lorimer, P. W. MacFarlane, G. Provan, T. Duffy, and T. D. V. Lawrie (Royal Infirmary, Glasgow, Scotland). *Cardiovascular Research,* vol. 5, Apr. 1971, p. 169-173. 20 refs. Research supported by Pfizer, Ltd.

A standardized 'stress' was applied to groups of normotensive and hypertensive subjects. Systolic and diastolic blood pressures rose in both groups but were significantly greater in the hypertensive than in the normotensive group. Urinary catecholamines rose with stress to a similar extent in both groups. There was no evidence that patients with sustained hypertension have an increased production of catecholamines either at rest or under 'stress.' (Author)

A71-31452 Computer quantitation of ST segment response to graded exercise in untrained and trained normal subjects. C. T. M. Davies (Medical Research Council, London, England), A. H. Kitchin (Western General Hospital, Edinburgh, Scotland), A. V. Knibbs (Royal Infirmary, Edinburgh, Scotland), and J. M. Neilson (Carnegie College, Leeds, England). *Cardiovascular Research,* vol. 5, Apr. 1971, p. 201-209. 26 refs.

Description of a computer technique which has been employed to record continuously the amplitude of selected points on the ECG waveform during and after graded exercise in untrained and trained young subjects. There was a wide scatter of values, a proportion lying outside previously suggested criteria of normality. The general pattern was one of increasing ST segment depression and slope with increasing severity of exercise. The results obtained conflict with the reports of Sheffield et al. (1965) and of Bellet and Roman (1967) who record that they have never seen such patterns in young normal subjects. M.M.

A71-31453 * Effect of upright tilt on the phases of the cardiac cycle in normal subjects. David H. Spodick, Melvin Meyer, and J. Raoul St. Pierre (*Lemuel Shattuck Hospital; Tufts University,* Boston, Mass.). *Cardiovascular Research,* vol. 5, Apr. 1971, p. 210-214. 18 refs. Grant No. NGR-22-012-006.

Noninvasive techniques were used to investigate the effects of upright tilting on the duration of cardiac cycle phases in 10 healthy male volunteers who were tilted to 70 deg for 7 min. All statistically significant changes occurred during the first minute, including: increases in heart rate, preejection period, isovolumic contraction time, and the ratio of preejection period to ejection time, and decreases in left ventricular ejection time, pulse transmission time, and the ejection time index. No significant changes occurred in electromechanical interval, preisovolumic contraction period, isovolumic relaxation period, and rapid filling period. Most of the statistically significant changes reflect the effects of tilt demonstrated by invasive methods. The sensitivity of noninvasive techniques to the stress of tilting provides a basis for their wider application in the evaluation of cardiocirculatory status. (Author)

A71-31454 Haemodynamic response to exercise after combined sympathetic and parasympathetic blockade of the heart. I. Nordenfelt (Lasarettet, Lund, Sweden). *Cardiovascular Research,* vol. 5, Apr. 1971, p. 215-222. 28 refs.

Autonomic blockade of the heart was achieved in healthy young males. During a graded submaximal exercise the heart rate, cardiac output, mean systolic ejection rate, and blood pressure were significantly lower than during a control exercise before the blockade. Most subjects felt the work more tiring during the blockade but no one had any difficulty in completing it. (Author)

A71-31455 Muscle blood flow during exercise in normal man studied by the xenon-133 clearance method. Jan P. Clausen and Niels A. Lassen (Bispebjerg Hospital, Copenhagen, Denmark). *Cardiovascular Research,* vol. 5, Apr. 1971, p. 245-254. 20 refs. Research supported by the Danish Medical Research Council.

Blood flow in m. tibialis anterior and m. vastus lateralis was investigated during rhythmic exercise in 34 healthy subjects. The muscle blood flow (MBF) during exercise varied from an average 21 ml/100 g/min to 51 ml/100 g/min, being proportional to the work intensity in the interval from 20 to 70% of the maximal work load. No further increase in MBF was seen with increase of the work load beyond this level and, during 'supramaximal work,' MBF decreased. The change in MBF at the onset of exercise or at alteration of the work load occurred very rapidly, a new steady state value being attained within 1 min. The results are discussed in relation to the general hemodynamic adjustment to exercise in man. M.M.

A71-31456 * # Living and working in Skylab space. Joseph P. Kerwin (NASA, Manned Spacecraft Center, Houston, Tex.), Edward J. McLaughlin (NASA, Office of Life Sciences, Washington, D.C.), and Stanley C. White (USAF; NASA, Office of Life Sciences, Washington, D.C.). *Astronautics and Aeronautics,* vol. 9, June 1971, p. 24-33.

General discussion of the facilities to be provided for the Skylab and the experiments to be carried out. The habitability considerations are designed to enhance the astronauts' effectiveness in complex and varied assignments and at the same time support their physical well being and the ability to conduct an in-depth examination of physiological integrity. The experiments to be carried out emphasize technical areas predicted to offer the greatest potential threat to crew health and safety. Various aspects of crew selection and training are considered. F.R.L.

A71-31602 Measurement of height and distance information provided pilots by the extra-cockpit visual scene. C. L. Kraft (Boeing Co., Seattle, Wash.). In: Education in creative engineering; Massachusetts Institute of Technology, Symposium, Massachusetts Institute of Technology, Cambridge, Mass., April 16-19, 1969, Proceedings. Symposium supported by the Boeing Co., the Grumman Aircraft Corp., the Lockheed Aircraft Corp., the North American Rockwell Corp., the TRW Systems Group, and the National Science Foundation. Edited by Y. T. Li. Cambridge, Mass., MIT Press, 1970, p. 257-264. 12 refs.

Discussion of one aspect of night visual approaches that can lead even experienced pilots into dangerously low approaches. Research with a night visual simulator has provided data supporting a logical explanation for about 16% of air transport accidents. The explanation is in the form of a two-part hypothesis: a descent path that nulls out some visual information and a delay in the relative motion supplement of the same information. The missing topographic information allows incorrect interpretation of altitude and distance. The two-part hypothesis has been tested in a series of experimental investigations. The performance of senior instructor pilots was measured as topographic, and operational variables influenced their approach performance. F.R.L.

A71-31726 # **Oxygen deficit and muscle metabolites in intermittent exercise.** J. Karlsson and B. Saltin (Gymnastik- och idrottshögskolan, Stockholm, Sweden). *Acta Physiologica Scandinavica,* vol. 82, May 1971, p. 115-122. 18 refs. Research supported by the Swedish Medical Research Council and the Swedish Sports Federation.

Muscle ATP (adenosine triphosphate), CP (creatine phosphate), ADP (adenosine diphosphate), glycogen, G-6-P, lactate, and blood lactate concentration were studied in three subjects during intermittent exercise. Oxygen uptake was determined continuously and oxygen deficit could be calculated for each activity burst. The ratio between oxygen deficit and oxygen debt was 0.55. The breakdown of ATP and CP stores showed progressive phosphagen depletion with each burst of activity while the muscle lactate concentration reached its highest level as early as after the first work period. Muscle glycogen concentration was reduced with each work period but did not become completely depleted in any of the subjects. Of the studied metabolic variables muscle lactate concentration was the one best related to the point of exhaustion. M.M.

A71-31727 # **Lactate in working muscles after prolonged exercise.** Jan Karlsson (Gymnastik- och idrottshögskolan, Stockholm, Sweden). *Acta Physiologica Scandinavica,* vol. 82, May 1971, p. 123-130. 19 refs. Research supported by the Swedish Medical Research Council.

Nearly normal muscle lactate concentrations were obtained with a submaximal work load preceded by prolonged heavy exercise for 2-4 and 5-7 hr, resulting in a marked decrease in muscle glycogen content. The same was true if prolonged work for 2-4 hr preceded a standardized supramaximal work test in contrast to prolonged work for 5-7 hr. In all these studies, however, the blood lactate concentration was reduced after prolonged work, thus confirming earlier findings (Astrand et al., 1963). This might indicate enhanced use of blood-borne lactate induced by the preceding, prolonged work. M.M.

A71-31948 * **Processing of tactual and visual point stimuli sequentially presented at high rates.** John W. Hill (Stanford Research Institute, Menlo Park, Calif.). *Journal of Experimental Psychology,* vol. 88, June 1971, p. 340-348. 17 refs. Contract No. NAS 2-4582.

The differences between tactile and visual localization ability and temporal ordering ability were investigated using a sequential presentation of 4- and 6-point stimuli in a 3 x 8 matrix of stimulators, one at a time, at onset intervals between 10 and 200 msec. The visual and tactile experiments were made as similar as possible by using analogous displays, identical experimental procedures, and the same Ss. The experimental results showed (1) that ordering a large number of points required considerably larger onset intervals than ordering a smaller number; (2) that ordering tactually presented points was more difficult than ordering the same number of visually presented points; and (3) that the ability to localize the points reached a minimum with a 50-msec onset interval. Tests showed that this dip in performance with onset interval was not due to spatially dependent masking. (Author)

A71-31949 **Directed attention and maladaptive 'adaptation' to displacement of the visual field.** Lance Kirkpatrick Canon (Washington, University, Seattle, Wash.). *Journal of Experimental Psychology,* vol. 88, June 1971, p. 403-408. 15 refs. NSF Grant No. GB-7693.

The subjects, wearing binocular, 30-diopter prisms inducing lateral displacement of the visual field, tracked a moving target during a 10-min exposure period. The experimental group received simultaneous visual and auditory stimuli from this target, but was instructed to attend to, and localize exclusively in terms of, the visual stimuli available. One control group operated with similar instructions but with only visual and no auditory stimuli available from the target, and a second control group localized the target on the basis of both visual and auditory cues that were successively but never simultaneously present. As predicted, only postexposure shifts in auditory localizations developed, and these occurred only in the experimental condition, where the exposure circumstances provided intermodality inconsistency of input regarding the spatial locus of the target. M.M.

A71-31951 * **The sleep cycle and subcortical-cortical EEG relations in the unrestrained chimpanzee.** James J. McNew, R. C. Howe, and W. Ross Adey (California, University, Los Angeles, Calif.). *Electroencephalography and Clinical Neurophysiology,* vol. 30, June 1971, p. 489-503. 17 refs. Grant No. NsG-502; Contract No. NSR-05-007-158.

Sleep was recorded for seven consecutive nights from each of three chimpanzees by means of biotelemetry techniques. A 'first night effect' was evidenced by a lower percentage of REM (rapid eye movement) sleep, a higher percentage of light sleep, more time spent in the awake stage, and longer latencies to the onset of both deep sleep and REM. Computer analysis techniques were used in the description of the physical parameters of the EEG to investigate subcortical-cortical relationships during the various stages of the sleep cycle. During REM, non-REM, and the awake stages of the cycle, the cortex and each subcortical area studied were found to have their own characteristic patterns of spectral density. The unrestrained chimpanzee's sleep cycle as well as his subcortical-cortical EEG patterns were found to compare closely with those of man. M.M.

A71-31952 **Effects of 5-hydroxytryptophan on the sleep of normal human subjects.** R. J. Wyatt, V. Zarcone, K. Engelman, W. C. Dement, F. Snyder, and A. Sjoerdsma (National Institutes of Health, Bethesda, Md.; Stanford University, Palo Alto, Calif.). *Electroencephalography and Clinical Neurophysiology,* vol. 30, June 1971, p. 505-509. 22 refs.

In each of the twelve subjects studied, rapid eye movement (REM) sleep increased from 5 to 53% of placebo baseline. The total rapid eye movement activity also increased. Non-REM sleep decreased slightly, apparently compensating for the increased amount of REM sleep. The apparent serotonin-REM sleep association is discussed in the light of recent animal experiments in which total insomnia was produced by decreasing brain serotonin concentration with parachlorophenylalanine. M.M.

A71-31953 **Readiness potential, vertex positive wave, contingent negative variation and accuracy of perception.** Dale W. McAdam and Eugene H. Rubin (Rochester, University, Rochester, N.Y.). *Electroencephalography and Clinical Neurophysiology,* vol. 30, June 1971, p. 511-517. 14 refs. Research supported by the Leonard Waasdorp Memorial Fund and the U.S. Navy; PHS Grant No. NS-08456.

The readiness potential (RP), contingent negative variation (CNV) and vertex positive wave (P302) were recorded in a situation where subjects were asked to present themselves with brief visual stimuli, to attempt to perceive them correctly and subsequently, on cue, to report their perceptions. The results show that the RP preceding the button press leading to the presentation of the stimulus was a reliable index of the neural events associated with subsequent correct or incorrect perception. P302, although showing clear localization at the vertex, was not reliably correlated with the behavioral response. The CNV was shown to be related in this situation to motivation/expectancy/attention factors following the perception and preceding the report. It is concluded that the RP and the CNV reflect common underlying neural processes when both are studied in complex (global) psychological situations. M.M.

A71-31954 Relationships between EEG, personality and vigilance. Ch. Becker-Carus (Max-Planck-Institut für Psychiatrie, Munich, West Germany). *Electroencephalography and Clinical Neurophysiology,* vol. 30, June 1971, p. 519-526. 25 refs. Translation.

The dependence of alpha frequencies on vigilance performance and on the personality variables of rigidity, extroversion, and neurotic tendency was investigated. Some of the results that were obtained are: (1) good vigilance correlates positively with low and negatively with high alpha frequencies during both task performance and the subsequent resting stage; (2) rigidity correlates positively with the error score in the vigilance task and negatively with the percentage of correct responses; (3) neurotic tendency correlates positively with intermediate alpha frequencies during the vigilance task and with the alpha index during and after this task. The results suggest that good vigilance is associated with the lower alpha frequencies and poor vigilance with the higher ones. Rigidity appears to be associated with high alpha frequencies and poor performance. M.M.

A71-31955 Evoked cortical responses to patterned light flashes - Effects of ocular convergence and accommodation. M. Russell Harter and Lenin E. Salmon (North Carolina, University, Greensboro, N.C.). *(American EEG Society, Annual Meeting, Washington, D.C., Sept. 17-19, 1970.) Electroencephalography and Clinical Neurophysiology,* vol. 30, June 1971, p. 527-533. 12 refs. NSF Grant No. GB-8053.

Visually evoked cortical responses and visual acuity were investigated as a function of changes in accommodation and convergence. The effects of convergence on both evoked response amplitude and visual acuity depended on the accommodative stimulus used. Evoked potential amplitude was greatest and visual acuity best when the stimuli to accommodate and converge were associated. Evoked response amplitude appeared to reflect the degree to which subjects accommodated the different experimental conditions since response amplitude was positively correlated with visual acuity. The results are discussed in terms of the physiological and functional relationships between convergence and accommodation. M.M.

A71-31956 Effect of ischaemia on the function of the sensorimotor cortex in cat. K.-A. Hossmann and K. Sato (Max Planck Institute for Brain Research, Cologne, West Germany). *Electroencephalography and Clinical Neurophysiology,* vol. 30, June 1971, p. 535-545. 35 refs.

Transient cerebral ischemia of 20 min to 2 hr was produced in normothermic cats by clamping the innominate and subclavian arteries and simultaneous lowering of the systemic blood pressure, or by interrupting the blood supply to animals with extracorporeal circulation. After ischemia high systemic blood pressure was maintained to assure the adequate blood recirculation of the brain. The effect of ischemia on the sensorimotor cortex was studied by recording the spontaneous EEG and the pyramidal response (PR) to electrical stimulation of the cortex. The results obtained confirm that basic neuronal functions may reappear after complete ischemia of more than 1 hr. M.M.

A71-31957 Red nucleus fast activity and signs of paradoxical sleep appearing during the extinction of experimental seizures. Augusto Fernández-Guardiola and Fructuoso Ayala (Universidad Nacional Autónoma de México, Mexico City, Mexico). *Electroencephalography and Clinical Neurophysiology,* vol. 30, June 1971, p. 547-555. 34 refs. Research supported by the Fund for Overseas Research Grants and Education.

The electrical activity of several cortical and subcortical structures was analyzed in cats during electrically and pentamethylenetetrazol-induced seizures. These activities were compared with the spinal monosynaptic reflex variations during the same seizures. Some of the results obtained are: (1) the monosynaptic spinal reflex is initially facilitated during the tonic phase and when it is elicited in the vicinity of a clonic wave; (2) in the last stages of the seizure, the monosynaptic spinal reflex appears deeply inhibited. This inhibition coincides with the appearance of fast sinusoidal activity in the red nucleus; (3) the electrical stimulation of red nucleus areas which show fast sinusoidal activity is also associated with a spinal monosynaptic reflex depression; and (4) in the last stages of the convulsive activity, central and peripheral signs appear which are similar to those described for paradoxical or REM (rapid eye movement) phase of normal sleep. M.M.

A71-31958 Automatic analysis of polygraphic sleep recordings (Analyse automatique des enregistrements polygraphiques de sommeil). Jean-Michel Gaillard, André E. Simmen, and René Tissot (Genève, Université, Geneva, Switzerland). *Electroencephalography and Clinical Neurophysiology,* vol. 30, June 1971, p. 557-561. 17 refs. In French.

Polygraphic recordings of human sleep are automatically analyzed by a device which gives a minute by minute diagnosis of the sleep stage, along with comments (artifacts) and numerical results for rapid and slow eye movements, muscle tone, heart and respiratory rates. The analytical device consists of an analog component formed by 18 analyzers, a digital component, and an interface allowing the establishment of a dialogue between the two previous components. An automatic correction of the gross results by the context and a series of logical decisions constituting the program eventually produce a diagnosis. The results are recorded step by step on a typewriter. Other applications of the device are feasible by means of a simple change in program, such as long-term recordings in animals. M.M.

A71-31959 A technique for the measurement of phase relations of the EEG. D. Papakostopoulos, R. Cooper, and W. Grey Walter (Burden Neurological Institute, Bristol, England). *Electroencephalography and Clinical Neurophysiology,* vol. 30, June 1971, p. 562-564. Research supported by the W. Clement and Jessie V. Stone Foundation.

Description of a method in which the sine and cosine components of the Fourier analysis of multichannel EEG data are displayed as vectors. A small general purpose digital computer is used to separate the frequency components and compare the phases of EEG activity from electrode to electrode. The sine and cosine components of this analysis are then used to determine the phase angle of particular frequencies. Common reference recordings are recommended because of the interaction of amplitude and phase differences in bipolar montages. M.M.

A71-31960 Period analytic estimates of moments of the power spectrum - A simplified EEG time domain procedure. Bernard Saltzberg (Tulane University, New Orleans, La.) and Neil R. Burch (Texas Research Institute of Mental Sciences, Houston, Tex.). *Electroencephalography and Clinical Neurophysiology,* vol. 30, June 1971, p. 568-570. 7 refs. PHS Grants No. 5 R01 NS04705-05; No. PH 43-68-1412.

Mathematical description of the relationships connecting zero crossing descriptors (also called period analytic descriptors) with moments of the power spectral density. Analyzed EEG data are presented to demonstrate that counting zero crossings over an epoch is equivalent to the more complex procedures of computing the autocorrelation function and taking its derivatives at zero lag, or squaring and integrating derivatives of the EEG time trace over each epoch. M.M.

A71-31984 Aftereffect of visual movement - Storage in the absence of a patterned surround. E. R. Strelow and R. H. Day (Monash University, Clayton, Victoria, Australia). *Perception and*

Psychophysics, vol. 9, June 1971, p. 485, 486. 10 refs.

Storage of the visual movement aftereffect is shown to occur if, after movement, the stationary target remains clearly visible in a surround that is dark and featureless. This finding is considered in terms of the earlier observation that the movement aftereffect is reduced or eliminated when the target surround is featureless. It is noted that current hypotheses in terms of direction-specific units cannot easily explain the storage of the movement aftereffect.

(Author)

A71-31985 The equivalence of target and nontarget processing in visual search. J. Patrick Cavanagh and William G. Chase (Carnegie-Mellon University, Pittsburgh, Pa.). *Perception and Psychophysics,* vol. 9, June 1971, p. 493-495. 10 refs. PHS Grant No. MH-07722.

A comparison of a forced-choice visual search task with an item recognition task did not support Neisser's (1967) hypothesis of a preattentive stage that processes targets and nontargets differentially. In the forced-choice condition, subjects indicated which of two items in a visual display was a target; in item recognition, subjects determined whether or not the single item in the visual display was a target. The size of the memorized set of possible targets was varied from one to six items for both tasks. Latencies increased linearly with memory set size in both conditions, the slopes for forced choice and item recognition were 41.8 and 27.9 msec per item, respectively. The ratio of 1.38 between the two slopes was well fit by Sternberg's (1967) item recognition model, which predicts a ratio of 1.50. This evidence supports the hypothesis that the identification or 'standing out' of targets, as compared to 'blurred' nontargets, in visual search, occurs after both the encoding and memory search processes have terminated. M.M.

A71-32001 The role of the vagus nerve in cardiac adaptation to exercise. B. W. Goldstone, M. J. Silberstein (Witwatersrand, University, Johannesburg, Republic of South Africa), and C. H. Wyndham (Chamber of Mines of South Africa, Republic of South Africa). *Pflügers Archiv,* vol. 325, no. 2, 1971, p. 113-124. 30 refs.

Experiments were carried out in which ten dogs were subjected to bilateral removal of thoracic sympathetic chains so as sympathetically to denervate the heart while leaving vagal control intact. Their cardiac output was then estimated at different levels of exercise. A repeated estimation about a year later yielded almost identical results. Cutting both vagi in these dogs resulted in practically no immediate deterioration of their cardiac input to exercise. On the other hand, hearts of dogs that had been completely denervated some months previously, had a relatively poor cardiac adaptation to exercise. It is concluded that in the sympathectomized dogs even the recent possession of the vagus confers almost full power of cardiac adaptation to exercise. It is suggested that the recent possession of the vagus has trophic influence on the heart enabling it to retain mitochondria essential to normal function. O.H.

A71-32050 * Fatty acid composition of thermophilic, mesophilic, and psychrophilic clostridia. May Chan, Richard H. Himes, and J. M. Akagi (Kansas, University, Lawrence, Kan.). *Journal of Bacteriology,* vol. 106, June 1971, p. 876-881. 21 refs. NIH Grant No. A1 04672; Grant No. NGR-17-002-042.

The fatty acid composition of two thermophilic anaerobes was determined, and the results were compared with those from a mesophilic and a psychrophilic anaerobe. Notable differences were that the thermophiles contained a higher content of saturated straight- and branched-chain fatty acids, and, of the latter, iso C sub 15 was the predominant type. The mesophile and psychrophile were characterized by having a higher percentage of unsaturated fatty acids. An unidentified fatty acid, present in all of the organisms, was purified from the psychrophile. By physical and chemical analysis the structure of the unknown acid was resolved and found to be the unsaturated cyclopropane fatty acid, 12, 13-methylene-9-tetradecenoic acid. (Author)

A71-32196 # Evaluation of the Gundefender earplug - Temporary threshold shift and speech intelligibility. J. D. Mosko and John L. Fletcher (U.S. Army, Medical Research Laboratory, Fort Knox, Ky.). *Acoustical Society of America, Journal,* vol. 49, June 1971, pt. 1, p. 1732, 1733.

Evaluation tests of the Gundefender earplug were conducted using the temporary-threshold-shift-reduction method and the modified rhyme technique for measuring speech intelligibility in noise. The obtained results confirm the ability of this earplug to achieve its objective of providing the wearer with protection from high-intensity impulsive-type noise, while providing improved communication in low-noise and no-noise conditions. M.V.E.

A71-32220 * # Integration of an isotope Brayton power system with a life support system. James N. Deyo, John L. Klann, and Raymond S. Bilski (NASA, Lewis Research Center, Cleveland, Ohio). *American Institute of Aeronautics and Astronautics, American Society of Mechanical Engineers, Institute of Electrical and Electronics Engineers, and Society of Automotive Engineers, Intersociety Energy Conversion Engineering Conference, 5th, Las Vegas, Nev., Sept. 21-25, 1970, Paper.* 16 p. 13 refs.

Results of an analytical study conducted to determine the feasibility of using an isotope Brayton power system to supply both the electrical and thermal needs of an integrated life support system. Emphasis was placed on studying the steady-state and transient interactions that would result from thermal integration of the two systems. Results of the study show that thermal integration can be accomplished most flexibly by extracting heat in the Brayton power system's waste heat loop through the use of an auxiliary liquid-to-liquid heat exchanger. Thermal transient effects on both systems are within operating tolerances. However, to provide the life-support-system process heating temperature requirement will necessitate operating the power system compressor inlet temperature about 40 F above the existing design point of 80 F, thereby reducing the calculated power system conversion efficiency from 0.29 to 0.27. Hardware modifications to permit integration were examined and found to be minor. Both systems can be made electrically compatible by the addition of a frequency converter. (Author)

A71-32242 * Noise as perceived by the community. Paul N. Borsky (Columbia University, New York, N.Y.). In: Society of Automotive Engineers and U.S. Department of Transportation, Conference on Aircraft and the Environment, Washington, D.C., February 8-10, 1971, Proceedings. Part 2. New York, Society of Automotive Engineers, Inc., 1971, p. 11-20. 16 refs. Grant No. NGL-33-008-118.

Different composite noise indexes are compared and CNR or NEF is believed best suited for judging community annoyance and physiological effects. Noise levels in areas close to airports are very high and in some communities may constitute a hazard for hearing loss. Effects of intense noise on other physiological reactions are less well known, but should be studied. Interference with communications and sleep are the most serious effects of aircraft noise exposure, with sleep interruption rated relatively more annoying. Increasing noise accounts for about 25% of the total variance in human annoyance; attitudes, experiences and other human factors are even more important. Responses from persons with only moderate fear of crashes and feelings that authorities are somewhat misfeasant in minimizing noise, indicate that about one-third have 'high annoyance' at NEF 20-25, and almost half at NEF 30+. Measures for noise abatement are briefly described, including a time schedule for reducing maximum noise levels, modifying existing engines, introducing new 'quiet' engines producing 10 EPNdB less noise than the existing FAA rule, reducing the number of flights by rationalizing duplicating flights to optimize capacity of airplanes, and development and enforcement of compatible land use zoning regulations.

(Author)

A71-32250 * # Effects of aircraft noise on human sleep. Jerome S. Lukas. *American Industrial Hygiene Association, American Industrial Hygiene Conference, Toronto, Canada, May*

24-28, 1971, Paper. 18 p. 15 refs. Contracts No. NAS 1-6193; No. NAS 1-7592; No. NAS 1-9286.

The responses of subjects of different ages and during different stages of sleep to simulated sonic booms and subsonic jet aircraft noise at random intervals during the night were experimentally studied. Results show that the sleep of children tends to be uniformly unaffected by these two types of noise over a wide range of intensities. Men of about 50 years, on the average, were awakened by about 18% of sonic booms ranging from 0.65 to 5.0 psf in intensity and to an equal extent by subsonic jet flyover noises ranging in intensity from 101 to 119 PNdB. On the average, men of some 70 years were awakened by about 28% of the sonic booms of 0.65 to 5.0 psf in intensity and, to a statistically insignificant degree, by subsonic noises in the range from 101 to 119 PNdB. For middle-aged and old men, sonic booms of 2.0 psf are, on the average, as awakening as subsonic jet noises of about 110 PNdB. O.H.

A71-32296 Snake infrared receptor - Thermal or photochemical mechanism. John F. Harris and R. Igor Gamow (Colorado, University, Boulder, Colo.). *Science,* vol. 172, June 18, 1971, p. 1252, 1253. 10 refs. Research supported by the Research Corporation of Minneapolis and the University of Colorado; NSF Grant No. GK-5682.

It appears that the two most sensitive infrared receptors known in the biological world are found in two widely different families of snakes, the pit vipers and the boas. After an infrared stimulus from a carbon dioxide laser, which has a monochromatic output at 10.6 micrometers, we find evoked potentials in boas with chronically implanted electrodes. Our data suggest that the receptors operate on a thermal principle. (Author)

A71-32306 # Contribution to a study of mental performance in the presence of a definite physical stress (Beitrag zur Untersuchung der mentalen Leistungsfähigkeit bei definierter physischer Beanspruchung). Eckehard Behr. München, Technische Universität, Fakultät für allgemeine Wissenschaften, Doktor der Naturwissenschaften Dissertation, 1970. 140 p. 260 refs. In German.

A study is made of the mental performance of individuals in receiving, processing, and classifying signals, particular attention being paid to changes in performance due to above-normal muscular stress. A concept of mental stress is developed, and an outline is given of the physiological bases and the data processing aspects of this type of stress. In the case of double choice reactions investigated in this work it is established that mental stress is determined by the data processed per unit time. A survey is made of the literature on contributions to mental performance in the presence of simultaneous mental and physical stress. A series of tests is described in which the effect of muscular activity on mental performance is investigated in an example of complex data processing. On the basis of the results of this test series a second series of tests is carried out involving quantifiable mental stresses. The mental performance was evaluated on the basis of signal response in double choice reaction problems with various signal presentation rates in the presence of a simultaneous definite physical stress resulting from ergometer work. A.B.K.

A71-32308 # The obtainment of kinetic energy of braked flywheel masses with human muscular force (Erhaltung der Bewegungsenergie gebremster Schwungmassen mit menschlicher Muskelkraft). Herbert Schnauber. Darmstadt, Technische Hochschule, Fakultät für Maschinenbau, Dr.-Ing. Dissertation, 1969. 149 p. 44 refs. In German.

The influence of the mechanical conditions such as velocity of motion and moment of inertia on work, power output, and time involved in a single contraction of the forearm is investigated. A testing device suitable for these studies had been designed, built, and tested. The investigations show that the work transferred to a mechanical system depends on the velocity with which the forearm moves while performing the work. This is true even if a certain initial velocity has been previously imparted to the flywheel mass system. The relation between work and velocity can be best described by a hyperbola. A biomechanical analysis indicates that no energy can be transferred to the external system if the velocity of the motion of the forearm exceeds a critical value. G.R.

A71-32346 Intraocular pressure variation during xenon and ruby laser photocoagulation. Frederick T. Fraunfelder (Johns Hopkins University, Baltimore, Md.) and Lawrence J. Viernstein (Johns Hopkins University, Silver Spring, Md.). *American Journal of Ophthalmology,* vol. 71, June 1971, p. 1261-1266. 12 refs. PHS Grant No. NB 07226.

Description of quantitative measurements of the acoustical wave that is generated during the xenon photocoagulation and ruby laser burns of the iris and retina. Possible clinical correlations are drawn. It is pointed out that there is a sharp pressure surge lasting about one msec simultaneous with the explosion of ocular tissue during heating by the xenon photocoagulator or ophthalmic ruby laser. The data described support the possibility of secondary effects due to a shock wave, and suggest the desirability of avoiding the 'pop' in ocular xenon photocoagulation. M.M.

A71-32347 Ocular effects of argon laser radiation. II Histopathology of chorioretinal lesions. James O. Powell, George H. Bresnick, Myron Yanoff, Georg D. Frisch, and Jack E. Chester (U.S. Army, Frankford Arsenal, Philadelphia, Pa.). *American Journal of Ophthalmology,* vol. 71, June 1971, p. 1267-1276. 11 refs.

The eyes of rhesus monkeys were exposed to the argon laser operating at 488.0 and 514.5 nm. Chorioretinal lesions produced at threshold and suprathreshold power levels were studied by histopathology and fluorescein angiography. Minimal threshold damage was confined to the retinal pigment epithelium and was demonstrated by light microscopic examination of retinal flat-mounts. Changes in the pigment epithelium and photoreceptor layers were consistent with a predominantly thermal damage mechanism based on primary laser absorption by the melanin granules of the pigment epithelium. M.M.

A71-32348 Properties observed in cataracts produced experimentally with ultrasound. D. Jackson Coleman, Federic L. Lizzi, William J. Burt, and Harriet Wen (Columbia University, New York, N.Y.). *American Journal of Ophthalmology,* vol. 71, June 1971, p. 1284-1288. 6 refs. PHS Grant No. EY-00275-04.

The use of externally applied ultrasound to soften lens material in order to facilitate aspiration was suggested by hf mechanical aspirating methods. In vivo rabbit lenses were used to study the possible softening of lens material after application of CW ultrasonic irradiation. The lenses were followed for periods up to 60 days. The lens material became hard and even calcific during this time, apparently due to the mechanical and heating effects of ultrasonic irradiation. The use of externally applied ultrasonic irradiation at the frequency, powers, and durations specified, as a means of softening lens material prior to aspiration, does not appear clinically feasible at this time. M.M.

A71-32449 A program for assistance in EEG analysis and interpretation through a small computer. Stephen L. Sherwood (U.S. Veterans Administration Hospital; Stanford University, Palo Alto, Calif.) and D. W. Wilson (Stanford University, Palo Alto, Calif.). *Medical Research Engineering,* vol. 10, Apr.-May 1971, p. 23-26. 24 refs.

A data processor of limited capacity is used to assist the electroencephalographer, after perusal of an EEG tracing, to describe the record and print out a summary report and, through an automatic logic, derive appropriate clinical conclusions. The anticipated extension of this - namely, a fully automated EEG report, can be based on what the electroencephalographer does: he recognizes 'frequencies,' their predominance and anatomical distributions. Algorithms to accomplish this are now available in the form of fast Fourier transforms. M.M.

A71-32529 # **Conditioned reflex and the physiology of the sense organs - Differentiation and discrimination (Uslovnyi refleks i fiziologiia organov chuvstv - Differentsirovanie i razlichenie).** N. F. Suvorov (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR,* vol. 57, Mar. 1971, p. 329-340. 37 refs. In Russian.

Investigation of the mechanisms and functional localization of the discrimination function and of differentiating inhibition. Their interrelationship and interactions are examined together with differences in originating mechanisms and morphological organization. The experimental data presented in the study indicate that the signal discrimination function involves an irritative process, an orientative reaction, and both intrinsic and acquired information-processing mechanisms. On the other hand, differentiation is always associated with internal inhibition which is acquired in ontogenetic development. A logic network of brain operation during the formation of a conditioned reflex is described, and an attempt is made at identifying individual logic processing elements with the activity of different brain areas. T.M.

A71-32530 # **Evaluation of the quality of work of a human operator on the basis of the EEG (Ob otsenke kachestva raboty cheloveka-operatora po EEG).** A. V. Chubarov and V. V. Petelina (Akademiia Meditsinskikh Nauk SSSR, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR,* vol. 57, Mar. 1971, p. 341-347. In Russian.

In view of the fact that the electrical activity of the brain is a general indication of the functional state of the central nervous system (CNS), the possibility of evaluating the work quality of a human operator by interpretation of EEG data was examined. Despite evident individual features of motor reactions and differing levels of CNS tonic activity, a clearly expressed constant relationship was discovered between the quality of task performance and the background electrical activity present at the time when the task was entrusted. Task performance quality was measured by the response time and accuracy exhibited by the subject in restoring a suddenly deflected spot to a marked central position on the screen of an oscilloscope. The electrical activity was measured by the parameter P, corresponding to the ratio of the EEG averaged amplitude to its frequency. Lower values of P corresponded to reduced task performance quality. T.M.

A71-32531 # **Blood circulation in the cortical section of the auditory analyzer (O krovoobrashchenii v korkovom otdele slukhovogo analizatora).** A. I. Naumenko and N. A. Tikhonova (I Leningradskii Meditsinskii Institut, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR,* vol. 57, Mar. 1971, p. 414-419. 21 refs. In Russian.

The relationship between blood circulation in the auditory cortex and its bioelectrical activity was studied in 99 tests on 11 cats. Pure tones of different frequencies were used as the stimuli. The sound stimuli evoked local changes in blood supply to the auditory cortex without affecting the overall arterial pressure. The changes depended on the frequency of the particular stimulus. Dilation of the vessels was six times as evident as constriction. Dilation effects evoked by the sound stimuli coincided with changes in bioelectrical activity in some cases, but no completely parallel response pattern was established between electrocorticogram reactions and increased local blood supply. T.M.

A71-32532 # **Action potential of the human skeletal muscle during inhibition of the spinal center (Potentsial deistviia skeletnoi myshtsy cheloveka vo vremia tormozheniia spinal'nogo tsentra).** M. Kh. Starobinets (Petrozavodskii Gosudarstvennyi Universitet, Petrozavodsk, USSR). *Fiziologicheskii Zhurnal SSSR,* vol. 57, Mar. 1971, p. 427-432. 15 refs. In Russian.

Reflex (H) and motor (M) reactions of the musculus soleus in response to stimulation of the tibial nerve were measured in healthy human subjects. Voluntary contraction of the antagonist muscle (musculus tibialis anterior) increased the latent period of the H response and reduced its amplitude. At the same time, the amplitude and the latent period of the M response increase and shorten, respectively. Changes in the M response pattern were most regular for moderate stimuli evoking from 30 to 40% of the maximum motor reaction. The increased amplitude of the M response is examined as a consequence of (1) depressed efferent influences and (2) enhanced excitability of motor units. T.M.

A71-32533 # **Changes of the gaseous metabolism and of the thermoregulatory activity in the muscles of animals in a hyperoxic atmosphere (Izmeneniia gazoobmena i termoreguliatsionnoi aktivnosti myshts u zhivotnykh v giperoksicheskoi atmosfere).** G. V. Troshikhin (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR,* vol. 57, Mar. 1971, p. 438-441. 18 refs. In Russian.

Investigation of the gas exchange and electrical activity in the muscles of rats exposed for successive one-hour periods to air, oxygen, and air atmospheres. Three sets of experiments were performed at ambient temperatures of 16 to 18 C, 20 to 22 C, and 25 C. The gas exchange and the thermoregulatory muscle tone at 20 to 22 C ambient temperatures were higher in oxygen than in air. Ambient temperatures of 16 to 18 C increased the changes in the gaseous metabolism and in the electrical activity of the muscles, while a temperature of 25 C tended to minimize these changes. The gas exchange rate during oxygen respiration is strongly dependent on the thermoregulatory activity of the muscles. T.M.

A71-32534 # **Use of the 'Mir' electronic digital computer in physiological research - Experience in organization, operation, and maintenance (Ob ispol'zovanii elektronnoi tsifrovoi vychislitel'noi mashiny 'Mir' v fiziologicheskikh issledovaniiakh - Opyt po organizatsii ekspluatatsii i obsluzhivaniia).** N. S. Slepchuk and K. P. Ivanov (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR,* vol. 57, Mar. 1971, p. 457-459. In Russian.

Description of experience gained with the 'Mir' small-scale, solid-state digital computer in statistical processing of experimental medical data. A three man group consisting of a mathematician, an engineer, and an operator is entrusted with the use and maintenance of the computer. In consultation with individual researchers, this group formulates the problem, derives the necessary equations, selects the required statistical processing procedure, compiles the program, and feeds the initial information into the machine. An example program is described for calculating the rate of change in the amplitude of the slow component of nystagmus. T.M.

A71-32535 # **Features of microelectrode fabrication for studying the cellular activity of the human brain in a neurosurgical clinic (Osobennosti mikroelektrodnoi tekhniki pri izuchenii kletochnoi aktivnosti mozga cheloveka v neirokhirurgicheskoi klinike).** S. N. Raeva, N. L. Gorbachevskaia, and L. P. Kravchenko (Akademiia Nauk SSSR, Institut Biofiziki, Pushchino; Akademiia Meditsinskikh Nauk, Moscow, USSR). *Fiziologicheskii Zhurnal SSSR,* vol. 57, Mar. 1971, p. 460-462. 6 refs. In Russian.

Description of a method of fabricating microelectrodes for extracellular recording of the activity of individual neurons during stereotaxic operations on Parkinsonism and various hyperkinesia syndromes. Tungsten wires (300-micron diam) are electrolytically sharpened to a steep tip (1 to 2 microns) which is subsequently lacquered with an epoxy varnish. Experience shows that these electrodes have little traumatic influence on the brain, are mechanically strong, exhibit stable recording characteristics, and can be used repeatedly. T.M.

A71-32536 **Ultrasonic measurement of left ventricular wall motion in acute myocardial infarction.** Kiyoshi Inoue, Harold

Smulyan, Saktipada Mookherjee, and Robert H. Eich (New York, State University, Syracuse, N.Y.). *Circulation,* vol. 43, June 1971, p. 778-785. 28 refs. Research supported by the Heart Association of Upstate New York and the Broome County Heart Association; PHS Grant No. HE-05410.

The time-motion representation of the echogram was used to evaluate the left ventricular posterior wall motion in myocardial infarction. The left ventricular posterior wall echo was obtained in ten normal subjects and 26 patients with chest pain admitted to a coronary care unit, including 11 with acute myocardial infarction (group 1), nine with old myocardial infarction (group 2), and six with chest pain of miscellaneous origin (group 3). By using the measurements of posterior wall excursion, mean posterior wall velocity, and isometric contraction time, group 1 patients were differentiated from those of groups 2 and 3 and from the normal subjects. The data from patients in groups 2 and 3 were not statistically different from those of normal subjects. The measurements obtained by the time-motion curve of the left ventricular posterior wall echo appear to be of value in the bedside evaluation of acute myocardial infarction. M.M.

A71-32537 Radioisotopic angiocardiography - Wide scope of applicability in diagnosis and evaluation of therapy in diseases of the heart and great vessels. Joseph P. Kriss, Lee P. Enright, William G. Hayden, Lewis Wexler, and Norman E. Shumway (Stanford University, Stanford, Calif.). *Circulation,* vol. 43, June 1971, p. 792-808. 20 refs. Research supported by the Easter Seal Research Foundation; NIH Grant No. GM-1707.

Results of radioisotopic angiocardiography performed in 120 patients after the intravenous injection of super 99m Tc pertechnetate. A scintillation camera and a variable time-lapse videoscintiscope were used. The results indicate that the method permits identification and physiological assessment of a wide variety of congenital and acquired cardiovascular lesions, including septal defects, valvular stenosis and incompetence, aneurysm, tumor, venous obstruction, ventricular hypertrophy, and effusion. Emphasis particularly is given, therefore, to the wide scope of applicability of the procedure. The diagnostic criteria employed for a representative group of these lesions are presented together with illustrative examples to demonstrate the type and quality of the information which may be obtained with the method. The procedure is rapid and safe and does not require hospitalization, heart catheterization, or special preparation of the patient, advantages which favor its use as a diagnostic screening test. In addition to its diagnostic uses, radioisotopic angiography may offer a useful and convenient method of assessing the effects of therapy or of following the course of disease. (Author)

A71-32538 Maximal treadmill stress test correlated with postexercise phonocardiogram in normal subjects. Wilbert S. Aronow, Nicholas P. Papageorge's, Ronald R. Uyeyama, and John Cassidy (U.S. Veterans Administration Hospital, Long Beach; California, University, Irvine, Calif.). *Circulation,* vol. 43, June 1971, p. 884-888. 8 refs.

Results of a maximal treadmill stress test of one hundred normal subjects, mean age 51, who had had a simultaneous phonocardiogram and electrocardiogram at rest and a double Master's test. Thirteen of 100 normal people (13%) had an abnormal maximal treadmill stress test with at least 1.0 mm of ischemic ST-segment depression. Ten of 29 normal subjects (34%) with a fourth heart sound and four of 11 normal people (36%) with a third heart sound after their double Master's test had an abnormal maximal treadmill stress test. Three of 71 normal subjects (4%) without a fourth heart sound and nine of 89 normal people (10%) without a third heart sound after their double Master's test had an abnormal maximal treadmill stress test. Normal subjects with an abnormal maximal treadmill stress test had a significantly higher incidence of fourth heart sounds (P less than 0.001) and third heart sounds (P less than 0.02) than normals with a normal maximal treadmill stress test. (Author)

A71-32539 Concealed and supernormal atrioventricular conduction. Anthony N. Damato and Sun H. Lau (U.S. Public Health Service Hospital, Staten Island, N.Y.). *Circulation,* vol. 43, June 1971, p. 967-970. 5 refs. NIH Grants No. HE-11829; No. HE-12536.

Discussion and illustration of an example of antegrade concealed conduction caused by a simple premature atrial beat, an example of retrograde concealed conduction caused by an interpolated premature ventricular contraction, and an example of a concealed premature ventricular beat altering the discharge rate of a junctional pacemaker. Supernormal A-V (atrioventricular) conduction is the term applied to the phenomenon in which conduction of impulses is better than expected. In 15 patients the zone of so-called supernormal A-V conduction was found to be between 30 and 80 msec. M.M.

A71-32540 Pathologic features of atrioventricular and intraventricular conduction disturbances in acute myocardial infarction. D. B. Hackel and E. H. Estes, Jr. (Duke University, Durham, N.C.). *Circulation,* vol. 43, June 1971, p. 977-979. 10 refs. NIH Contract No. PH-43-67-1440.

In relation to anatomic findings in patients with heart block complicating acute myocardial infarction, it is interesting to speculate on the possible reasons for the observation that, in some cases, conducting fibers are spared despite massive infarction of adjacent myocardium. An obvious possibility is that diffusion of oxygen from the ventricular cavity directly to the underlying conducting fibers affords protection. An equally attractive explanation lies in the known metabolic differences between contractile and conducting fibers. One study, for example, has shown that the rate of oxygen consumption is one fifth as great in the conducting as in the contractile musculature (Schiebler et al., 1956). It is also of interest to consider the basis for the transient functional defect that arises in the anatomically intact conducting fibers. It is possible that sublethal anoxia may play a role or that there may be an efflux of potassium from the surrounding necrotic tissue. M.M.

A71-32541 # The right ventricular function during exercise in patients with and without right ventricular failure. S. J. K. Lee, A. R. McClelland, and A. J. Zaragoza (Alberta, University, Edmonton, Alberta, Canada). *Acta Cardiologica,* vol. 25, no. 4, 1970, p. 313-325. 17 refs.

Study of the effects of supine leg exercise on the right ventricular hemodynamics, including end-diastolic volumes, in patients with apparently normal cardiovascular systems and with congestive heart failure which had been treated with Digitalis and diuretics. The ejection fraction at rest was decreased in the failure group (21%) compared to the normals (29%), and with exercise this decreased to 16% in the failure group while no change occurred in the normals. However, the difference in the right ventricular end-diastolic volume index was small both at rest (151 vs 176 ml/sq m) and exercise (186 vs 216 ml/sq m), which appears to be due to the treatment the failure group received prior to the study. The right ventricular mechanical work was markedly increased in the failure group, especially during exercise, due to the increased pulmonary artery pressure. However, the right ventricle end-diastolic pressure was also markedly elevated in the failure group, and the modified ventricular function curve showed a shift to the right consistent with a depressed ventricular function in this group. Stroke volume during exercise was reduced in the failure group, although the resting values were similar. Therefore the failure group was characterized by decreased ejection fraction and stroke volume during exercise and increased end-diastolic pressure and stroke work. A.B.K.

A71-32542 # Critical study of the anatomical-pathological bases of determination of the age of ischemic lesions of the myocardium in a dossier of 153 cases (Etude critique des bases anatomo-pathologiques de détermination de lâge des lésions ischémiques du myocarde dans un matériel de 153 cas). J. Mainguet (Ixelles, Hôpital, Ixelles, Belgium). *Acta Cardiologica,* vol. 25, no. 4,

1970, p. 326-343. 49 refs. In French.

Verification of a previously proposed method of determining the age of lesions in cases of myocardial infarction on the basis of various histopathological criteria. An attempt is made to check the validity of the initial premises of the method and to determine its margin of error. It is found that this error increases in proportion to the age of the lesion. The method becomes practically worthless when the lesions are more than six months old. On the other hand, a systematic microscopic examination of the data made it possible to discover 98 clinically silent infarctions. By comparing the distribution of the ages of lesions in proved cases of infarctions with that in cases without clinical records, a similarity is noted between the percentages of lesions of identical age in the two groups. This is therefore taken to be an argument in favor of the validity of the anatomical-pathological criteria proposed by the author. A.B.K.

A71-32543 # **Use of the computer in electrocardiographic diagnosis in hospital work - Study of 1735 tracings (Application de l'ordinateur au diagnostic électrocardiographique en pratique hospitalière - Etude de 1.735 tracés).** J. Enderle (Hôpital Universitaire Brugmann, Brussels, Belgium). *Acta Cardiologica,* vol. 25, no. 4, 1970, p. 357-377. 21 refs. In French.

Comparison of the cardiologist's conclusions with conclusions reached by a computer in a large number of cases of cardiac disorder (1735 records obtained from 1505 unselected patients). The percentage of abnormal ECG tracings was 75 per cent. The cardiologist's conclusions disagreed with the computer's conclusions in 354 cases (20.4 per cent). There was a discordance in opinion on rhythm analysis in 91 cases (5.2 per cent). A total of 8.5 per cent of the records considered as normal by the cardiologist were judged abnormal by the computer. In 24 cases (1.4 per cent) the computer succeeded in a diagnosis missed by the cardiologist. There were 367 mistakes in the contour analysis of the tracings by the computer, with several mistakes occurring in one record in some cases. A.B.K.

A71-32553 # **Variations of coronary arteries - Review of 224 cases (Les variations des artères coronaires - Revue de 224 cas).** J. A. Ogden and J. M. Kabemba (Yale University, New Haven, Conn.). *Acta Cardiologica,* vol. 25, no. 5, 1970, p. 487-500. 11 refs. In French.

Review of various congenital lesions of the coronary artery system encountered in 224 cases studied. The results of an analysis of minor coronary anomalies, major coronary anomalies, and secondary coronary anomalies are summarized and discussed. Most minor coronary anomalies involve the proximal portion of the coronary artery near its aortic origin. Major primary anomalies have a common characteristic - namely, an arteriovenous fistula in which the high pressure in the coronary artery system is constantly or intermittently related to low-pressure cardiac cavities. Secondary coronary anomalies are congenital variations accompanying moderate or severe cardiac malformations. A.B.K.

A71-32559 **Peristaltic pumping.** M. Y. Jaffrin and A. H. Shapiro (MIT, Cambridge, Mass.). In: Annual review of fluid mechanics. Volume 3. Edited by Milton Van Dyke, W. G. Vincenti, and J. V. Wehausen. Palo Alto, Calif., Annual Reviews, Inc., 1971, p. 13-36. 20 refs.

Peristaltic pumping is a form of fluid transport that occurs when a progressive wave of area contraction or expansion propagates along the length of a distensible tube containing a liquid. Physiologically, peristaltic action is an inherent neuromuscular property of any tubular smooth muscle structure. The governing equation and parameters for plane two-dimensional flow are considered, and peristaltic pumping under various conditions is discussed. G.R.

A71-32659 # **LVET/EICT index in mitral valve disease.** W. S. Aronow, M. A. Kaplan (U.S. Veterans Administration Hospital, Long Beach; California, University, Irvine, Calif.), and M. H. Ellestad (Long Beach Memorial Hospital, Long Beach; California, University, Irvine, Calif.). *Acta Cardiologica,* vol. 26, no. 1, 1971, p. 1-10. 15 refs.

Sixty-six patients with mitral valve disease had simultaneous phonocardiograms, carotid pulse tracings, and EKGs obtained within one week of cardiac catheterization and left ventricular cineangiography. The external isovolumic contraction time (EICT), left ventricular ejection time (LVET), and corrected preejection period (PEP) were determined in each patient. Fifty-seven patients with good left ventricular contractility determined by cineangiography had EICT values ranging from .015 to .045 sec with a mean value of .026 sec and LVET/EICT ratios varying from 5.9 to 19.7 with a mean value of 11.6. Six patients with poor left ventricular contractility had EICT values varying from .050 to .070 sec with a mean value of .062 sec and LVET/EICT ratios ranging from 3.1 to 4.3 with a mean value of 3.7. The LVET/EICT ratio was the best index for predicting left ventricular contractility by noninvasive techniques. M.M.

A71-32660 # **Functional diagnosis of the heart by the spatial T-area vector.** H. Abel (St. Josef-Hospital, Wiesbaden, West Germany). *Acta Cardiologica,* vol. 26, no. 2, 1971, p. 163-172. 13 refs.

The dependence of spatial T-area vectors on RR distances was examined in an attempt at finding a simple method for exact separation between people with healthy and sick heart muscles. Breathing air with 12% oxygen, young healthy adults showed a diminution of T-area vectors and a shift of the transit zone to a region of low heart frequency; in smokers, the curves were like those of patients with coronary insufficiency. The T-area vectors of both healthy and sick persons enlarged after application of a coronary dilatator. A stimulator of the beta-receptors showed the same effect as the coronary dilatator in healthy persons. In persons with coronary insufficiency, normalization of the curve is possible. Healthy persons receiving beta-receptor blockers for three days showed the same curves as persons with coronary insufficiency. All these effects are explainable by the diastolic tonus of the heart. T.M.

A71-32713 **Speed perception in intermittent light (La perception de la vitesse en éclairage intermittent).** André Delorme (Montréal, Université, Montreal, Canada). *Canadian Journal of Psychology,* vol. 25, June 1971, p. 213-221. 13 refs. In French. Research supported by the National Research Council of Canada.

Results of a test in which ten subjects were required to adjust the linear velocity of a mobile illuminated continuously in comparison with a standard mobile illuminated intermittently. In addition to the control condition, the experiment compares five illumination frequency conditions and two types of stimuli (moving bars and moving textures). It is found that a general overestimation of the speed in intermittent illumination occurs, as well as an evolution according to a curve of the maximum effect as a function of frequency. The effect is found to be systematically stronger with textures than with bars. The interpretation of the results is based principally on Piaget's notion of speed perception and on electrophysiological data concerning the brightness enhancement phenomenon. A.B.K.

A71-32728 # **Model concepts of the biomechanical 'man-operator' system in the case of random vibrational effects (O model'nykh predstavleniiakh biomekhanicheskoi sistemy 'chelovek-operator' pri sluchainom vibratsionnom vozdeistvii).** B. A. Potemkin and K. V. Frolov (Gosudarstvennyi Nauchno-Issledovatel'skii Institut Mashinovedeniia, Moscow, USSR). *Akademiia Nauk SSSR, Doklady,* vol. 197, Apr. 21, 1971, p. 1284-1287. 8 refs. In Russian.

The dynamic characteristics of the human body subjected to random vibrations are determined experimentally as a function of the changes in the working position, with a view toward studying the dynamic properties of the operator/machine system and constructing

mechanical models of the machine-operator body. The study is limited to the vibrations of the human body in the sitting position, treating it as a linear mechanical system. Allowance is made for changes in the system parameters, depending on level of muscular tension and on the position of the spine in space. The frequency characteristics of the human body are plotted, and mechanical models for various positions are constructed. V.P.

A71-32735 # Pessimum of Vvedenskii's frequency after irradiation of the spinal cord during the compensation period (Pessimum chastoty Vvedenskogo posle oblucheniia spinnogo mozga i v periode kompensatsii). V. N. Semagin (Akademiia Nauk SSSR, Institut Vysshei Nervnoi Deiatel'nosti i Neirofiziologii, Moscow, USSR). *Akademiia Nauk SSSR, Doklady,* vol. 197, Apr. 21, 1971, p. 1452-1455. 21 refs. In Russian.

The orthodromic ventral root reactions to rhythmic stimuli were studied, using rats whose spinal cord had been just irradiated with a dose of 1000 rad. Oscillograms of the reactions recorded at intervals of 5 sec are presented and discussed. Similar oscillograms obtained four months after irradiation are also studied. Graphs showing the dynamics of the amplitude of monosynaptic reaction to increasing stimulation frequency are presented. V.P.

A71-32736 # Detection and characteristics of the functional properties of unmyelinated afferent fibers of the lower cardiac nerve (Vyiavlenie i kharakteristika funktsional'nykh svoistv nemielinizirovannykh afferentnykh volokon nizhnego serdechnogo nerva). V. M. Khaiutin, V. L. Shur, and E. V. Lukoshkova (Akademiia Nauk SSSR, Institut Normal'noi i Patologicheskoi Fiziologii, Moscow, USSR). *Akademiia Nauk SSSR, Doklady,* vol. 197, Apr. 21, 1971, p. 1456, 1457. 10 refs. In Russian.

Experiments are discussed in which cats were used in an effort to detect in the lower cardiac nerve afferent fibers of spinal origin whose stimulation might lead to pressor reflexes, which are the vegetative component of algesic reaction. The proximal area of the lower cardiac nerve (severed as close as possible to the heart) was electrically stimulated, and the latent period was determined from the recordings of the reflector reaction in the renal nerve. This made it possible to determine the propagation rate of signals in the fibers under consideration. It is found that not only A(delta) and sC fibers but also drC type fibers are afferent ones. V.P.

A71-32826 # Prediction of an operator's performance reliability from the characteristics of the functional state of his organism (Prognozirovanie nadezhnosti raboty operatora po pokazateliam funktsional'nogo sostoianiia organizma). V. P. Zagriadskii, A. S. Egorov, E. F. Mordvinov, and B. N. Iakovets. *Voenno-Meditsinskii Zhurnal,* Apr. 1971, p. 20-23. In Russian.

A group of 20 healthy male subjects were instructed to perform addition and subtraction of digits at prescribed rates as they saw the digits moving on an endless tape past an observation window. The subjects spoke their results into a microphone connected to a magnetophone. An electroencephalograph was used for synchronous recording of encephalograms, EKG and electrocutaneous reaction. A frequency analyzer and integrator were used for data analysis. Tests continued as long as the subjects were able to cooperate and then they explained their breakdown. The frequency of errors was individual, there was no apparent relation between errors and the functional state of the operator, and the heart beat rate and the electromyogram appeared to be informative as a basis for performance reliability predictions. V.Z.

A71-32827 # Army medical appraisal of chronic microwave field-induced affections (Voenno-vrachebnaia ekspertiza khronicheskikh parazhenii SVCh polem). G. V. Sukharev. *Voenno-Meditsinskii Zhurnal,* Apr. 1971, p. 23-26. In Russian.

General consideration of the harmful effects caused by microwaves in personnel working with microwave sources. Files of some major medical boards covering a period of five years and a large group of individuals engaged in microwave technology for at least three years are reviewed to assess the microwave-induced health damage. The inadequacy of the existing practices and procedures of such boards are indicated. Suggestions are made as to how sufficient information should be collected to provide a basis for reliable conclusions concerning this health hazard. V.Z.

A71-32828 # Significance of cortical neurodynamics for vestibular professional selection (Znachenie korkovoi neirodinamiki pri vestibuliarnom profatbore). A. I. Vasil'ev. *Voenno-Meditsinskii Zhurnal,* Apr. 1971, p. 27-30. 7 refs. In Russian.

A group of 38 healthy male subjects underwent automatically controlled vestibular stimulation in a Khilkov swing for studying cortical neurodynamics during vestibular afferent activity and associated cardiovascular and respiratory reactions. Heart beat rates, electroencephalograms, and respiratory activity were recorded simultaneously during the experiments, showing the existence of a statistically reliable correlation between encephalograms and hemodynamics. V.Z.

A71-32829 # Psychological selection of aerial photograph interpreters (Psikhologicheskii otbor deshifrovshchikov aerofotosnimkov). B. L. Pokrovskii and V. A. Urazaeva. *Voenno-Meditsinskii Zhurnal,* Apr. 1971, p. 48-50. In Russian.

A set of 10 procedures is discussed for testing the attention stability, concentration capability, perception speed and precision, operational memory persistence and spatial imagination of candidates for the profession of aerial photograph interpreter. The tests were applied to groups of 20 servicemen to prognosticate their future performance in this capacity. A comparison of prognosticated performances with the actual performances of individual subjects after completion of a training program showed the adequacy of these tests as a basis for selection of qualified persons for this profession. V.Z.

A71-32830 # Psychophysiological characteristics of the development of illusions in airmen (Psikhofiziologicheskie osobennosti vozniknoveniia illiuzii u letchikov). I. A. Kamyshov and V. G. Lazarev. *Voenno-Meditsinskii Zhurnal,* Apr. 1971, p. 60-63. 6 refs. In Russian.

The illusory attitude perception experienced by pilots is shown to be associated with their state of being statically connected to what supports them in space - the aircraft. This condition is believed to make pilots misinformed about their position with respect to the ground. This misinformation in combination with interruptions in visual control of the horizon (which occur when the pilot is engaged in other piloting activities with map, equipment and target) is considered to be responsible for illusory spatial position perception by pilots. Psychological and medical approaches to coping with these illusions are suggested. V.Z.

A71-32831 # Effect of complicated situations on young pilots (Vliianie slozhnykh situatsii na molodykh letchikov). V. S. Dorogobed. *Voenno-Meditsinskii Zhurnal,* Apr. 1971, p. 64-66. In Russian.

Discussion of the actions of pilots having 2 to 3 years flying experience in handling various emergency situations, such as communication system failure and other equipment breakdowns. Cases of emotional reactions, including a case when a panicky young pilot bailed out from an intact aircraft, are referred to. Attention of flight surgeons is drawn to such situations. V.Z.

A71-32866 Beta inflection in the darkness adaptation curve (Die beta-inflexion in der Dunkeladaptationskurve). H.-G. Giessmann and B. Lutze (Medizinische Akademie, Augenklinik,

Magdeburg, East Germany). *Vision Research,* vol. 11, Apr. 1971, p. 343-350. 8 refs. In German.

Examinations of the mono- and binocular adaptations of normal trichromat, protanope, and deuteranope subjects were carried out, using the Hartinger adaptometer. Both alpha and beta inflections were found in most of the subjects tested between the 11th and 13th minute. Differences in the perception time and sensitivity were found both in mono- and binocular examinations in the groups of subjects tested. A mathematical expression is presented for the adaptation curve. Three independent adaptive systems for different stimulus thresholds are postulated. Z.W.

A71-32867 Visual latencies at photopic levels of retinal illuminance. A. M. Prestrude (Virginia Polytechnic Institute, Blacksburg, Va.). *Vision Research,* vol. 11, Apr. 1971, p. 351-361. 30 refs.

Study of the latency differences as a function of binocular differences in retinal illuminance. A single function relating absolute latency to intensity was derived from the data obtained, using a method based on a model of the effects of adaptation on the sensitivity of the Limulus visual receptor. The derived function is highly similar to one previously reported. The magnitude of the derived latencies corresponds to that of the ERG a-wave and suggests that the retinal process studied may be a receptor event. Z.W.

A71-32868 Light adaptation and visual latency. A. M. Prestrude (Virginia Polytechnic Institute, Blacksburg, Va.) and H. D. Baker (Florida State University, Tallahassee, Fla.). *Vision Research,* vol. 11, Apr. 1971, p. 363-369. 19 refs.

The temporal resolving properties of the eye are considered in terms of binocular latency differences. Two experiments demonstrate that temporal resolution is a function of visual adaptation. The effects of target-background contrast on visual latencies appear to be consistent with the effects of field adaptation. It is suggested that the mechanism of visual adaptation is sufficient to account for the relation between intensity and latency. Z.W.

A71-32869 Discrete slow potentials and threshold-level spikes in the Limulus ommatidium. Alan R. Adolph (Retina Foundation, Boston, Mass.). *Vision Research,* vol. 11, Apr. 1971, p. 371-376. 13 refs. NIH Grant No. EY-00306.

It is shown that the spectral sensitivities of average frequency of discrete slow potentials (SPF) and nerve spikes, recorded simultaneously by one microelectrode, match a 520 nm rhodopsin spectral absorption curve. Hyperpolarizing currents strongly reduced spike frequency, but slightly increased SPF frequency in response to constant light stimuli at different wavelengths. There is no loss of spectral information during the initial stages of photoreception despite the 'noisy' character of SPF's and threshold-level spikes. Z.W.

A71-32951 * Evoked potential correlates of auditory signal detection. Steven A. Hillyard (California, University, La Jolla, Calif.), Kenneth C. Squires, Jay W. Bauer, and Peter H. Lindsay (California, University, San Diego, Calif.). *Science,* vol. 172, June 25, 1971, p. 1357-1360. 23 refs. NIH Grant No. NS 07454; Grant No. NGR-05-009-083.

A long-latency component of the averaged evoked potential recorded from the human scalp varied in close relationship with subject's perceptual reports in an auditory signal detection task. Detected signals evoked potentials several times larger than did undetected signals, falsely reported signals, or correctly reported nonsignals. The threshold signal intensity at which detection performance exceeded chance levels was identical with concurrently obtained electrophysiological measures of threshold. (Author)

A71-33049 * Experimental studies on the Hawaiian silverswords (Argyroxiphium spp.) - Some preliminary notes on germination. S. M. Siegel, Paula Carroll, Carolyn Corn, and T. Speitel (Hawaii, University, Honolulu, Hawaii). *Botanical Gazette,* vol. 131, Dec. 1970, p. 277-280. 11 refs. Grant No. NGR-012-001-042.

Natural, unselected seed populations of the silverswords germinated most rapidly on alternating 8-25 C temperature cycles and at a constant 25 C. No germination occurred at constant 8 C or on any regimes involving 8 hr or more at -15 or 35 C. Prolonged incubation at 35 C was lethal. Thiourea, potassium nitrate, kinetin, and other forcing agents or hormones either had no effect or inhibited germination. Seed pretreatments (including coat puncture, UV radiation, heat, and cold) did not enhance germination, and 15 min at 60 C reduced viability. Comparisons with a number of other species emphasized the extraordinary heat sensitivity of silversword seed. T.M.

A71-33050 * A radiotelemetry stimulator for conditioning of large animals. W. Morton Caldwell and Allen B. Judy (West Virginia University, Morgantown, W. Va.). *Psychophysiology,* vol. 7, no. 3, 1971, p. 499-502. Research supported by the West Virginia Heart Association; Grant No. NGL-49-001-001.

A radiotelemetry stimulator for the conditioning of large animals by the application of high voltage, short duration pulses to the skin surface is described. The system uses commercial radio control assemblies to simplify construction. (Author)

A71-33057 * Substrate and light dependent fixation of molecular nitrogen in Rhodospirillum rubrum. H.-J. Schick (Florida State University, Tallahassee, Fla.). *Archiv für Mikrobiologie,* vol. 75, 1971, p. 89-101. 23 refs. Grant No. NGR-10-004-018.

Whole cells of Rhodospirillum rubrum were cultivated in a malate medium lacking bound nitrogen under N2 and tested for their nitrogenase activity by measuring the disappearance of nitrogen manometrically. It is shown that properly grown cells can maintain a very reproducible, specific nitrogen-fixing activity which is about twice as high as the best cell-free preparations on a total protein basis. Furthermore, the manometry allowed the nitrogen uptake to be followed continually and thus made it easy to determine the effect of environmental factors on this reaction. O.H.

A71-33058 * Regulation of photoreduction in Rhodospirillum rubrum by ammonia. H.-J. Schick (Florida State University, Tallahassee, Fla.). *Archiv für Mikrobiologie,* vol. 75, 1971, p. 110-120. 15 refs. Grant No. NGR-10-004-018.

Rhodospirillum rubrum was grown in a malate medium, without bound nitrogen, anaerobically under nitrogen. Resting cells of these cultures showed a gradual decrease in photoreducing activity (light-induced consumption of carbon dioxide with hydrogen). Small amounts of ammonium chloride immediately restored the initial activity. A stoichiometric relationship was found between the amount of ammonium chloride added and the amount of gases which disappeared during the ensuing photoreduction. Photosynthetic reduction of carbon dioxide, nitrogen fixation, and the protein metabolism of R. rubrum are discussed. T.M.

A71-33059 * Interrelationship of nitrogen fixation, hydrogen evolution and photoreduction in Rhodospirillum rubrum. H.-J. Schick (Florida State University, Tallahassee, Fla.). *Archiv für Mikrobiologie,* vol. 75, 1971, p. 101-109. 23 refs. Grant No. NGR-10-004-018.

Study of the fluctuations in the ability of Rhodospirillum rubrum cells to perform three gas exchanges as a function of cultural conditions and culture age. The three gas exchanges are: the reduction of carbon dioxide with hydrogen gas; evolution of hydrogen and carbon dioxide; and the fixation of molecular nitrogen. The results described furnish an explanation for reported variations in metabolic rates which depend very clearly on the stages of growth in batch cultures of R. rubrum. M.V.E.

A71-33071 * Cardiovascular telemetry implants. Roland D. Rader (Southern California, University, Los Angeles, Calif.). *Telemetry Journal,* vol. 6, Apr.-May 1971, p. 15-20. 5 refs. Contract No. NSR-05-018-087.

One of the more important factors in the approach reported has been the realization of low current operation in conjunction with small size and good thermal and temporal stability. Since a frequency modulated telemetry system is employed, the outcome of the electronic development has been a frequency modulated subcarrier oscillator proportional to either pressure or flow. Detection of blood pressure was accomplished by the use of chronically implanted miniature pressure sensors. The sensor body is unalloyed titanium 6.5 mm in diameter and 1 mm thick. Flow detection by an ultrasonic technique was selected. Applications of the new technique are reported. It is pointed out that the collection of quantitative and qualitative blood pressure and blood flow data on free-roaming animals is now possible with the use of implant telemetry techniques. G.R.

A71-33075 * Participation of central noradrenergic neurons in arterial baroreceptor reflexes in the rabbit. J. P. Chalmers and R. J. Wurtman (MIT, Cambridge, Mass.). *Circulation Research,* vol. 28, Apr. 1971, p. 480-491. PHS Grants No. AM-11237; No. AM-11709; Grant No. NGR-22-009-272.

Disappearance rates of intracisternally administered tritium-norepinephrine and activities of tyrosine hydroxylase were examined in the rabbit in five brain regions and in three cord regions two weeks after section of the carotid sinus and aortic nerves. Mean blood pressure rose by 29% and heart rate by 17% in the animals with neurogenic hypertension. Endogenous catecholamine concentrations in the eight regions examined were not altered by denervation. G.R.

A71-33099 Analysis of biological structures. A. S. Kobayashi and S. L-Y Woo. In: Recent advances in matrix methods of structural analysis and design; U.S. National Science Foundation and Japan Society for the Promotion of Science, Seminar, Tokyo, Japan, August 25-30, 1969, Proceedings. Edited by R. N. Gallagher, Y. Yamada, and J. T. Oden. University, University of Alabama Press, 1971, p. 837-851; Discussion, p. 851-853. 18 refs. NIH Grant No. 1-R01-NB-07089-01.

The finite element method is used for analyzing the structural response of arterioles and of the corneo-scleral shell under various realistic loading conditions. The mechanical stress distribution obtained for the arterioles was used to identify the primary load bearing subcomponents. Hydrostatic stress distributions are illustrated throughout the thickness of the cornea and along the midsurface of the stroma. The results obtained have immediate clinical significance for applanation tonometry. T.M.

A71-33103 * Inferences based on unreliable reports. Kurt J. Snapper and Dennis G. Fryback (Michigan, University, Ann Arbor, Mich.). *Journal of Experimental Psychology,* vol. 87, Mar. 1971, p. 401-404. Grant No. NGL-23-005-171.

Inferences may be based on direct observation of events or on reports from indirect sources about the occurrence of events. A direct observation will be more diagnostic than a report if the source of the report is not completely reliable. Previous studies have investigated Ss' inferences based on either directly observed events or completely reliable reports. This study investigated Ss' inferences based on partially reliable reports. The Ss responded to reduced report reliability by using a formally inappropriate rule that led to overestimation of the diagnostic impact of a report. (Author)

A71-33107 Comparison of tracking-task performance and nystagmus during sinusoidal oscillation in yaw and pitch. Alan J. Benson and Fred E. Guedry, Jr. (U.S. Naval Aerospace Medical Center, Aerospace Medical Research Laboratory, Pensacola, Fla.). *Aerospace Medicine,* vol. 42, June 1971, p. 593-601. 18 refs. Army-Navy-sponsored research.

Performance limits and nystagmus induced by angular accelerations about the pitch and the yaw axes are experimentally compared. During angular motion in the pitch-forward direction, the nystagmus frequency and slow phase velocity, and the consequent performance decrement, were found to be significantly greater than during the pitch-back half cycle. No such asymmetry was found during oscillation in yaw where the nystagmus measures and error scores were similar to those obtained in the pitch-back half cycle. The poorer suppression of vestibular nystagmus during pitch-forward motion is attributed to the higher frequency and smaller amplitude of downbeating nystagmus. Angular oscillation in pitch induced motion sickness more rapidly than a comparable yaw-axis stimulus; the probable causes are differences in the dynamic response of vertical and lateral canals and the greater mismatch of canal and gravireceptor signals during oscillation in pitch. O.H.

A71-33108 Period analysis of space flight EEG. Ashley J. Welch (Texas, University, Austin, Tex.). *Aerospace Medicine,* vol. 42, June 1971, p. 601-606. 21 refs. Grant No. AF AFOSR 69-1792.

The research reported in this paper illustrates how different combinations of three descriptors of the EEG may be used to delineate space flight sleep patterns. The three descriptors examined are the zero crossings, points of zero slope, and points of zero change in slope of the EEG. Combinations of these descriptors based upon the 'total weighted count,' regression analysis, and linear discriminant analysis are used to score a night of sleep in space. The calculated sleep stage classifications are compared to manual scores for the same night of sleep. The accuracy and real time implementation of all techniques are discussed. (Author)

A71-33109 Computerized trauma registry - A new method for categorizing physical injuries. D. R. Boyd, R. J. Baker (Illinois, University; Cook County Hospital, Chicago, Ill.), D. M. Rappaport, J. P. Marbarger, and L. M. Nyhus (Illinois, University, Chicago, Ill.). *Aerospace Medicine,* vol. 42, June 1971, p. 607-615. 30 refs. PHS Grant No. GM-18003-01.

A central registry of traumatic injuries has been developed at the Trauma Unit of the Cook County Hospital and Research Resources Laboratory of the University of Illinois, using an IBM 360/44 computer and a generalized information retrieval system. The design of the registry and its use for analysis of mortality rates for graded injuries, for paired patient comparative studies, and for attempts to determine at-risk factors for various accidental events is discussed. O.H.

A71-33110 * Delineation of emergency surface decompression and treatment procedures for project Tektite aquanauts. Peter O. Edel (J & J Marine Diving Co., Inc., Pasadena, Tex.). *Aerospace Medicine,* vol. 42, June 1971, p. 616-621. Contract No. NAS 9-9176.

A series of experiments was conducted to determine to what degree of safety the aquanauts living, according to Project Tektite, for 60 days in a habitat on the sea floor at a depth of 42 ft, can make a 'no-decompression' ascent to surface from the habitat, and the maximum surface decompression interval they can safely undergo. Recompression-decompression schedules were calculated for treatment of the subjects tested in these experiments after their exposure to surface intervals of various lengths of time. All subjects were successfully treated according to these tables. A safe surface interval of 15 minutes and use of the recompression-decompression schedules that were developed as a result of this experimentation are recommended for incorporation into the Project Tektite operational procedures. O.H.

A71-33111 Calcium, potassium, and iron loss by Apollo VII, VIII, IX, X, and XI astronauts. R. L. Brodzinski, L. A. Rancitelli, W. A. Haller, and L. S. Dewey (Battelle Pacific Northwest Laboratories; Hanford Environmental Health Foundation, Richland, Wash.). *Aerospace Medicine,* vol. 42, June 1971, p. 621-626. 18 refs. AEC Contract No. AT (45-1)-1830.

A technique of instrumental neutron activation analysis has been employed to determine the concentrations of seventeen elements in astronaut fecal samples collected during the course of the United States Apollo 7 through 11 space missions. The quantities of three of these are compared to dietary intake values in determining the elemental mass balance of the astronauts. Elemental losses of 635 mg Ca/day, 296 mg K/day, and 6.4 mg Fe/day were observed, and some possible consequences of the imbalance are discussed. Enhanced osteoporosis due to the weightless conditions of the space environment is shown to be an insignificant problem for reasonably short duration missions (less than 14 days). The applicability of various techniques for determination of calcium loss is discussed. (Author)

A71-33112 # Comparisons of nystagmic responses in basic airmen, grounded pilots and active pilots. Gregory J. Matz and James W. Wolfe (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aerospace Medicine,* vol. 42, June 1971, p. 627-629. 8 refs.

Study in which the Dix-Hallpike bithermal caloric test and bidirectional rotary stimulations (10 deg/sec/sec acceleration for 16 seconds followed immediately by 10 deg/sec/sec deceleration for 16 seconds) were given to three groups: nonflying airmen, pilots actively engaged in flying, and pilots who had been grounded for at least six months for reasons other than diseases of the ear. Based on the two main contrasts of interest (paresis and preponderance), there were no significant differences between the groups for either variable, nor were there any differences in slow phase velocity in the rotational test. However, the analysis of variance did reveal a significant group by temperature interaction for velocity and frequency due to the grounded pilots responding in an opposite manner to the stimuli than the other groups. It was concluded that any habituation of the vestibuloocular reflex that might result from flying did not generalize to these test conditions. (Author)

A71-33113 Effect of flash field size on flashblindness in an aircraft cockpit. William H. Cushman (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aerospace Medicine,* vol. 42, June 1971, p. 630-634. 12 refs. DASA-supported research.

Study in which ten volunteers were exposed to high-intensity double-pulse light flashes with flash fields subtending 1, 3, 5, 10 and 15 deg of visual angle. Flashblindness recovery times for several aircraft instruments were measured for each flash field diameter. Counter-measures including looking around the afterimage and body movement were permitted on some of the trials. Recovery time increased as the adapting flash visual angle was increased from 1 to 15 deg. Instruments requiring a greater visual acuity to be read has substantially longer recovery times than instruments requiring less. The two countermeasures listed above were found to be helpful in reducing recovery time. (Author)

A71-33114 Physical fitness, flight requirements and age. Ralph F. Goldman (U.S. Army, Research Institute of Environmental Medicine, Natick, Mass.). *Aerospace Medicine,* vol. 42, June 1971, p. 635-641. 26 refs.

The generally recognized aspects of physical fitness - i.e., muscular strength, cardio-respiratory capacity, and relative body weight - are briefly reviewed and it is shown that they alter predictably with age and can be altered by training. Considering the physical work in flight, it is examined to what degree physical fitness, and which of the three mentioned aspects of it, are important to an aircrewman. It is suggested that these three well defined aspects of physical fitness are of little importance to aircrew. The attitude of the 'fit' individual in terms of a sense of well being, self-confidence, and youthful outlook may be one of the more important facets of physical fitness. O.H.

A71-33115 Relationship of low temperature to mouse resistance to infection with Klebsiella pneumoniae. William D. Won and Harold Ross (California, University, Berkeley, Calif.). *Aerospace Medicine,* vol. 42, June 1971, p. 642-645. 16 refs. Navy-sponsored research.

The effect of exposure to a cold environment on the host susceptibility or resistance to infective organisms was investigated using a mouse-Klebsiella pneumoniae model system. Cold environment, as reflected by the mortality data, lowered host resistance. O.H.

A71-33116 * Effect of dietary antioxidant level and oxygen exposure on the fine structure of the proximal convoluted tubules. Roberta T. Hess and Daniel B. Menzel (California, University, Berkeley, Calif.). *Aerospace Medicine,* vol. 42, June 1971, p. 646-649. 21 refs. Grant No. NGR-05-003-090.

Rats fed varying levels of the antioxidant vitamin E and vitamin A were exposed to ambient air or 100% oxygen at 600 mm Hg pressure. When the proximal convoluted tubules were examined, ultrastructural changes were found in air-exposed animals associated with dietary vitamin levels. All oxygen-exposed animals showed an increased number of lipid bodies regardless of the diet. Animals depleted in vitamin A were the most affected by oxygen exposure, but it was not possible to resolve which changes were attributable to oxygen toxicity. (Author)

A71-33117 Inertial properties of a segmented cadaver trunk - Their implications in acceleration injuries. Y. King Liu, J. Monroe Laborde, and William C. Van Buskirk (Tulane University, New Orleans, La.). *Aerospace Medicine,* vol. 42, June 1971, p. 650-657. 19 refs. PHS Grants No. EC-00402-04; No. EC-00087-03; Contract No. AF 33(615)-70-C-1565.

In order to implement a new generation of mathematical models and manikins being developed to study the response of the human body to acceleration and impact, the inertial properties of the human body were investigated. For this purpose, an unembalmed quick frozen male cadaver was segmented by transverse cuts and the mass, center of mass, and mass moments of inertia about the three principal axes were then determined for each segment. These inertial properties were then used as the input for a previously developed mathematical model of spinal response to impact. The specific situation studied was that of seat ejection in high speed aircraft. The results provide an explanation for the high incidence of fracture sustained by the lower-thoracic vertebrae during this maneuver. O.H.

A71-33118 Influence of adrenalectomy on electrical activity of the brain under high oxygen pressure. I. D. Torbati, D. Harel (Israel Defence Forces, Medical Corps, Jerusalem, Israel), and S. Lavy (Hebrew University, Jerusalem, Israel). *Aerospace Medicine,* vol. 42, June 1971, p. 658-660. 14 refs. Research supported by the Israel Oceanographic and Limnological Research Co.

The electrical activity of the cortex and subcortical areas in unrestrained, unanesthesized, adrenalectomized and normal rats was examined under hyperbaric oxygen of six atmospheres absolute (atms. abs.). Continuous electroencephalographic recordings were obtained by means of chronically implanted electrodes. The appearance of electrical discharges was considered to be the first indicator of oxygen toxicity to the central nervous system. No significant difference regarding the time of onset of electrical discharges was noted between the adrenalectomized and nonadrenalectomized animals. It was also found that electrical discharges appeared simultaneously in cortical and subcortical structures examined. (Author)

A71-33119 # Evaluation of tannic acid and water washes in prevention of absorption of monomethylhydrazine through skin. Edwin B. Smith and Dale A. Clark (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aerospace Medicine,* vol. 42, June 1971, p. 661-663. 9 refs.

Experiments were conducted to study the effectiveness of

washing to remove monomethylhydrazine (MMH), which is the most toxic of the hydrazine derivatives currently used as a rocket fuel and which is rapidly absorbed through the skin. Both tap water and a 10% aqueous solution of tannic acid were evaluated as agents to facilitate washing MMH off the skin of anesthetized dogs. Pretreatment of the skin with 20% tannic acid was also studied as possible means of preventing the absorption of MMH subsequently applied. O.H.

A71-33120 Army aviation and the lower extremity amputee. Robert L. Reid and George I. Baker (U.S. Army, Walter Reed General Hospital, Washington, D.C.). *Aerospace Medicine,* vol. 42, June 1971, p. 667-669.

The cases of six Army aviators with below-knee amputations which have been returned to flight status are discussed with the aim to establish guidelines to be used when considering lower extremity aviator amputees for retention on flight status. The recommended guidelines are: service need; type of lower extremity amputation and proper prosthetic fit; age of aviator; motivation and career potential; number of hours flown at time of amputation; and total time in the military. O.H.

A71-33121 Epidemiological study of in-flight airline pilot incapacitation. Linton L. Kulak, Robert L. Wick, Jr., and Charles E. Billings (Ohio State University, Columbus, Ohio). *Aerospace Medicine, vol. 42, June 1971, p. 670-672. 10 refs. Research* supported by the Airline Pilots' Association International.

Age-specific incidence rates of fatal and nonfatal causes of career termination among members of the U.S. Airline Pilots' Association were determined for an 11-year period. Selected statistical data are presented and discussed. Based on these findings, an expected incidence rate for potentially serious in-flight pilot failure was determined. O.H.

A71-33166 Binocular observation of moving objects. Mary L. Boas, Richard C. Calhoun, and Owen Horan (DePaul University, Chicago, Ill.). *American Journal of Physics,* vol. 39, July 1971, p. 782-790. 5 refs.

The stereoscopic effects of using a pair of eyes or observing instruments on the appearance of objects moving at relativistic speeds are explored. It is assumed that the light rays from the object arrive simultaneously at the two eyes and that the instantaneous apparent position of a point object is the intersection of the lines of sight of the two eyes. It is shown that, contrary to what is true for objects at rest, stereoscopic observation of moving objects does not determine correctly either their shape or position. M.V.E.

A71-33183 * # Mean lives of excited levels in O I-O VI. I. Martinson, H. G. Berry, W. S. Bickel, and H. Oona (Arizona, University, Tucson, Ariz.). *Optical Society of America, Journal,* vol. 61, Apr. 1971, p. 519-523. 29 refs. Grant No. NGR-03-002-017; Contract No. AF 33(615)-70-C-1007.

Oxygen spectra between 450 and 2200 A were studied with the beam-foil technique. Mean lives of over 50 excited levels in O I-O VI were measured with pulse-counting techniques, each mean life being measured 4 to 6 times at two different energies. The spectra showed essentially all previously known oxygen lines as well as a number of unreported lines. In addition to strong hydrogen lines in the mass-18 beam, a few C I and C II lines from foil-ejected carbon atoms were identified. The new lines are thought to come from unreported transitions in oxygen ions. V.P.

A71-33189 Cardiac output and regional blood flow in hypoxic woodchucks. Roy F. Burlington, James A. Vogel, Thomas M. Burton, and Irving A. Salkovitz (U.S. Army, Research Institute of Environmental Medicine, Natick, Mass.). *American Journal of Physiology,* vol. 220, June 1971, p. 1565-1568. 21 refs.

Study of the cardiovascular response to acute hypoxia in unanesthetized, euthermic, woodchucks (Marmota monax). Compared to control animals in room air, hypoxia (oxygen partial pressure of 57 mm Hg for 30 min) induced a significant decrease in cardiac output, but mean arterial pressure was maintained and total peripheral resistance was increased. These responses to hypoxia are markedly different than those observed by other investigators in the rabbit, dog, or man. Blood flow, as estimated by Sapirstein's rubidium 86 method, was decreased in all tissues from hypoxic woodchucks. The percentage of total cardiac output to skin, skeletal muscle, white fat, and brown fat was decreased during hypoxia, while no change was noted in heart, diaphragm, kidney, liver, stomach, and intestines. These cardiovascular changes represent a potential mechanism for oxygen conservation and could partially account for the ability of euthermic hibernators to survive severe hypoxia better than nonhibernating mammals. (Author)

A71-33190 Rat hepatic polysome profiles and in vitro protein synthesis during hypoxia. Martin I. Surks (Montefiore Hospital and Medical Center, Bronx, N.Y.) and Melvin Berkowitz (Yeshiva University, Bronx, N.Y.). *American Journal of Physiology,* vol. 220, June 1971, p. 1606-1609. 16 refs. Contract No. DA-49-193-MD-2967.

Study of polysomal disaggregation and attendant reduction in hepatic protein synthesis in rats as a result of decreased feed ingestion during hypoxia. The results indicate the occurrence of marked polysomal disaggregation that resulted in a significant decrease in polysomes and increase in monosomes and disomes. Feeding an amino acid solution led to a resynthesis of polysomes and a reduction in monosomes and disomes. Despite resynthesis of polysomal RNA, L-leucine incorporation remained unchanged. This suggests that hypoxia affects reactions in protein synthesis which are independent of food supply and ribosomal aggregation. M.V.E.

A71-33191 Reflex cardiovascular responses after 36 hr of hypoxia. Donald D. Heistad, Robert C. Wheeler, and Vincent S. Aoki (U.S. Army, Physiology Laboratory, Natick, Mass.). *American Journal of Physiology,* vol. 220, June 1971, p. 1673-1676. 24 refs.

Study of hypoxia effects on vasoconstrictor responses in man aimed at determining whether reflex vasoconstriction remains depressed during prolonged hypoxia or whether adaptation occurs. The results obtained indicate that decreased vascular responsiveness remains apparent after 36 hr of hypoxia, suggesting that adaptation of vascular reflexes does not occur. Measurement of the response of heart rate to lower body negative pressure also suggests interference with cardiac reflexes during both acute and prolonged hypoxia. M.V.E.

A71-33192 * Intermittent cardiac block and efferent vagal activity in the anesthetized dog. Peter G. Katona (Case-Western-Reserve University, Cleveland, Ohio) and Russell M. Mersereau (MIT, Cambridge, Mass.). *American Journal of Physiology,* vol. 220, June 1971, p. 1683-1687. 7 refs. Contract No. DA-28-043-AMC-02536(E); Grant No. NGL-22-009-304.

Cardiac vagal efferent (CVE) activity was recorded in anesthetized dogs during the occurrence of isolated sinoatrial and atrioventricular blocks. Occasionally these blocks developed spontaneously; in other cases they resulted from a transient rise in the blood pressure caused by inflating a balloon in the descending aorta. Two methods were used to quantitatively characterize CVE activity controlling the length of each heart beat. In the first method the recorded CVE impulses were counted in a fixed time interval prior to each beat; in the second method the effects of all previous impulses were taken into account by using an exponential weighting function. The hypothesis that the occurrence of normal and blocked beats could be predicted by comparing CVE activity with a threshold for each heart beat was examined. It was found that although a perfect

prediction could not be achieved, for each beat a decision could be made that resulted in a smaller probability of error than that given by a random guess. The overall performance of the two methods was similar when the parameters of each were adjusted to be optimum. (Author)

A71-33193 Ultrastructural and metabolic alterations in myocardium from altitude-acclimated rats. Wilbert D. Bowers, Jr., Roy F. Burlington, Bertwell K. Whitten, R. C. Daum, and Mary A. Posiviata (U.S. Army, Research Institute of Environmental Medicine, Natick, Mass.). *American Journal of Physiology*, vol. 220, June 1971, p. 1885-1889. 25 refs.

Observation that heart muscle mitochondria in tissue from rats exposed to 14,500 ft for 6 to 12 weeks differ from those of sea-level animals. Incubation in a medium containing *succinate, rotenone, and* rutamycin prior to fixation produced 'condensed' or 'energized' configurations in mitochondria of altitude-exposed hearts. Similar conditions produced 'zig-zag' and 'branched' configurations in mitochondria of sea-level tissue. This difference in response to the same incubation conditions may relate to changes in mitochondrial membranes which result from prolonged altitude exposure. After similar altitude exposure, isolated perfused rat hearts showed a higher phosphate potential and greater lactate production than sea-level hearts when both were subjected to hypoxia. Changes in mitochondria could complement the increased glycolytic capacity and aid in protecting altitude-acclimated rats from the effects of hypoxia. (Author)

A71-33194 * Assessment of renal hemodynamic factors in whole kidney glomerulotubular balance. Terrance M. Daugharty, S. M. Zweig, and Laurence E. Earley (California, University, San Francisco, Calif.). *American Journal of Physiology*, vol. 220, June 1971, p. 2021-2027. 31 refs. NIH Grant No. AM-12753; Grant No. NGR-05-025-007.

The glomerulotubular balance for the whole kidney was studied in anesthetized dogs by manipulating filtration rate through constriction of either the aorta, thoracic vena cava, renal vein, or ureter. The results indicate that each maneuver was associated with a similar degree of balance between filtration and reabsorption and that this degree of balance is approximately the same as has been reported for superficial proximal tubules. Total renal plasma flow was the hemodynamic variable other than glomerular filtration rate that was most closely associated with changes in tubular reabsorption. M.V.E.

A71-33195 Effects of hypoxia on myocardial potassium balance. Harley D. Sybers, Phyllis R. Helmer, and Quillian R. Murphy (Wisconsin, University, Madison, Wis.). *American Journal of Physiology*, vol. 220, June 1971, p. 2047-2050. 11 refs.

The effects of severe hypoxia on the myocardial potassium balance in dogs were studied during cardioaccelerator nerve and atrial stimulation. When the animals were ventilated with 100% oxygen, atrial stimulation produced a brief loss of myocardial potassium followed by return to balance or even slight uptake within 1-2 min despite continued tachycardia. When the animals were ventilated with 95% nitrogen-5% oxygen, severe hypoxia prevented this potassium-conserving response, resulting in loss of potassium from the heart. When the cardioaccelerator nerve was stimulated in well-ventilated animals, loss of potassium occurred only during the first 30 sec followed by a marked uptake. During hypoxia, uptake was blocked in spite of the stimulatory effect on potassium uptake which occurs during cardioaccelerator nerve stimulation. The loss of potassium was not inhibited but was actually accelerated. These experiments indicate that the mechanisms responsible for conserving myocardial potassium are oxygen dependent while those associated with its loss are not. (Author)

A71-33239 Mechanics of the diaphragm. L. D. Pengelly, Ann M. Alderson, and J. Milic-Emili (McGill University, Montreal, Canada). *Journal of Applied Physiology*, vol. 30, June 1971, p. 797-805. 21 refs. Research supported by the Medical Research Council of Canada.

Intrathoracic (esophageal) and intra-abdominal (gastric) pressures together with lung volume and airflow were measured in decerebrate cats and in conscious men during respiration elicited by electrical stimulation of the phrenic nerves. Measurements were made with graded resistances added during inspiration. With a stimulus of fixed strength, and at constant lung volume, transdiaphragmatic pressure, i.e., the difference between intra-abdominal and intrathoracic pressure (an expression of the force of contraction of the diaphragm) was found to increase progressively with decreasing airflow (an expression of speed of shortening of the diaphragm) induced by added resistances. For a stimulus of fixed strength, and at a constant airflow, transdiaphragmatic pressure decreased with increasing lung volume (an expression of length of the diaphragm). Mechanical power developed by the diaphragm for a fixed stimulus also varied with added load. These observations indicate that the intrinsic properties of the diaphragm (i.e., its force-speed of shortening and force-length relationships) play an important role in the respiratory adjustments to loading. (Author)

A71-33240 Water metabolism in humans during acute high-altitude exposure (4,300 m). Harry J. Krzywicki, C. Frank Consolazio, Herman L. Johnson, Walter C. Nielsen, Jr., and Robert A. Barnhart (U.S. Army, Medical Research and Nutrition Laboratory; Fitzsimons General Hospital, Denver, Colo.). *Journal of Applied Physiology*, vol. 30, June 1971, p. 806-809. 14 refs.

During 6 days of altitude exposure at 4,300 m, the following changes in body water compartments were observed. (1) Total body water was significantly decreased by 2.25 kg during the 6-day altitude exposure. (2) Extracellular water appeared to increase by 1.27 kg at altitude, although not significantly. (3) Intracellular water, in turn, was significantly decreased by 3.52 kg at altitude, which is contrary to some previous reports. Under the conditions of this study, with heavy physical activity prior to and during altitude exposure, and with fairly high food intakes (above 3,440 kcal/day), it appeared that hypohydration and a diuresis still occurred during acute altitude exposure. This suggested that body water loss may have been an adaptive mechanism in acute altitude exposure. (Author)

A71-33241 Prediction of maximal oxygen uptake by a stepwise regression technique. R. T. Hermiston and J. A. Faulkner (Michigan, University, Ann Arbor, Mich.). *Journal of Applied Physiology*, vol. 30, June 1971, p. 833-837. 19 refs. NIH Grant No. GM-12554.

Recent data have demonstrated that maximal oxygen uptake cannot be predicted with precision from the heart rate measured during submaximum work. We have used a step-wise multiple-regression technique to develop equations for the predictions of the maximal oxygen uptake of physically active and physically inactive men from data collected during a submaximum treadmill walk. The most accurate prediction for physically active men was obtained from a regression equation which included the subject's age, fat-free weight, heart rate, fraction of carbon dioxide in expired gas, and tidal volume at a submaximum work level, in addition to the rate of change of the respiratory exchange ratio. For the physically inactive men, the most accurate prediction equation included age, fat-free weight, respiratory exchange ratio, and tidal volume at a submaximum work level. The coefficient of correlation was 0.91 between predicted maximal oxygen uptake measured on two different occasions and 0.90 between the observed and predicted maximal oxygen uptake. None of the paired t ratios were significant. (Author)

A71-33242 # Exercise O2 debts of dogs at ground level and at altitude with and without beta-block. Stephen M. Cain (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Journal of Applied Physiology*, vol. 30, June 1971, p. 838-843. 18 refs.

Investigation of the effects of a beta-adrenergic blocking agent on oxygen uptake and oxygen debt of dogs exercising at a moderate work rate at ground level and altitude and with more severe exercise at ground level. Differences in oxygen uptake found with beta-adrenergic blockage are accepted as evidence for the role of catecholamine calorigenesis in exercise energy metabolism. M.V.E.

A71-33243 * Exercise temperature regulation in man during hypohydration and hyperhydration. J. E. Greenleaf and B. L. Castle (NASA, Ames Research Center, Biotechnology Div., Moffett Field, Calif.). *Journal of Applied Physiology,* vol. 30, June 1971, p. 847-853. 46 refs.

Changes in body temperature during exercise under various hydration regimes are investigated in order to determine how these changes are related to alterations in sweating. The obtained results suggest that the effects of dehydration on sweating and body temperature during exercise may be mediated through increased serum osmolarity, Na(+), and possibly K(+) concentration. Whether the effect might be mainly a local effect on sweat glands, a secondary effect on sweat glands via changes in peripheral circulation, and/or mainly an effect on the regulatory centers in the hypothalamus remains to be elucidated. Another contributory mechanism is the inhibition of sweating by the presumably elevated antidiuretic hormone with hypohydration. M.V.E.

A71-33244 Maximal oxygen uptake at sea level and at 3,090-m altitude in high school champion runners. D. B. Dill (University of Nevada System, Boulder City, Nev.) and William C. Adams (California, University, Davis, Calif.). *Journal of Applied Physiology,* vol. 30, June 1971, p. 854-859. 27 refs. Research supported by the Nevada Heart Association; PHS Grant No. GM-15693-03; NSF Grant No. GB-17126; Grant No. AF AFOSR 69-1659.

The decrement is assessed in the maximum rate of oxygen consumption at sea level occasioned by an altitude of 3090 m and a barometric pressure of 530 mm Hg in highly trained young middle-distance runners. Measured fluctuations in the maximum rate of oxygen consumption during a 17-day long continuous residence at altitude are reviewed, and comparisons are discussed of postaltitude maximum rates of oxygen consumption with prealtitude values. M.V.E.

A71-33245 Capillary density of skeletal muscle in well-trained and untrained men. Lars Hermansen (Oslo, Universitetet, Oslo, Norway) and Milena Wachtlova. *Journal of Applied Physiology,* vol. 30, June 1971, p. 860-863. 27 refs.

The relationship is investigated between capillary density and aerobic power (i.e., maximal oxygen uptake) in groups of untrained and well-trained subjects, using muscle samples obtained by needle biopsies from the lateral portion of muscle quadricepts femoris. The results obtained seem to indicate that the primary effect of endurance training on human skeletal muscle is an increase in the size of the muscle cells with a secondary increase in the number of capillaries per fiber. The average half-distance between two capillaries (diffusion distance), however, remains constant. M.V.E.

A71-33246 Length-tension properties of alveolar wall in man. Toshihiko Sugihara, C. J. Martin, and J. Hildebrandt (Virginia Mason Research Center and Firland Hospital; Washington, University, Seattle, Wash.). *Journal of Applied Physiology,* vol. 30, June 1971, p. 874-878. 28 refs. Research supported by the Washington State Heart Association; NIH Grants No. HE-01892; No. HE-12596.

The length-tension characteristics of isolated single human alveolar walls are studied in relationship to age, sex, and expiratory flow. The maximum extensibility ratio, calculated from the length-tension relationship, is related to the stress developed at each strain. M.V.E.

A71-33247 Effect of a steady-state exercise on maximal anaerobic power in man. R. Margaria, P. E. di Prampero, P. Aghemo, M. Mariani (Milano, Università, Milan, Italy), and P. Derevenco. *Journal of Applied Physiology,* vol. 30, June 1971, p. 885-889. 16 refs. Research supported by the Consiglio Nazionale delle Ricerche.

Maximal human anaerobic power was tested by measuring the vertical component of the speed in four subjects running at top speed up a normal staircase, and the O2 requirement for various exercise intensity levels was determined. In some experiments, blood samples were taken from the antecubital vein for lactic acid determination. The decrease in the maximal anaerobic power was found to be greater the higher the exercise intensity but unaffected by increases in exercise duration over 3 min. The increase of blood lactic acid as an effect of anaerobic exercise is not appreciably affected by previous aerobic exercise. M.V.E.

A71-33248 Cuvette for continuously measuring blood oxygen tension. Eric O. Feigl (Pennsylvania, University, Philadelphia, Pa.) and Louis G. D'Alecy (Washington, University, Seattle, Wash.). *Journal of Applied Physiology,* vol. 30, June 1971, p. 909-911. 7 refs.

An oxygen electrode cuvette has been designed which permits continuous measurement of arterial or venous oxygen tension. The advantage of the design is that good mixing is obtained at the electrode face at low flow rates by directing a jet of blood against the electrode. A small cathode and a thin Teflon membrane are used, giving a 90% response time of less than 3 sec. The cuvette is constructed so that the calibration may be easily achieved without disturbing the electrode or its membrane covering. The system has been used to record oxygen tension continuously from the coronary sinus and femoral artery in dogs but can be adapted for recording from almost any vessel with a flow greater than 3-5 ml/min. (Author)

A71-33318 Development of a human performance reliability data system. David Meister (Bunker-Ramo Corp., Westlake Village, Calif.) and Robert G. Mills (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio). In: Annals of reliability and maintainability. Volume 10 - Assurance technology relates to today's world; Proceedings of the Tenth Reliability and Maintainability Conference, Anaheim, Calif., June 27-30, 1971. Conference sponsored by the American Society of Mechanical Engineers, the Society of Automotive Engineers, and the American Institute of Aeronautics and Astronautics. New York, American Society of Mechanical Engineers, 1971, p. 425-439. 11 refs.

A study was performed to determine the requirements for and the elements of a human performance reliability (HPR) data system. The heart of the HPR system is a taxonomic structure for classifying behavioral studies. 140 studies from a variety of sources were coded using this taxonomy. To test the efficiency of this data bank to provide answers to system development questions a number of tests were performed to determine the relevance of the data retrieved to the questions asked. The results of these tests indicated that it is possible to expand the HPR data base provided one is not restricted to a probabilistic metric. (Author)

A71-33359 Absence of histone in the blue-green alga Anabaena cylindrica. Fumiko Makino and Junji Tsuzuki (Tokyo, University, Tokyo, Japan). *Nature,* vol. 231, June 18, 1971, p. 446, 447. 8 refs.

The protein components of the chromosomes of Anabaena cylindrica are analyzed. The analysis reveals that the chromosomes of this alga contain a small amount of acid-extractable protein, which, however, is not as strongly basic as the histones of eukaryotic cells. There should be little loss of chromosomal basic protein during the purification procedure in the experimental conditions, pH and ionic strength, which were chosen so as to maintain the integrity of DNP. The results obtained agree with observations of Leak (1967) who

demonstrated the presence of fine fibrils in the nucleoplasm of some blue-green algae and suggested low chromosomal protein content. This has been confirmed in Anabaena cells in which it was found that the nucleoplasm consisted of unit fibrils with diameter of 30 A and their aggregated form. O.H.

A71-33366 # **Validity and reproducibility of determination of cardiac output by thermodilution in man.** B. Olsson, J. Pool, P. Vandermoten, E. Varnauskas, and R. Wassén (Göteborg, Universitet, Göteborg, Sweden). *Cardiology,* vol. 55, no. 3, 1970, p. 136-148. 24 refs.

A thermodilution technique using a dual thermistor catheter introduced in the pulmonary artery was used for the determination of cardiac output at rest in 12 patients and for the same measurement during exercise in 6 patients with valvular disease. The correlation coefficient between thermodilution and the dye dilution technique is 0.98. The precision of the method assessed by multiple repeated determinations is 7.5 per cent at rest and 6.9 per cent during mild exercise. The reproducibility at rest indicates that a steady state has been maintained in an acceptable way. In one case of tricuspid insufficiency it was not possible to evaluate the cardiac output. (Author)

A71-33367 # **Cardiovascular responses to hypothalamic, spinal cord and stellate ganglion stimulation.** Kee Soon Kim, W. C. Randall, and C. N. Peiss (Loyola University, Maywood, Ill.). *Cardiology,* vol. 55, no. 3, 1970, p. 164-177. 29 refs. NIH Grant No. HE-08682.

Electrical stimulation of the hypothalamus, spinal cord and stellate ganglion was performed to determine optimal stimulation parameters for eliciting (1) maximal, and (2) best maintained cardiovascular responses. Magnitude of response was a function of various combinations of intensity, pulse duration and frequency, while maintenance of response was predominantly frequency-dependent. Optimal parameters for the best combination of both magnitude and maintenance of response were 20 cps-3 msec for both hypothalamus and spinal cord, and 10 cps-5 msec for the stellate ganglion. These experiments suggest that response decay may be due to transmitter exhaustion at higher rates of stimulation, but that other mechanisms involving failure of synaptic transmission are responsible at low stimulation rates. (Author)

A71-33372 **The relationship between speed and accuracy of movement aimed at a target.** C. I. Howarth, W. D. A. Beggs, and J. M. Bowden (Nottingham University, Nottingham, England). *Acta Psychologica,* vol. 35, May 1971, p. 207-218. 13 refs. Research supported by the Medical Research Council.

Rational equations have been developed to describe and explain the relationship between speed and accuracy of movement. They are based on the assumption that the increase in error at higher speeds is due solely to the increase in the length of the uncontrolled terminal phase of the movement. Error on target is assumed to increase linearly with the length of this uncontrolled movement and to be independent of its speed. Our final equation is very different from the logarithmic equation of Fitts, but the differences are accounted for by the differences in experimental conditions. There is some evidence to suggest that when Fitts' law holds it may do so for quite different reasons than those he suggested. (Author)

A71-33423 **Myocardial blood flow and oxygen uptake in clinical and experimental cardiomegaly.** Henry S. Badeer (Creighton University, Omaha, Neb.). *American Heart Journal,* vol. 82, July 1971, p. 105-119. 100 refs.

Postmortem studies of physiologic and pathologic cardiomegaly have shown that there is an increase in the capacity of the coronary arterial tree as a result of lengthening and widening of these vessels. In adults, the coronary capillaries and arterioles do not seem to multiply and the ratio of capillaries to muscle fibers remains normal. Based on the N2O method, coronary blood flow and oxygen uptake per unit mass of hypertrophied myocardium in the resting dog and man are normal except in some cases of thyrotoxicosis, severe anemia, and aortic insufficiency in which the values were above normal. In no case was the coronary flow or oxygen consumption below normal. The lack of precision of the N2O method is pointed out and the possibility of minor degrees of ischemia that may be critical is considered. Possible limitation in the diffusion of nutrients and metabolites as the basis for metabolic derangements of the thickened myocardial fiber is emphasized. O.H.

A71-33461 # **Nitrogen assimilation and oxygen uptake by Chlorella cells.** N. Tomova, M. Setchenska, Iu. Christova, M. Georgieva, and O. Dimova (Bulgarian Academy of Sciences, Central Laboratory of Biophysics, Bulgaria). *Bolgarskaia Akademiia Nauk, Doklady,* vol. 24, no. 3, 1971, p. 373-376. 11 refs.

Investigation of the oxygen consumption by nitrogen-starved nonsynchronous Chlorella during assimilation of nitrogen from NH4H2PO4, KNO3, KNO2, or urea in darkness and in light, in a stream of 2% CO2. After nitrogen starvation assimilation of these compounds in light was accompanied by a sharp increase in oxygen uptake which reached a maximum three hours after nitrogen admission and then subsided. V.Z.

A71-33462 # **Effect of the speed of speech on the length of and the relation between normal articulator and phonatory phases (Vliianie skorosti proiznosheniia na dliny i sootnosheniia artikuliatornoi i fonatornoi faz v norme).** L. Mavlov (B'lgarska Akademiia na Naukite, Sofia, Bulgaria). *Bolgarskaia Akademiia Nauk, Doklady,* vol. 24, no. 3, 1971, p. 409-411. In Russian.

Analysis of articulator-phonatory phase oscillograms of healthy subjects showed that the phonation phase was much longer than the articulator phase when the speed of speech was slow and that the articulator-phonatory cycles became faster, with the lengths of both phases reduced, when the rate of production of sounds was increased moderately. The cycles became still faster when the rates of sounds were increased further, but the length of the articulator phase reached then a constant minimum of 83 millisec so that only the reduction of time of the phonatory phase accounted for the cycle time reduction. V.Z.

A71-33465 # **Centrally-parietal chromatophore in green coccal algae.** D. Vodeničarov and K. Benderliev (Vissh Pedagogicheski Institut, Plovdiv, Bulgaria). *Bolgarskaia Akademiia Nauk, Doklady,* vol. 24, no. 4, 1971, p. 503-505. 7 refs.

The chromatophore apparatus in Neglectella eremosphaerophila algae is shown to combine features of a typical parietal chromatophore with those of a central one. For this reason it is suggested that a new term be used for its designation - namely, centrally parietal chromatophore. M.V.E.

A71-33467 # **Cytophotometric proof of DNA replication in the muscles of a vascular wall of man during the physiological regeneration of the vascular wall (Tsitofotometrichni dokazi replikatsii DNK u muskulaturi sudinnoi stinki pri ii fiziologichnii regeneratsii u liudini).** V. I. Maliuk (Akademiia Nauk Ukrains'koi RSR, Institut Zoologii, Kiev, Ukrainian SSR). *Akademiia Nauk Ukrains'koi RSR, Dopovidi, Seriia B - Geologiia, Geofizika, Khimiia i Biologiia,* vol. 33, May 1971, p. 447-449. 17 refs. In Ukrainian.

The DNA content is studied cytophotometrically in the nuclei of intercostal artery muscle cells of a 44-year man, showing the prevalence of diploid forms in the cells. It is also found that a portion of these cells undergoes polyploidization during the DNA replication cycle and that the tetraploid forms retain a capability of further reduplication. DNA synthesis in polyploid cells either comes to completion when they divide or leads to the production of octoploid forms. V.Z.

A71-33468 # **Investigation of the crystallization of blood serum albumin of man (Doslidzhennia kristalizatsii al'buminu sirovatki krovi liudini).** M. D. Lutsik (L'vivs'kii Derzhavnii Medichnii Institut, Lvov, Ukrainian SSR) and L. E. Nazarevich (Ukrains'kii Naukovo-Doslidnii Institut Fiziologii i Biokhimii Sil'skogospodars'kikh Tvarin, Ukrainian SSR). *Akademiia Nauk Ukrains'koi RSR, Dopovidi, Seriia B - Geologiia, Geofizika, Khimiia i Biologiia,* vol. 33, May 1971, p. 450-452. 7 refs. In Ukrainian.

The effect of bivalent metal salts on the crystallization of blood serum albumin is investigated by a technique providing adequate isolation of pure protein from the serum. Rod-shaped albumin crystals clustering into druses were obtained in the presence of cadmium sulfate. Along with these crystals hexagonal plates were formed when mercuric chloride was used. V.Z.

A71-33522 # **Changes in the morphological pattern of the inflammation process in high mountain areas (Ob izmenenii morfologicheskoi kartiny vospalitel'nogo protsessa pod vliianiem vysokogor'ia).** T. G. Chernova (Tadzhikskii Gosudarstvennyi Meditsinskii Institut, Dyushambe, Tadzhik SSR). *Akademiia Nauk Tadzhikskoi SSR, Doklady,* vol. 14, no. 2, 1971, p. 72-75. 10 refs. In Russian.

Study of the effect of high-mountain altitudes on the local inflammation process in rabbits not adapted to high-altitude conditions. It is found that a complex of high-mountain factors has an inhibiting effect on the inflammation process, leads to an attenuation of the rate of exsudation and cellular infiltration, and slows down the process of healing of wounds. A.B.K.

A71-33529 # **The ONR program in engineering psychology.** Martin A. Tolcott and Gerald S. Malecki (U.S. Navy, Office of Naval Research, Washington, D.C.). *Naval Research Reviews,* vol. 24, May 1971, p. 10-17.

The program is generally concerned with problems relating to the interface between Navy and Marine Corps personnel and the equipment with which they work. The portion of the program related to information input and display concepts deals with two types of displays including those designed specifically for use in aircraft and those designed for more general use in detecting and classifying weak signals such as might appear on radar or sonar scopes, either airborne or shipborne. The final phase of research and development on Hardiman has been reached in the area concerned with motor output and control concepts. Other parts of the program are connected with information processing and decision making, with model, methods, and data organization, and with man's performance in the sea. G.R.

A71-33576 # **Psychic states of pilots and their forms of appearance in flight (Psikhicheskie sostoianiia letchikov i formy ikh proiavleniia v polete).** L. P. Grimak and V. A. Ponomarenko. *Voenno-Meditsinskii Zhurnal,* May 1971, p. 72-76. In Russian.

Psychic states which reduce the functional efficiency of pilots are categorized into three distinct groups. The first consists of extreme shifts in functional states and includes preliminary psychic demobilization and dominant states developing both before and during flight. The second category groups psychic states induced by flight factors, including drowsiness, short-term psychic stunning, euphoria after negative emotional stress, and inhibited differentiation. The third group comprises psychic states with elements of phobia caused by critical situations in previous flights. It is noted that these psychic states are not a constantly present sickness and can lead to neurosis only under specific circumstances. Such unfavorable conditions are delineated and illustrated by examples of case histories. T.M.

A71-33577 # ***Mechanism of the biological effects of inert* gases at elevated pressure (K mekhanizmu biologicheskogo deistviia indifferentnykh gazov pri povyshennom davlenii).** I. A. Sapov and I. S. Karev. *Voenno-Meditsinskii Zhurnal,* May 1971, p. 77-81. 13 refs. In Russian.

Survey of published research on processes by which inert gases contained in elevated-pressure respiratory mixtures affect the human central nervous system. The effects considered include euphoria, reduced self-control, lowered functional efficiency, and loss of consciousness. Functional disturbances of the central nervous system correlated with changes in EEG indices under the influence of both high-pressure inert gases and typical narcotics. This led to conclusions that the gases act in a manner similar to narcotics. A more recent explanation is that disturbances of the central nervous system are associated with hypercapnia which is caused by accumulated carbon dioxide in the organism. Arguments for and against both points of view are advanced, and areas of further research are suggested. T.M.

A71-33578 # **Changes of psychophysiological qualities under conditions of elevated atmospheric pressure (Izmenenie psikhofiziologicheskikh kachestv v usloviiakh povyshennogo atmosfernogo davleniia).** A. P. Miasnikov, Iu. M. Bobrov, and V. S. Shchegolev. *Voenno-Meditsinskii Zhurnal,* May 1971, p. 81, 82. In Russian.

Study of the effects of elevated atmospheric pressure on the capacity and stability of attention, short- and long-term memory, ability for estimating time, excitability, and equilibrium of nervous processes in humans. Experiments conducted over a six-month period included two exposures to a pressure of 11 atm, three exposures to 9 atm, and periodic exposures to pressures ranging from 2.2 to 7 atm. Statistically significant reductions were observed in the capacity and stability of attention. The response time of a simple sensomotor reaction to light stimuli increased, and the accuracy of time estimates decreased. Word lengths in handwriting tests increased. Short- and long-term memory capacities were reduced at 11 atm. T.M.

A71-33676 # **Pathogenesis of the weightlessness syndrome' (Patogenez 'sindroma nevesomosti').** E. A. Kovolenko and P. V. Vasil'ev. *Akademiia Nauk SSSR, Izvestiia, Seriia Biologicheskaia,* May-June 1971, p. 356-369. 43 refs. In Russian.

Functional changes caused by prolonged weightlessness in analysors, cardiovascular and respiratory systems, motor and muscular activity, metabolism and body energetics are discussed in the light of available observations and experiments. Acceleration-to-weightlessness shifts, partial adaptation to weightlessness, cumulative effects of weightlessness, weightlessness-to-acceleration and to gravity shifts, weightlessness aftereffects and adaptation to gravity are considered as successive phases of the reaction of the human organism to weightlessness. Interactions between various pathogenic developments caused by weightlessness are analyzed. V.Z.

A71-33677 # **Role of biogenic amines (serotonin) in the development of vestibular disorders in flight (Rol' biogennykh aminov /serotonina/ v vozniknovenii vestibuliarnykh narushenii v polete).** E. V. Lapaev, N. N. Lebedev, Iu. F. Udalov, E. M. Iuganov, and O. P. Khalatov. *Akademiia Nauk SSSR, Izvestiia, Seriia Biologicheskaia,* May-June 1971, p. 370-374. 14 refs. In Russian.

The functional state of the vestibular apparatus was studied on a rocking stand and in flight in a group of 12 healthy subjects 21 to 45 years old. Changes in pyridoxine and serotonin metabolism and a depressed vestibular stability were observed in the subjects. Simulation experiments indicated that disorders in biogenic amine metabolism were responsible for the depressed function of the vestibular analysor. V.Z.

A71-33678 # **Results of studies of turtles on some spacecraft (Rezul'taty issledovanii s cherepakhami na nekotorykh kosmicheskikh letatel'nykh apparatakh).** N. A. Gaidamakin, G. P.

Parfenov, V. G. Petrukhin, and V. V. Antipov. *Akademiia Nauk SSSR, Izvestiia, Seriia Biologicheskaia,* May-June 1971, p. 451-453. 6 refs. In Russian.

It is found that there were no considerable changes in the organs and tissues of turtles which were carried by the Zond 5 and 7 lunar probes on a circumlunar flight. Minor atrophic changes observed in the turtles after return to the earth were due to radiation-irrelevant causes. V.Z.

A71-33679 Effects of redundancy on performance under overload stress. Paul M. Hurst and James M. McKendry. *Perceptual and Motor Skills,* vol. 32, June 1971, p. 907-915. 5 refs. Contracts No. AF 33(616)-7892; No. Nonr-4423(00).

The focus of this study was a transducing task in which various information items (stimulus elements) are sequentially presented and S is required to make the appropriate response for a set of such elements. The goal was to determine the role of redundancy (one to two surplus elements) in ameliorating or heightening the sharp performance decrement previously found to result when input rates exceed a crucial range. Results showed an optimum level of redundancy for this task, which could be analyzed as a resultant of a facilitative influence and a detrimental one. Practice at various levels of redundancy seemed to transfer equally to posttest conditions when the levels of redundancy in the latter were crossed over. (Author)

A71-33680 * The partial reinforcement effect in a vigilance task. Joel S. Warm, Gerald L. Hagner, and Dale Meyer (Cincinnati, University, Cincinnati, Ohio). *Perceptual and Motor Skills,* vol. 32, June 1971, p. 987-993. 18 refs. Grant No. NGL-36-004-014.

In the investigation the knowledge of results (KR) was varied as the incentive. Ss detected the onset of a visual signal during a 1-hr vigil divided into four periods. Five groups of 25 Ss were employed: (1) 100% KR throughout the session, (2) 50% KR throughout the session, (3) 100% KR during the first 2 periods and none thereafter, (4) 50% KR during the first two periods and none thereafter, and (5) no evaluative feedback but acknowledgment of each response. Response times in the group receiving no evaluative feedback exceeded those of all of the others and increased consistently across periods. G.R.

A71-33744 * # Development of planetary quarantine in the United States. D. G. Fox, L. B. Hall (NASA, Planetary Quarantine Office, Washington, D.C.), and E. J. Bacon (Exotech Systems, Inc., Washington, D.C.). *COSPAR, Plenary Meeting, 14th, Seattle, Wash., June 18-July 2, 1971, Paper.* 22 p. 16 refs.

The program evolution of the U.S. planetary quarantine is traced, with emphasis on progress during the past 4 years. Following a brief review of the program background and inception, NASA's policies are outlined, such as they are guided by recommendations from ICSU, COSPAR, and the U.S. National Academy of Sciences Space Science Board. Policy formulation, program planning, and implementation are shown to follow an orderly process recommended by a Planetary Quarantine Advisory Panel and other related groups. It is shown how expanding knowledge of contamination sources and probability and advances in sterilization technology influence contamination constraint programming. Ongoing flight programs are used to illustrate the role of the quarantine program in assuring the biological integrity of the planets. M.V.E.

A71-33757 # Demonstration of a biological effect of cosmic and telluric radiations. H. Planel, J. P. Soleilhavoup, and R. Tixador (Université Paul Sabatier, Toulouse, France). *COSPAR, Plenary Meeting, 14th, Seattle, Wash., June 18-July 2, 1971, Paper.* 10 p.

Laboratory experiments were carried out to detect an eventual biological effect of ionizing natural radiations, and to separate the respective roles of cosmic rays and natural radioactivity. All experiments were performed on Protozoa, Paramecium caudatum, and P. aurelia. The effect of radioprotection and of low doses of radiation was investigated. Results suggest that there is a relationship between the intensity of natural ionizing radiations and the growth rate of Paramecia, and that both cosmic and telluric radiations may exhibit stimulating effect on some living organisms. O.H.

A71-33770 * # Synergistic characteristics of thermoradiation sterilization. H. D. Sivinski and M. C. Reynolds (Sandia Laboratories, Albuquerque, N. Mex.). *COSPAR, Plenary Meeting, 14th, Seattle, Wash., June 18-July 2, 1971, Paper.* 23 p. 11 refs. NASA Contract No. W-12,853.

A new process, referred to as thermoradiation, has been developed which combines dry heat and ionizing radiation in a way that results in a greater microbial inactivation than the additive effects would imply. This process produces a synergistic effect which can be utilized for sterilization with significantly reduced sterilization times. For example, at 105 C and a dose rate of 7.5 krads per hour, the D-value for B. subtilis var. niger spores decreases from 4.5 hours for dry heat alone to 1.5 hours when both are applied simultaneously. Other spore systems also exhibit this synergistic inactivation characteristic. Those studied include B. stearothermophilus, B. pumilus, and some highly resistant soil spores. It was found that dose rate is a major factor to be considered in optimization of the synergism observed. Other effects studied include those of water activity and the use of a nitrogen atmosphere. O.H.

A71-33774 # The effects of dose protraction on hematopoiesis in the primate and dog. J. F. Spalding, L. M. Holland, and J. R. Prine (California, University, Los Alamos, N. Mex.). *COSPAR, Plenary Meeting, 14th, Seattle, Wash., June 18-July 2, 1971, Paper.* 20 p. 20 refs. AEC-sponsored research.

Two investigations are in progress to study the effects of dose protraction on hematopoiesis in dogs and monkeys and to test the usefulness of the equivalent residual dose (ERD) concept for predicting radiation-induced injury and recovery. Data currently available from these investigations suggest that the dog is more radiosensitive to acute gamma-ray exposure than is the monkey; that the dog is more responsive than the monkey to dose protraction in terms of an increase in the minimum lethal dose; and that the ERD concept is a reasonably good indicator of hematopoietic injury and recovery for the exposure conditions used in the investigation. If the recommended upper ERD limit is lowered from 200 to 100 rads, the ERD concept should be a reasonable and conservative guide for exposure of man to radiation in an emergency. O.H.

A71-33778 # Energy requirements of man living in a weightless environment. J. E. Vanderveen and T. H. Allen (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *COSPAR, Plenary Meeting, 14th, Seattle, Wash., June 18-July 2, 1971, Paper.* 17 p. 12 refs.

Comparison of data obtained from the Gemini and Apollo missions with data obtained from metabolic balance studies accomplished on healthy subjects living in low pressure simulators and consuming foods used in space feeding systems. The ability to maintain energy balance is a vital factor in maintaining body composition. When energy requirements are expressed in kcal/kg of body weight, the difference in energy requirements among the astronauts and chamber subjects was small and not statistically significant. These data also indicate that changes in body weight and certain other body measurements detected during Gemini and Apollo missions were likely caused, at least in part, by a calorie deficiency. F.R.L.

A71-33796 * # Effects of aeolian erosion on microbial release from solids. E. A. Gustan, R. L. Olson (Boeing Co., Seattle, Wash.), D. M. Taylor, and R. H. Green (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). *COSPAR, Plenary Meeting, 14th, Seattle, Wash., June 18-July 2, 1971, Paper.* 8 p. 8

refs. Contract No. JPL-952916.

Determination of the percentage of spores that would be expected to be released from the interior of solid materials by aeolian erosion on a planetary surface. The information obtained from the study can be used in calculations to determine the probability of microbial release in the total planetary quarantine probability equation. Methyl methacrylate and Eccobond disks were fabricated so that each disk contained approximately 40,000 spores. The disks were placed in a specially designed sandblasting device and eroded. Exposure periods of 0.5, 2 and 24 hr were investigated using filtered air to accelerate the sand. A series of tests was also conducted for a 0.5-hr period using carbon dioxide. Examination of the erosion products showed that less than 1% of the spores originally contained in the solids was released by aeolian erosion. F.R.L.

A71-33799 * # **Planetary quarantine analysis for an unmanned Mars orbiter.** A. R. Hoffmann, R. J. Reichert, N. R. Haynes (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.), and L. B. Hall (NASA, Washington, D.C.). *COSPAR, Plenary Meeting, 14th, Seattle, Wash., June 18-July 2, 1971, Paper.* 11 p.

It is found that three sources - accidental impact of the spacecraft, loose particles, and gases used for attitude control and pressurization - form the major hazards. Furthermore, the analysis results indicate that with the planned mission strategy, including aiming point and delivery biases, and the imposition of facility and procedural control during the systems test operations to minimize particulate and microbial contamination of the spacecraft, the planetary quarantine constraints for the Mariner Mars 1971 mission are being met. A mathematical model has been constructed to allocate and to estimate probability of contamination associated with identified contaminating sources or events. To assure that permissible microbial burden levels would not be exceeded, extensive cleaning and facility personnel control programs were implemented. G.R.

A71-33808 * # **Biological instrumentation for the Viking 1975 mission to Mars.** Harold P. Klein (NASA, Ames Research Center, Moffett Field, Calif.) and Wolf Vishniac (Rochester, University, Rochester, N.Y.). *COSPAR, Plenary Meeting, 14th, Seattle, Wash., June 18-July 2, 1971, Paper.* 23 p. 13 refs.

Biological experiments to be performed during the Viking mission, in which two unmanned spacecraft will land on Mars, are described. Soil samples will be acquired by a sampler aboard the Viking lander and will be distributed both to the biology experiments and to the gas chromatograph/mass spectrometer equipment by a common assembly system. The nature and instrumentation of the 'gas exchange' experiment, the 'carbon assimilation' experiment, the 'label release' experiment, and the 'light scattering' experiment are discussed. The reasons why Mars is of interest from a biological point of view are outlined. V.P.

A71-33816 # **Test of a life support system in sounding rockets.** Robert G. A. Lotz, Gary H. Bowman, and Lothar Schrötter (Frankfurt, Universität, Frankfurt am Main, West Germany). *COSPAR, Plenary Meeting, 14th, Seattle, Wash., June 18-July 2, 1971, Paper.* 17 p.

Two Nike Tomahawk rockets each carrying two Biosondes were launched from Wallops Island, Virginia, the first on Dec. 10, 1970, and the second on Dec. 16, 1970. Primary objective of both flights was to test under a near weightless environment the Biosonde life support system. Duration of the weightless environment was approximately 6.5 minutes. Data obtained during the flight via telemetry was used to ascertain the operation of the system. Based on the information obtained, it has been concluded that the operation of the Biosondes during the flight was essentially the same as that observed in the laboratory. (Author)

A71-33872 **Suiting up for space: The evolution of the space suit.** Lloyd Mallan. New York, John Day Co., 1971. 271 p. $9.95.

The early history of the space suit during the 1930's in connection with attempts to reach high altitudes in balloons without the use of a hermetically sealed gondola is considered giving attention to the pioneering role of Ridge. Another pioneer in the history of the space suit is the aviator Post. The various factors which make necessary special protection measures during an ascent in successively higher altitudes are examined. Instruments and tests used to determine the requirements which must be met to make life for human beings in a space environment and during acceleration possible are described. The space suits discussed include XH full-pressure stratosphere suits and MC partial pressure suits. Attention is given to the development of space suits in connection with the U.S. space program. The requirements of disposing of human waste products during very long space flights are to be met by refined closed-loop-ecology waste-management systems. Design details for suits worn by the astronauts on the lunar surface are presented. G.R.

A71-33897 # **Succinic acid in skeleton muscles during intensive activity and rest period (lantar'naia kislota v skeletnykh myshtsakh pri intensivnoi deiatel'nosti i v periode otdykha).** M. N. Kondrashova (Akademiia Nauk SSSR, Institut Biologicheskoi Fiziki, Pushchino-na-Oke, USSR) and N. R. Chagovets (Leningradskii Nauchno-Issledovatel'skii Institut Fizicheskoi Kul'tury, Leningrad, USSR). *Akademiia Nauk SSSR, Doklady,* vol. 198, May 1, 1971, p. 243-246. 13 refs. In Russian.

Creatine phosphate, lactic acid and succinic acid contents were determined in the hind leg muscles of albino rats during swimming for 15 min at 30 to 32 C and during rest with warming 30 and 60 min thereafter. The creatine phosphate content decreased and the lactic and succinic acid contents increased after swimming, recovered their original levels after 30 min rest and increased further after 60 min rest. It is theorized that the excess succinic acid built up during activity is used as the energy supplier in the recovery of creatine phosphate during rest. V.Z.

A71-33898 # **A method of analyzing neuron reactions to stimuli (Sposob analiza reaktsii neirona na razdrazhitel').** V. Iu. Krylov and A. Kh. Liapkusova (Akademiia Nauk SSSR, Institut Vysshei Nervnoi Deiatel'nosti i Neirofiziologii, Moscow, USSR). *Akademiia Nauk SSSR, Doklady,* vol. 198, May 1, 1971, p. 247-249. 6 refs. In Russian.

An analytic procedure is discussed by which the response of a neuron to a stimulus can be separated from a background of irrelevant pulsed activity of the neuron. The procedure uses a modified Pearson criterion (1916) to compare a stimulated neuron activity with a background activity which is subject to a hypothetic law of distribution. The key feature of the procedure is the drawing of a line showing the region of unreliable separation of a stimulated neuron response from the background on a histogram. V.Z.

A71-33899 # **Transformation of the pulsed activity characteristics of neurons in the auditory system (Preobrazovanie kharakteristik impul'snoi aktivnosti neironov v slukhovoi sisteme).** E. A. Radionova (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). *Akademiia Nauk SSSR, Doklady,* vol. 198, May 1, 1971, p. 250-253. 17 refs. In Russian.

The impulse activity of 693 cochlear nucleus neurons and 62 posterior clivus neurons in response to tonal signals was studied in the auditory system of cats under chloralose-urethane anesthesia. The difference between the profiles of discharges in the two types of neurons are discussed, noting the more frequent occurrence of multiple-impulse discharges in clivus neurons than in cochlear neurons. V.Z.

A71-33911 # **Correlation of changes in various functional systems of the organism during the action of increasing hypoxia on intact and anesthetized animals (Korreliatsiia izmenenii razlichnykh**

funktsional'nykh sistem organizma pri deistvii narastaiushchei gipoksii na intaktnykh i narkotizirovannykh zhivotnykh). N. A. Agadzhanian and Iu. V. Shevchenko (Institut Mediko-Biologicheskikh Problem, Moscow, USSR). *Akademiia Nauk SSSR, Doklady,* vol. 198, May 11, 1971, p. 471-474. 20 refs. In Russian.

Complex study of a number of functions in intact and anesthetized white rats subjected to increasing hypoxia in a decompression chamber. In both groups of animals some were subjected to hypoxia with their extremities fixed to a special machine, while the others were allowed to move freely. Fixation of the extremities is found to have a very unfavorable effect on the ability of the organism to withstand hypoxia. A.B.K.

A71-33912 # **Hydrodynamic interactions between sections of the vestibular apparatus (O gidrodinamicheskikh vliianiiakh mezhdu otdelami vestibuliarnogo apparata).** V. A. Kisliakov and I. V. Orlov (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). *Akademiia Nauk SSSR, Doklady,* vol. 198, May 11, 1971, p. 479-482. 8 refs. In Russian.

Study of reactions of nerve units of the lateral and anterior semicircular canals of frogs to caloric stimulation. Local caloric stimulation of individual formations of the membranous labyrinth is found to indicate the possibility of hydrodynamic interactions in the semicircular canals. The reactions of the lateral and anterior canals to caloric stimulation are found to correspond to the concepts of Bárány (1906) and to the laws of hydrodynamics of the labyrinth. A.B.K.

A71-33913 # **Histochemical investigation of the activity of certain enzymes during various phases of the cardiac cycle (Gistokhimicheskoe issledovanie aktivnosti nekotorykh fermentov v raznye fazy serdechnogo tsikla).** A. I. Strukov, R. A. Simakova, E. B. Babskii, and E. V. Bogdanova (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR). *Akademiia Nauk SSSR, Doklady,* vol. 198, May 11, 1971, p. 486-488. 9 refs. In Russian.

Experiments performed with frogs are described in which the activity of dehydrogenase of succinic, malic, citric, lactic, and glutamic acids and several other oxidizing-restorative enzymes was investigated. It is found that the activity of all these enzymes differs during the various phases of the cardiac cycle. The changes in enzymatic activity are attributed to changes in the ion concentration associated with excitation, contraction, and the action of products of enzymatic splitting of substances used by the cell. V.P.

A71-34017 # **A pilot's look at aircraft instrumentation.** Thomas G. Foxworth and Richard L. Newman. *American Institute of Aeronautics and Astronautics, Aircraft Design and Operations Meeting, 3rd, Seattle, Wash., July 12-14, 1971, Paper 71-787.* 22 p. 34 refs. Members, $1.50; nonmembers, $2.00.

Deficiencies in current aircraft instrumentation are discussed from pilots' point of view. The performance of typical aircraft instruments is analyzed and it is shown that in many cases they do not properly convey the information needed by the pilot to enable him to do his job. It is suggested that the information content should be improved, and the displays should not mislead the pilot; they should yield correct information, any malfunction or spurious reading should be indicated by clear warning, and they should be simple. What is important should be displayed, and what is temporarily unimportant should be suppressed. A pilot-designed display is proposed and its use is suggested. O.H.

A71-34040 # **Theoretical and practical problems of vigilance (Problèmes théoriques et pratiques de la vigilance).** M. Defayolle, J.-P. Dinand, and J. Fourcade (Ministère des Armées, Service de Santé des Armées, Lyons, France). *Revue des Corps de Santé des Armées,* vol. 12, Apr. 1971, p. 165-186. 26 refs. In French.

Attempt to sketch two different concepts of vigilance, each having its particular mode of approach. The first concept assumes that vigilance corresponds to different levels of behavioral wakefulness, graduated as a function of the intensity of activating nervous processes. The second concept assumes vigilance to be a qualitative mechanism, an active and selective orientation of agreed-on operations to treat an exact category of information delivered by the environment. An attempt is made to define how psychology and neurophysiology actually envisage the problems of vigilance. The effects of alcohol and certain tranquilizers on vigilance are examined. F.R.L.

A71-34090 **Maximal elevation of 2,3-diphosphoglycerate concentrations in human erythrocytes - Influence on glycolytic metabolism and intracellular pH.** B. Deuticke, J. Duhm, and R. Dierkesmann (Rheinisch-Westfälische Technische Hochschule, Aachen, West Germany). *Pflügers Archiv,* vol. 326, no. 1, 1971, p. 15-34. 49 refs. Research supported by the Deutsche Forschungsgemeinschaft.

The 2,3-diphosphoglycerate (2,3-DPG) concentrations in the blood cells can be elevated in vitro to a maximum of 24 micro moles/g by incubating the cells in media containing inosine, pyruvate, and inorganic phosphate (IPP media). The rate of accumulation depends on the extracellular phosphate level. The concentrations of organic phosphate fractions other than 2,3-DPG also increase during the initial phase of incubation in IPP media, but rediminish thereafter. As a consequence of these changes, the total concentration of acid-soluble organic phosphates in the red cells rises from 14 to 55 micro moles P/g red cells. The increase of nonpenetrating anions is responsible for a progressive lowering of the intracellular pH of the red cells during incubation in IPP media. G.R.

A71-34107 # **Analysis of the self-regulating properties of the central nervous system by control theory methods (Analiz avtoreguliatsionnykh svoistv tsentral'noi nervnoi sistemy metodami teorii upravleniia).** P. V. Bundzen and B. M. Shishkin (Akademiia Meditsinskikh Nauk SSSR, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR,* vol. 57, May 1971, p. 664-672. 31 refs. In Russian.

The homeostatic control process for the functional background of higher-order structures in the human brain was studied by using a parametric self-adjusting functional model of the brain's electrical activity to determine the regulating properties of the central nervous system. A significant advantage of this approach is the possibility of quantitatively describing the control processes by methods developed in automatic control theory. Emphasis is placed on the derivation of a generalized dynamic quality control criterion (stability criterion) for homeostatic control in a wide range of functional states. It is shown that a nonspecific control system of the brain can be treated as a complex control system containing both rigid and self-organizing elements. The parametric stability criterion for the control of the alertness level significantly affects the nature and dynamics of continuous and impulsive activity in the higher-order brain structures. T.M.

A71-34108 # **Influence of a stimulation of the tympanic-cavity nerve plexus on the cerebral blood circulation and overall arterial pressure (Vliianie razdrazheniia nervnogo spleteniia barabannoi polosti na mozgovoe krovoobrashchenie i obshchee arterial'noe davlenie).** V. A. Romanov and M. D. Gaevyi (Meditsinskii Institut, Semipalatinsk, USSR). *Fiziologicheskii Zhurnal SSSR,* vol. 57, May 1971, p. 697-703. 24 refs. In Russian.

Experiments performed with dogs and cats show that electrical stimulation of nerve fibers in the tympanic plexus evokes changes in the tonus of cerebral vessels which differ according to the type of animal and the particular vascular basin. Cats showed a moderate decrease of blood flow in the internal maxillary artery. Dogs exhibited an obviously increased blood flow in the internal carotid artery basin on the stimulated side, accompanied by somewhat

increased blood flow in extracranial vessels. The tonus of the vertebral artery in dogs increased on the stimulated side and decreased on the opposite side. Changes in the overall arterial pressure were not constant, and a short hypotensive reaction was observed in most tests. T.M.

A71-34109 # **Influence of calcium ions on the electrophysiological properties of the vena porta muscle cells (Vliianie ionov kal'tsiia na elektrofiziologicheskie svoistva myshechnykh kletok portal'noi veny).** V. M. Taranenko (Akademiia Nauk Ukrainskoi SSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Fiziologicheskii Zhurnal SSSR,* vol. 57, May 1971, p. 704-711. 19 refs. In Russian.

The double 'sucrose gap' method was used to study the influence of calcium ions in rats. Removal of Ca++ ions from Krebs' solution causes (1) depolarization of the membrane, (2) transient rise in the frequency and drop in the amplitude of spontaneous electrical activity with its subsequent suppression, (3) reduced membrane resistance, and (4) depression of the excitation of vena porta muscle cells. Increased Ca++ ion concentration in a Ringer-Lock solution causes hyperpolarization, increased amplitude and duration of spontaneous electric discharges, reduced excitability, and lowered resistance of the muscle cell membrane. T.M.

A71-34110 # **Influence of temperature on the spontaneous electrical and contractile activity of smooth muscle cells of the vena porta (Vliianie temperatury na spontannuiu elektricheskuiu i sokratitel'nuiu aktivnost' gladkikh myshechnykh kletok vorotnoi veny).** A. V. Gurkovskaia (Akademiia Nauk Ukrainskoi SSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Fiziologicheskii Zhurnal SSSR,* vol. 57, May 1971, p. 712-720. 10 refs. In Russian.

The spontaneous electrical activity of smooth muscle cells was observed simultaneously with the contractile activity of a section of the vena porta in rats. Each electric discharge of a cell was accompanied by contraction of the entire section of the vena porta, and the force of contraction depended on the nature and frequency of discharges from the particular cell. Reduction of the Krebs' solution temperature from 37 C to 27 C led to hyperpolarization of the cell membrane and to a sharp drop in the discharge frequency. The durations of the spike potential and of the slow wave were doubled on average, while the amplitude of contraction was substantially reduced. A temperature rise from 36 C to 40 C causes depolarization of the muscle cell membrane, a sharp increase in discharge frequency, and increased amplitude of contraction. T.M.

A71-34111 # **Mechanism of the influence of hypothermia on vasomotor regulation (O mekhanizme vliianiia gipotermii na sosudodvigatel'nuiu reguliatsiiu).** M. A. Kondratovich (Institut Klinicheskoi Meditsiny, Kiev, Ukrainian SSR). *Fiziologicheskii Zhurnal SSSR,* vol. 57, May 1971, p. 721-727. 26 refs. In Russian.

Tests involving constant-flow perfusion of blood vessels for different organs in dogs and cats showed substantial reductions of systemic and regional vasomotor reflexes when the body temperature was reduced to 25 C. The depression of the reflex regulation of vascular tonus during hypothermia is not associated with a direct influence of low temperature on the functional state of afferent, central, and efferent nodes of the reflex arch since their isolated cooling to the same temperature did not reduce the vasomotor reflexes. However, isolated cooling of the entire trunk (while the brain temperature was maintained at a normal level) led to depressed reflex regulation of vascular tonus which was identical with or even more significant than that observed for overall hypothermia. It is proposed that the reduction of the reflex function of the vasomotor center is associated with the development of an inhibition caused by changed afference from cooled tissues. T.M.

A71-34112 # **Pulmonary blood volume during certain changes in overall hemodynamics (Krovenapolnenie legkikh pri nekotorykh sdvigakh obshchei gemodinamiki).** D. P. Dvoretskii (Akademiia Meditsinskikh Nauk SSSR, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR,* vol. 57, May 1971, p. 728-736. 25 refs. In Russian.

Experiments with cats were used to study pulmonary blood volume changes arising due to certain neurogenic, pharmacological, and mechanical effects on the cardiovascular system. For a large set of neurogenic, pharmacological, and mechanical influences, the most commonly observed reaction was an increased capacity of the pulmonary vascular system. Attention is given to the possible role played by the pulmonary vascular capacity function in the regulation of the cardiac output. T.M.

A71-34113 # **Influence of the blockage of M-cholinergic and adrenergic subcortical structures on the blood flow rate in different sections of the circulatory system (O vliianii blokady M-kholino- i adrenoreaktivnykh podkorkovykh struktur na skorost' prodvizheniia krovi v raznykh uchastkakh sistemy krovoobrashcheniia).** L. I. Abaskulieva (Ministerstvo Zdravookhraneniia Azerbaidzhanskoi SSR, Laboratoriia Patofiziologii, Baku, Azerbaidzhan SSR). *Fiziologicheskii Zhurnal SSSR,* vol. 57, May 1971, p. 758-760. 12 refs. In Russian.

Changes of blood flow rate in the lesser (pulmonary) circulation system and in the inferior and superior venae cava were measured in experiments on intact and anesthetized dogs with blocked M-cholinergic and adrenergic subcortical structures. Blockage of the M-cholinergic structures did not change the blood flow rate in the lesser circulation system, but did accelerate the flow rate in the inferior and superior venae cava. Blockage of the adrenergic structures reduced the flow rate in the superior venae cava and did not affect it in the other two regions studied. T.M.

A71-34145 * **Nonlinear analysis of flow pulses and shock waves in arteries. II.** Max Anliker, Robert L. Rockwell (Stanford University, Stanford, Calif.), and Eric Ogden (NASA, Ames Research Center, Environmental Biology Div., Moffett Field, Calif.). *Zeitschrift für angewandte Mathematik und Physik,* vol. 22, May 25, 1971, p. 563-581. Grant No. NGL-05-020-223.

The authors' mathematical model is applied to a study of fluctuations in the pulse rate and stroke volume in the aorta, assuming that the aortic cross section area is reduced by 36%. The purpose of the study is to simulate aortic insufficiency under pathological conditions such as arteriosclerosis. Wave speed vs variations in aorta diameter, and also vasoconstriction, vasodilation and cardiac arrest are analyzed by simulation with the aid of this model. It is shown that the wave front rapidly steepens with the distance from the heart in a mode reminiscent of shock waves in a high-speed compressible fluid flow. V.Z.

STAR ENTRIES

N71-26801# Human Resources Research Organization, Alexandria, Va. Div. 6 (Aviation).
EQUIPMENT DEVICE TASK COMMONALITY ANALYSIS AND TRANSFER OF TRAINING
Paul W. Caro Jun. 1970 37 p refs
(Contract AHC19-70-C-0012)
(AD-709534; HumRRO-TR-70-7) Avail: NTIS CSCL 5/9

Procedures were developed to enable training personnel to systematically and objectively determine the potential utility of training devices for teaching how to perform missions in operational equipment. The procedures allow comparison of operational task stimulus and response elements with corresponding elements in synthetic training equipment. On the basis of such information, training programs consistent with the psychological principles underlying transfer of training may be developed. The procedures may be applied to the potential use of training equipment in a training situation other than that for which it was designed, or in determining the applicability of off-the-shelf training devices to specific training requirements. The procedures, termed task commonality analysis, were developed in connection with an Army rotary wing instrument flight training program. In an application of the procedures in that program, transfer of training predictions were generally consistent with empirical evidence collected earlier. Author

N71-26805*# Republic Aviation Div., Fairchild Hiller Corp., Farmingdale, N.Y.
HOUSEKEEPING CONCEPTS FOR MANNED SPACE SYSTEMS DATA BOOK. VOLUME 1: WASTE CONTROL TASKS AND SYSTEM CONCEPTS (DRL LINE ITEM NO. 4)
30 Oct. 1970 292 p refs
(Contract NAS9-10662)
(NASA-CR-115045; MS124Y0002-Vol-1) Avail: NTIS CSCL 22B

Parametric data on the waste control aspects of housekeeping for future manned orbital spacecraft are presented. Subjects discussed are: (1) identification of waste products, (2) utilization processes, (3) pretreatment processes for disposal, (4) waste disposal, (5) waste control and housekeeping, and (6) systems for sanitation control. Author

N71-26806*# Republic Aviation Div., Fairchild Hiller Corp., Farmingdale, N.Y.
HOUSEKEEPING CONCEPTS FOR MANNED SPACE SYSTEMS DATA BOOK. VOLUME 3: WASTE CONTROL SEARCH/REPORT COMPUTER PROGRAM (DRL LINE ITEM NO. 4)
30 Oct. 1970 684 p refs
(Contract NAS9-10662)
(NASA-CR-115038; MS124Y0002-Vol-3) Avail: NTIS HC $9.00/MF $0.95 CSCL 22B

The computer program which has been developed to store and process the available data on spacecraft waste control is described in Volume 1, Section 7; a detailed description of the program is contained in the user's manual (F/H Report MS 124Y0005). This volume of the data book contains a brief description of the organization of the data, a complete printout of the data, and a description of the search and retrieval capabilities provided. Author

N71-26807*# Republic Aviation Div., Fairchild Hiller Corp., Farmingdale, N.Y.
HOUSEKEEPING CONCEPTS FOR MANNED SPACE SYSTEMS DATA BOOK. VOLUME 2A: WASTE DEFINITION (DRL LINE ITEM NO. 4)
30 Oct. 1970 339 p refs
(Contract NAS9-10662)
(NASA-CR-115046; NS124Y0002-Vol-2A) Avail: NTIS HC $6.00/MF $0.95 CSCL 22B

The definition of waste products that could result from manned spacecraft systems having various combinations of mission activities and subsystems is presented. The definition of the waste is in a form that is meant to enhance the derivation of requirements and constraints on waste control housekeeping routines and equipments for various mission configuration. The definition includes identification of waste types and quantities and deals with small, medium, and large spacecraft presently being considered by the NASA agencies or studied by the aerospace industry. The mission limits include up to 100 men, a 10-year mission duration, a 30-day resupply interval, a 300-nautical mile near earth orbit, and a 55-degree orbit inclination. Author

N71-26808*# Welson (B.) and Co., Inc., Hartford, Conn.
HABITABILITY: GARMENT CONCEPTS AND ENGINEERING DATA Final Report
4 Dec. 1970 140 p
(Contract NAS9-10407)
(NASA-CR-115044) Avail: NTIS CSCL 06Q

The development of space suits for use in space station applications is discussed. Subjects presented are: (1) wardrobe definition, (2) fabric usage, (3) laundry system concepts, (4) wardrobe packaging, (5) candidate fabric testing, and (6) crewman sizing. Author

N71-26885# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
BINARY-CLASSIFICATION REACTION TIME: A REVIEW OF SOME STUDIES OF HUMAN INFORMATION PROCESSING CAPABILITIES
Raymond S. Nickerson 23 Dec. 1970 198 p refs
(Contract F44620-69-C-0115)
(AD-721199; BBN-2004; AFOSR-TR-71-0780) Avail: NTIS CSCL 5/10

The paper reviews some recent binary-classification experiments in which the primary performance measure was response time. The defining property of a classification task is that the number of admissible stimuli is greater than the number of response alternatives stimuli are mapped onto responses in a many-to-one fashion. For a binary-classification task, the number of response alternatives is two. Two types of binary-classification tasks are discussed, character-classification, or memory-scanning, tasks, and tasks involving same-different judgments. Same-different judgments are viewed as binary classifications inasmuch as the number of response alternatives is limited to two, whereas the number of stimulus alternatives typically is not. The theoretical thread that links the studies reviewed is the distinction between serial and parallel modes of processing information. Author (GRA)

N71-26892# Joint Publications Research Service, Washington, D.C.

EFFECT OF ULTRASOUND ON NUCLEIC ACIDS AND ON THE SKULL
20 May 1971 9 p refs Transl. into ENGLISH from Byull. Eksptl. Biol. i Med. (Moscow), no. 4, 1971 p 58–61 and 120–121
(JPRS-53177) Avail: NTIS

CONTENTS:

1. EFFECT OF ULTRASOUND ON THE CONTENT OF NUCLEIC ACIDS IN RAT ORGANS A. A. Chirkin et al p 1–5 refs

2. STUDY OF THE POSSIBILITY OF LOCAL ACTION OF FOCUSED ULTRASOUND THROUGH PORTIONS OF THE SKULL OF ANIMALS AND OF MAN Yu. S. Inin et al p 6–8 refs

N71-26893# Joint Publications Research Service, Washington, D.C.
EFFECT OF ULTRASOUND ON THE CONTENT OF NUCLEIC ACIDS IN RAT ORGANS
A. A. Chirkin et al *In its* Effect of Ultrasound on Nucleic Acids and on the Skull 20 May 1971 p 1–5 refs

Avail: NTIS

An investigation was conducted to determine the dynamics of changes in the content of DNA and RNA in the organs of white rats after they were exposed to ultrasound. Experiments were performed on 300 male rats weighing from 150 to 200 grams. The animals were exposed to ultrasound at a frequency of 830 kHz and intensities of 0.2, 0.6, and 1.8 w/sq cm. The results indicate that ultrasound produces complex wavelike changes in the nucleic acid content of the animals organs, and that an intensity of 1.8 w/sq cm produces the greatest changes in the DNA and RNA levels. Of the organs tested, the most significant difference in the content of nucleic acids was found in the kidneys, followed by the muscles, skin, intestine, and liver. It is suggested that the reason for this distribution may be that the tissues that possess a complex cellular architecture, as with the kidneys, absorb much more ultrasonic energy than do tissues with a simpler cellular organization, such as fatty tissues and the liver. D.L.G.

N71-26894# Joint Publications Research Service, Washington, D.C.
STUDY OF THE POSSIBILITY OF LOCAL ACTION FOCUSED ULTRASOUND THROUGH PORTIONS OF THE SKULL OF ANIMALS AND OF MAN
Yu. S. Inin et al *In its* Effect of Ultrasound on Nucleic Acids and on the Skull 20 May 1971 p 6–8 refs

Avail: NTIS

An experiment was conducted to determine the possibility of acting with focused ultrasound on local brain structures through the skull of animals and of man. The study was made on portions of the skulls of dead animals and human beings placed in distilled water. Tepler's optical effect was used to visualize the ultrasonic field. The frequency of radiation was 1 mHz and the open angles of the focusing system ranged from 30 to 70 deg. It was found that the geometry of the field did not change when a layer of brain 40 to 50 mm thick was placed in the path of the ultrasonic beam. The focusing of the ultrasound improved when the open angle increased. Analyses of the experimental data indicate that it is theoretically possible for local focused ultrasound to act on the human brain through the skull. However, focused ultrasound passing through the skulls of animals may distort the geometry of the ultrasonic field because of the uneven thickness of cranial bone. D.L.G.

N71-26909*# Life Systems, Inc., Cleveland, Ohio.
DEVELOPMENT OF A LABORATORY BREADBOARD MODEL OF A CHLORINE GENERATING DEVICE TO CHLORINATE RECLAIMED WATER ON A SPACECRAFT Final Report
F. H. Schubert and R. A. Wynveen Dec. 1970 34 p refs
(Contract NAS1-9917)
(NASA-CR-111854; ER-133) Avail: NTIS CSCL 06K

The application of the chlorination process to water reclamation for advanced life support systems was investigated. The device consists of three series electrolytic cells. A Cl2 generator that produces Cl2 flow rate proportional to current and quantity proportional to the integration of current over time. A by-product, hydorgen gas, is also produced. This H2 is immediately consumed in the second electrolytic cell. The third cell is an electrochemical valve that also performs a Cl2 flow metering function. A laboratory breadboard of the system was designed and tested. It consisted of three cells integrated together and a test control and instrumentation console. The latter was used to obtain characterization data during the test program. The total power required by the three components was less than 1/2 to 0.2 watts for the generator, 0.02 watts for the valve and no power required by the eliminator. The gases were found to be generated in a pure form. A continuous operating test was carried out after the parametric studies. A total of 788 hours were accumulated prior to shutdown for materials evaluation. The selected materials of construction were found to be stable. The device is ready for integrating into a complete water disinfecting system. A minimum form of the latter includes a Cl2-into-water dispenser and a chlorination level detector and feedback control loop in addition to the electrolytic feed supply. Author

N71-26914# Siemens-Schuckertwerke A. G., Erlangen (West Germany).
SMALL ROD-SHAPED SILICON-DETECTORS FOR MEDICAL AND BIOLOGICAL APPLICATIONS [SILIZIUM-MINIATURZAEHLER FUER MEDIZINISCHE UND BIOLOGISCHE ANWENDUNGEN]
O. Jaentsch, P. Glasow, and W. Grosse Aug. 1970 57 p refs In GERMAN
(BMBW-FBK-70-15) Avail: AEC Depository Libraries

It is shown that diffused Si-detectors for medical and biological applications can be manufactured only with high expense. Their spectrum is continuous even for monoenergetic radiation. This can be explained theoretically by using a RC delay line as equivalent circuit of the detector. Author (NSA)

N71-26944# Wyle Labs., Inc., Rockville, Md. Payne Div.
A FOUR-DEGREE-OF-FREEDOM LUMPED PARAMETER MODEL OF THE SEATED HUMAN BODY Final Report, 15 Jun. 1967–15 Jun. 1970
Peter R. Payne and Edward G. U. Band Wright-Patterson AFB, Ohio AMRL Jan. 1971 122 p refs
(Contract F33615-67-C-1807)
(AD-721225; WP-59101-6; AMRL-TR-70-35) Avail: NTIS CSCL 6/19

A four-degree-of-freedom lumped parameter model is tentatively proposed to study the problem of the vertical accelerations of the seated human body such as may be imposed by aircraft ejection systems. The coefficients defining the mass distribution and the spring and damping rates of the connecting links are obtained from experimental data. The way in which these coefficients are derived is described in the report. Development of the model is preceded by a study of the driving point impedance of generalized multi-degree of freedom systems. This study was carried out to determine how much reliance should be placed on experimental impedance measurements in the construction of the model. It is concluded that a reasonable representation of the dynamics of a seated human subject can be obtained by the four-degree-of-freedom lumped parameter model, but that there exists a surprisingly small amount of usable data, indicating that a sophisticated experimental program should be initiated to examine in detail particular aspects of body dynamics. Author (GRA)

N71-26993*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

LOUDNESS DETERMINED BY POWER SUMMATION

Walton L. Howes Washington May 1971 14 p refs

(NASA-TM-X-2300; E-6020) Avail: NTIS CSCL 06B

The predicted overall loudness of steady, broad-band noise is usually computed by summing weighted loudnesses of subbands of noise intensity (mean-square pressure) spectrum. It is proposed, instead, that the overall loudness be computed by summing weighted intensities of subbands (critical bands) of noise and then obtaining the loudness of the sum. The proposed computation method seems to yield better agreement with published loudness judgment data then does the usual method. It appears that the proposed method yields better agreement with annoyance judgments than does the perceived noise method of Kryter. Author

N71-27159# Honeywell, Inc., Hopkins, Minn. Corporate Research Center.

ODOR SENSING CELL ULTRASTRUCTURE BY ELECTRON MICROSCOPY Final Report

Herbert E. Heist Dec. 1970 107 p refs

(Contract F44620-68-C-0006)

(AD-720893; AFOSR-TR-71-0712) Avail: NTIS CSCL 6/16

The report is divided into five sections including the effects of octanol and ascorbic acid on the ATPase activities in rabbit olfactory epithelium, the initial studies on immobilized enzymes, the completion of the observations on the regeneration of olfactory cells and centriole migration during regeneration and normal development, and the developments in applying radioautography to olfactory studies. Octanol was found to stimulate the Na-K ATPase activity from olfactory tissue but to inhibit the same activity from brain. Ascorbic acid caused inhibition of Na-K ATPase activity under conditions in which it could readily oxidize to dehydroascorbic acid. Glucose oxidase and urease were immobilized in acrylamide gel which shows good possibilities of being developed into sensing systems. Regeneration of olfactory epithelium may be in the form of olfactory cells or ciliated columnar cells or a mixture, but they all appear to originate from the Bowmans glands. The incidence of centriole migration in variously aged animals and in adult regeneration tissue supports a hypothesis that olfactory cell development persists well into the adult life of the animal. Author (GRA)

N71-27160# New York Univ., N.Y. Dept. of Industrial Engineering and Operations Research.

EVOKED POTENTIALS AND VISUAL INFORMATION PROCESSING Annual Summary Report, 1 Apr. 1970–31 Mar. 1971

John L. Andreassi and Mark S. Mayzner 31 Mar. 1971 83 p refs

(Contract N00014-67-A-0467-0009)

(AD-720750; Rept-0-5511-356-2; ASR-2) Avail: NTIS CSCL 6/16

Five experiments were conducted. The first study was concerned with the nature of the visual evoked potential (VEP) at, above and below two-flash threshold. The second experiment explored the nature of the VEP under conditions of sequential blanking. In the third experiment VEPs were recorded under conditions in which the normally blanked stimuli and blanking stimuli were alternately increased in luminance. The fourth experiment involved the recording of evoked potentials from four different cortical areas under conditions of sequential blanking. The final experiment of this years report investigated VEPs as a function of three different stimulus configurations and one additional stimulus condition termed sequential displacement. Author (GRA)

N71-27176# Army Foreign Science and Technology Center, Charlottesville, Va.

PHYSIOLOGICAL CRITERIA AND PROCEDURES FOR DETERMINING WORK FATIGUE [O FIZIOLOGICHESKIKH FRITERIYAKH I METODIKE OPREDELENIYA TYAZHESTI RABOTY]

M. V. Leynik 24 Feb. 1971 18 p refs Transl. into ENGLISH from Gigena Truda i Prof. Zabolevaniya (Moscow), v. 4, no. 11, 1960

(AD-721246; FSTC-HT-23-818-70) Avail: NTIS CSCL 6/16

Among the physiological criteria and methods for determining work fatigue, which have taken a firm place in labor physiology, are those of the amount of external mechanical work expressed in kilogram-meters and energy consumption measured by the amount of consumed oxygen or amount of calories expended. This report discusses more accurate means of determining work fatigue, for the above criteria are applicable only for those forms of labor in which a large group of muscles are used. The method for studying work fatigue discussed here is based on the similarity and differences of varied types and forms of work. We present data concerning the indicators and methods for measuring functional stress on the indicated systems during work and the minimum and maximum possible values of this stress. The two kinds of fatigue primarly dealt with are nervous tension and muscular strain. Physical strain is measured by readings of pulse rate at various times during the work day. Fatigue for various types of professional labor can thus be established by the degree of functional stress on the various sytems of the organism. Author (GRA)

N71-27198# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.

VARIABILITY IN THE TIMING OF SIMPLE MOTOR RESPONSES

Raymond S. Nickerson 24 Jul. 1970 77 p refs

(Contract F44620-69-C-0115)

(AD-721213; BBN-1982; AFOSR-TR-71-0787) Avail: NTIS CSCL 5/10

Five experiments were conducted to investigate variability in the timing of simple motor responses. The task was to make a response a specified period of time following the occurrence of a signal. Target intervals ranged from 250 msec to 8 sec in the first experiment, and from 250 msec to 2 sec in the others. Absolute variability was measured by the standard deviation and the interquartile range. Three indications of relative variability were used: the ratio of the standard deviation to the mean, the ratio of the interquartile range to the median, and the proportion of responses falling within specified regions of the time distribution. Absolute variability increased with target interval, although the difference between the results obtained with 250 and 500 msec intervals was small. Relative variability was largest with the shortest intervals used. Performance feedback, in the form of an analog display proved to be effective in decreasing variability, at least for the shortest intervals used. Also, variability was further reduced when S was allowed to initiate the interval being judged as well as to terminate it, again with the most pronounced effect being obtained with the shortest intervals. Extensive practice by one S did not reduce variability noticeably. Author (GRA)

N71-27234* North American Aviation, Inc., Downey, Calif.

VIBROPHONOCARDIOGRAPH Patent

Lester N. Wright and Peter Barker, inventors (to NASA) Issued 16 Feb. 1971 5 p Filed 10 Apr. 1968 Cl. 128-2.05; Int. Cl. A61b5/02 Sponsored by NASA

(NASA-Case-XFR-07172; US-Patent-3,563,232; US-Patent-Appl-SN-720041) Avail: US Patent Office CSCL 06B

An apparatus is described for monitoring cardiac dynamics comprising an extremely low weight and small volume piezoelectric microphone with an amplifier having high input impedance for high sensitivity and low frequency response in a dynamic range of from about 2 to 2,000 cycles per second.

Official Gazette of the U.S. Patent Office

N71-27251*# Bunker-Ramo Corp., Canoga Park, Calif. Defense Systems Div.

HUMAN PERFORMANCE PREDICTION IN MAN MACHINE SYSTEMS. VOLUME 3: A SELECTED AND ANNOTATED BIBLIOGRAPHY

Dorothy L. Finley, Richard W. Obermayer, C. M. Bertone, David Meister, and Frederick A. Muckler Aug. 1969 370 p refs

(Contract NAS2-5038)

(NASA-CR-73428) Avail: NTIS HC $6.00/MF $0.95 CSCL 05H

Selected and annotated bibliographies of human performance prediction in man machine systems are presented. The information is presented in three areas: (1) methodological literature, (2) descriptions, data, and applications of tests, and (3) manned space vehicles. Author

N71-27279# Massachusetts Inst. of Tech., Cambridge. Fluid Mechanics Lab.

THE HYDRODYNAMICS OF ROLLER PUMPS AND THEIR IMPLICATION TO HEMOLYSIS Final Report

Michel Y. Jaffrin and James R. Meginniss Feb. 1971 38 p refs *Its* Fluid Mech. Lab. Publ. No. 71-1

(Contract N00014-67-A-0204-0008)

(AD-720320) Avail: NTIS CSCL 6/12

The peristaltic flow inside the tube of a roller pump is investigated with the assumptions that the fluid is Newtonian and that viscous forces dominate inertia. The output of the pump and the pressure and shear stress distributions are given in closed form as a function of the occlusion setting, the pressure head, the roller and tube diameters and the speed of rotation. It is found that conventional roller pumps with circular rollers generate very high stresses concentrated around the point of minimum radial gap in the tube. These shear stresses are equal or larger than the critical threshold for initiation of hemolysis reported in the literature. The analysis predicts that these concentrated high shear stresses are greatly reduced, to values much below the critical level, if the compression mechanism maintains a gap of uniform thickness over a finite length. Author (GRA)

N71-27290# Scientific Translation Service Ann Arbor, Mich.

PEROXIDASE AND CATALASE ACTIVITY IN OXYGEN UNDER PRESSURE [AKTIVNOST PEROKSIDAZY I KATALAZY V USLOVIYA KISLORODA POD POVYSHENNYM DAVLENNEM]

S. N. Efuni, Yu. E. Mikhailov, T. S. Fokina, and L. I. Shimkevich Mar. 1971 5 p refs Transl. into ENGLISH from Eksp. Khir. Anesteziol (USSR), V. 15, No. 3, May–Jun. 1970 p 63–65 Prepared for ANL Sponsored by ANL

(ANL-Trans-877) Avail: NTIS

Peroxidase and catalase activity in blood and certain internal organs of white mice was studied under pure oxygen at 5 atmospheres until toxic cramps supervened. Peroxidase activity rose markedly in the peripheral blood and in the leucocytes infiltrating the parenchymatous organs and catalase activity in the blood increased at the expense of erythroctosis (catalase index remained practically unchanged). Marked tissue eosinophilia was found. Data obtained were compared with literature data on increase content of peroxide compounds in the body during oxygen intoxication. It is suggested that increased activity of the enzymes is a sign of physiological adaptation to the toxic action of oxygen. Author

N71-27299# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

BRAIN AND HEART ACCUMULATION OF BROMOTRIFLUOROMETHANE

Ethard W. Van Stee and Kenneth C. Back Feb. 1971 17 p refs

(AD-721211; AMRL-TR-70-139) Avail: NTIS CSCL 6/20

One hundred seventy-six albino rats were divided into 11 groups of 16 rats each. The rats were exposed by groups to 70-75% CBrF3 in 02 for 5 minutes. The rats were serially killed throughout the exposure and 55-minute postexposure period. The brains and hearts from the rats in 10 of the 11 groups were rapidly excised and placed in vials of heptane. The contents of the vials were subsequently analyzed for CBrF3. Blood samples were obtained from the rats in the 11th group which was treated identically to the other 10 groups. After the first minute of the 5-minute exposure, the concentration of CBrF3 in the brains rose approximately twice as rapidly as the concentration in the hearts. At the end of the 5-minute exposure the brain concentration was approximately 50% greater than the heart concentration. The heart concentration did not differ significantly from the blood concentration. The postexposure rates of decline of the tissue concentrations of CBrF3 were approximately equal. The brain required almost exactly 1 minute longer to reach a given concentration than the heart. Only trace amounts of CBrF3 were detectable beyond 10 minutes postexposure. Author (GRA)

N71-27355# Texas Technological Univ., Lubbock.

PERFORMANCE AND RECOVERY UNDER PROLONGED VIBRATION

M. M. Ayoub and T. M. Khalil (Florida Univ.) 1970 36 p refs

(Contract DAAD05-69-C-0102)

(AD-721014) Avail: NTIS CSCL 5/5

The research was conducted for the purpose of studying the performance and recovery characteristics of men when subjected to relatively long periods of whole-body, vertical vibration. The effect of environment, and of a work/rest schedule, upon performance and recovery were investigated. Analysis of the performance in terms of duration of exposure to vibration was also undertaken. Author (GRA)

N71-27475# State Univ. of New York, Stony Brook. Coll. of Engineering

MATHEMATICAL THEORY OF MOLECULAR CONTROL SYSTEMS Final Report

Sumner N. Levine Mar. 1971 8 p

(Grant AF-AFOSR-1660-69)

(AD-721207; Rept-186; AFOSR-TR-71-0790) Avail: NTIS CSCL 6/3

A brief summary is given of a research program which placed major emphasis on the analysis of problems associated with the effects of surfaces on blood clotting and on the theory of blood clot regulation. This subject is now at the forefront of medical and surgical research because of recent advances in prosthetic materials and artificial organs. Author (GRA)

N71-27476# Aeronautical Research Labs., Melbourne (Australia).

SIMULATED FREE FALL OF A STUNT MAN

B. M. Hearn, S. R. Sarrailhe, and A. P. Vulcan Aug. 1970 12 p refs

(ARL/SM-353) Avail: NTIS

An instrumented dummy drop was carried out to simulate the free fall of a stuntman who jumped 63 ft and landed without injury on a pile of cardboard boxes 3 ft high. The dummy deceleration was measured to provide further information on human tolerance to impact. Author

N71-27477# American Inst. for Research, Pittsburgh, Pa.

DEVELOPMENT OF A TAXONOMY OF HUMAN PERFORMANCE: A REVIEW OF THE THIRD YEAR'S PROGRESS

Edwin A. Fleishman and Robert W. Stephenson Sep. 1970 79 p refs
(Contracts DAHC19-71-C-0004; F44620-67-C-0116; ARPA Order 1032; ARPA Order 1623)
(AD-721217; AIR-R70-11; AIR-726-9/70-TPR3; AFOSR-TR-71-0052; TPR-3) Avail: NTIS CSCL 5/10

The purpose of the taxonomy project is to develop and evaluate systems for describing and classifying tasks which can improve generalization of research results about human performance and to develop a common language for communicating between researchers and individuals who need to apply research to personnel problems. The ability-requirement and task characteristics approaches were used to post-dict mean values of performance measures and relevant factor loadings for a variety of tasks. Author (GRA)

N71-27609# Dunlap and Associates, Inc., Santa Monica, Calif.
PREDICTIVE AND ADAPTIVE PROCESSES IN THE CONTROL OF AIR FORCE SYSTEMS Annual Report
Charles R. Kelley and Daniel J. Prosin 30 Jul. 1970 68 p refs
(Contract F44620-69-C-0129)
(AD-721220; AFOSR-TR-71-0779; AR-1) Avail: NTIS CSCL 5/9

The objective of this project is to investigate adaptive and predictive processes in planning, decision, and control systems. Real and fast time analog computing equipment were connected via an especially developed interface device to a desk top digital computer, to form together a unique small laboratory facility for studying adaptive and predictive processes and devices. In this first year of the project, three experimental studies of prediction in manual control were conducted. A display blanking technique established that the operators error in predicting the outcome of his control actions is very nearly proportional to the length of time ahead that he predicts. This result held for second and third order controlled elements throughout the range of prediction times of concern in predictive control (1 to 9 seconds in these studies). A functioning predictive model of the human operator was then mechanized which showed many of the characteristics of manual control, including an insensitivity to changes in controller signal gain that is typical of human operators but not of non-predictive forms of human operator model. The final study utilized the display blanking technique again to show that prediction: reflected learing in a manual control loop; was very sensitive to operator loading via a secondary tracking task; and was highly resistant to effects of operator fatigue. Author (GRA)

N71-27647*# St. Louis Univ., Mo. Dept. of Physiology.
EVALUATION OF METAROLIC LOSSES IN WHOLE BODY SWEAT FROM MEASUREMENTS OF SMALL SKIN AREAS
W. van Beaumont Mar. 1971 94 p refs
(Contract NAS9-9630)
(NASA-CR-115031) Avail: NTIS CSCL 06P

The problems of sweat collection from small skin areas and the predictability of whole body sweat constituent losses from the subsequent analysis are discussed. The information is given in tabular and graphical form. Author

N71-27698# Federal Aviation Administration, Oklahoma City, Okla. Office of Aviation Medicine.
COMPARISON OF STATUS VARIABLES AMONG ACCIDENT AND NON-ACCIDENT AIRMEN FROM THE ACTIVE AIRMAN POPULATION
Michael T. Lategola, Vincent Fiorica, Charles F. Booze, Jr., and Earl D. Folk Dec. 1970 19 p refs Supersedes AM-70-18; See N71-21852
(FAA-AM-70-18A; FAA-AM-70-18) Avail: NTIS

The distribution of age, weight, height, body weight/body surface area and ponderal index for the accident versus nonaccident segments of the active airman population were compared for years 1966–1967. The differences in the distributions of these five status variables in the accident versus nonaccident population segments were statistically significant in all instances. The accident rate increased with age and was highest for ages of 60 or greater. The accident rate also increased with the variables related to increasing body weight. The interrelationship between age and body weight represents the most obvious focus for future research efforts. Various paired combinations of age with each of the other four variables are potentially capable of narrowing the focus of where, within the active airman population, to search for undetected human factors associated with accidents. Author

N71-27719*# National Aeronautics and Space Administration, Washington, D.C.
BIOMEDICAL RESEARCH AND COMPUTER APPLICATION IN MANNED SPACE FLIGHT
Jefferson F. Lindsey and John C. Townsend, eds. 1971 206 p refs
(NASA-SP-5078) Avail: NTIS; SOD $2.00 CSCL 06B

The areas of medicine in which computers can be employed are summarized and several cases where computers were applied in connection with the medical aspects of NASA's manned space flight program are examined in detail. Such problems are treated as those of automated medical data storage and retrieval systems, continuous monitoring and interpretation of electrocardiograms, and computer-aided medical diagnosis. Emphasis is placed on ways to permit the computer to perform various clerical functions while leaving critical decisions to a human monitor. Author

N71-27732# European Nuclear Energy Agency, Paris (France).
INFORMATION BULLETIN ON ISOTOPIC GENERATORS, NO. 10
Nov. 1970 55 p refs Prepared jointly with CEA, Saclay
(NP-18563) Avail: AEC Depository Libraries

The development of sealed Pu-238 sources for implantable cardiac pacemakers is reviewed. The safety requirements for such sources and methods for testing the chemical, mechanical, radiological, and thermal safety of isotopic batteries are discussed. NSA

N71-27742*# Omnitech, Inc., Dudley, Mass.
DESIGN, DEVELOPMENT AND PRODUCTION OF PRESSURE SUIT SPECTACLES Final Report
Albert J. Laliberte 31 Mar. 1971 41 p refs
(Contract NAS9-9666)
(NASA-CR-115039) Avail: NTIS CSCL 06Q

Research and development tasks were carried out to design, develop, and fabricate an improved protective spectacle for use in the Apollo pressure suit. A total of 150 such spectacles, of five different types, having various attenuative and transmissive characteristics in the ultraviolet, visible, and infrared region of the spectrum were produced. Author

N71-27743*# Hawaii Univ., Honolulu.
THE PERFORMANCE AND CAPABILITIES OF TERRESTRIAL ORGANISMS IN EXTREME AND UNUSUAL GASEOUS AND LIQUID ENVIRONMENTS
S. M. Siegel Feb. 1971 25 p refs *Its* Hawaii Botanical Sci. Paper No. 21
(Grant NGR-012-001-042)
(NASA-CR-118883) Avail: NTIS CSCL 06M

Three inhibitor studies are presented dealing with substances that possess the ability to inactivate terrestrial organisms. The studies described include: (1) biological activity in psilotin, a phenolic glucoside from the psilotales; (2) toxicology and metabolism of

manganese; and (3) anomalous deuterium isotope effect on selected enzymes. Significant findings in the studies indicate that the properties of psilotin might be of ecological importance in reducing competitive pressures in stands of the plant species bearing it, and the existence of mechanisms for precipitation of MnO2 may determine species distribution in Mn-rich soils. In addition, the differential effects of moderate D2O levels on the akinetics were demonstrated. D.L.G.

N71-27770*# General Electric Co., Philadelphia, Pa. Missile and Space Div.

DEVELOPMENT OF A PROTOTYPE WASTE COLLECTION SYSTEM (THE MODIFIED HYDRO JOHN)

J. K. Mangialardi and R. W. Murray 31 Mar. 1971 101 p

(Contract NAS9-9741)

(NASA-CR-115040; Doc-71505211) Avail: NTIS CSCL 06K

The modified Hydro John is a fecal waste management system which combines the salient features of two previously developed concepts. The feces are disposed of and stored as in previous Dry John systems. An anal flush replaces the use of toilet tissue as in previous Hydro John systems. The modified Hydro John is completely automatic and is designed for use in either zero or one gravity environment. The operation of the system consists of four basic steps in sequence: collection of the solid matter; pumping of the solids to a storage container; and flushing and drying; and vacuum drying of the solid matter in the storage container. The system was designed, developed, and tested for the National Aeronautics and Space Administration. Author

N71-27784*# AiResearch Mfg. Co., Los Angeles, Calif.

LONG-DURATION EXERCISE AT MODERATE WORK LOADS

W. Sanborn, V. B. Dunn, A. Camacho, and E. C. Wortz May 1971 105 p refs

(Contract NAS9-10994)

(NASA-CR-115033; Rept-71-7424) Avail: NTIS CSCL 06S

The results of a research program on the metabolic effects of long duration exercise are tabulated. The subjects, methods, procedures, apparatus, data, and conclusions drawn from a series of experiments in which the duration of the rest break in each hour, the water intake, the amount of sleep, and the overall duration of exercise were varied, are described. The principal exercise mode was an 8-hr walk on a level surface at a velocity of 3.2 mph, which roughly corresponds to an energy expenditure of 1000 Btu/hr. Balke tests conducted to provide exercise correlative and physical fitness information included pre- and post-experiment tests and two sets of tests utilizing a bicycle ergometer. Author

N71-27788*# Hamilton Standard, Windsor Locks, Conn.

ADVANCED EXTRAVEHICULAR PROTECTIVE SYSTEM Interim Report, 1 Jul. 1970 –31 May 1971

James G. Sutton, Phillip F. Heimlich, and Edward H. Tepper 31 May 1971 135 p refs

(Contract NAS2-6021)

(NASA-CR-114320) Avail: NTIS CSCL 06K

General conclusions and recommendations are reported emanating from an Advanced Extravehicular Protective System (AEPS) study program to provide a meaningful appraisal of various regenerable and partially regenerable portable life support system concepts for EVA use in the 1980's and to identify the required new technology areas. The space station, lunar base, and Mars AEPS specifications (Revision B) are given. A detailed description of the study methodology utilized in the conduct of the AEPS study is presented as well as the subsystem and system study summaries. New technology requirements and recommendations are discussed. A complete bibliography of the texts and references utilized in the conduction of the effort is listed. Author

N71-27794*# 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, 1 Jan. –31 Mar. 1971

J. E. Campbell May 1971 19 p Prepared in part by CDC, Phoenix, Ariz. and the Spacecraft Bioassay Lab., Cape Kennedy, Fla.

(NASA Order R-36-015-001)

(NASA-CR-118870; QPR-24) Avail: NTIS CSCL 06M

A continuing study is described aimed at the development of an experimental system capable of detecting the acceptable levels of contamination. Efforts reported include: (1) a plan to test terminal sterilization cycles for unmanned landers, (2) a suggested outline for evaluation of thermal sterilization cycles, (3) current status of equipment and experimental methods, and (4) a preliminary evaluation of the system. D.L.G.

N71-27983*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

IMPLANTABLE BIOTELEMETRY SYSTEMS

Thomas B. Fryer Washington 1970 119 p refs

(NASA-SP-5094) Avail: NTIS; SOD $0.55 CSCL 06B

Biotelemetric systems for monitoring physicological parameters internally and externally in animals are described. The circuit designs are discussed with emphasis on miniaturization and low power consumption. Also examined are the effects of moisture, pressure, temperature, and environment on the transmission power of the systems. E.H.W.

N71-27991*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

BACTERIAL ADENOSINE TRIPHOSPHATE AS A MEASURE OF URINARY TRACT INFECTION Patent Application

Emmett Chappelle and Grace L. Picciolo, inventors (to NASA) 31 p Filed 4 Aug. 1970

(NASA-Case-GSC-11092-1; US-Patent-Appl-SN-60950) Avail: NTIS CSCL 06M

A rapid and routine procedure is developed for detecting and counting the bacteria present in urine samples, determining thereby the extent of urinary tract infection. The method depends on the presence and determination of adenosine triphosphate which is a nucleotide present in all known living matter, the quantitative determination being a measure of the light emitted in the bioluminescent reaction of the adenosine triphosphate with the firefly enzyme luciferase. NASA

N71-27992*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

AUTOMATIC INSTRUMENT FOR CHEMICAL PROCESSING TO DETECT MICROORGANISMS IN BIOLOGICAL SAMPLES BY MEASURING LIGHT REACTIONS Patent Application

Burton N. Kelbaugh, Grace L. Picciolo, Emmett Chappelle, and Maurice E. Colburn, inventors (to NASA) 51 p Filed 4 Aug. 1970

(NASA-Case-GSC-11169-1; US-Patent-Appl-SN-60882) Avail: NTIS CSCL 06M

An automated apparatus for sequentially assaying urine samples for the presence of bacterial adenosine triphosphate (ATP) is described. The apparatus includes a rotary table which carries a plurality of sample containing vials; a dispensing means which automatically dispenses fluid reagents into the vials at predetermined times preparatory to injecting a light producing luciferase-luciferin mixture into the samples; and an indicating means which automatically measures the light produced in each urine sample by a bioluminescence reaction of the free bacterial

adenosine triphosphate with the luciferase-luciferin mixture. The light measured is proportional to the concentration of bacterial adenosine triphosphate which, in turn, is proportional to the number of bacteria present in the respective urine sample. After the light measurement is performed, the vials are ejected from the table. NASA

N71-28005# Federal Aviation Administration, Oklahoma City, Okla. Civil Aeromedical Inst.

BIODYNAMIC EVALUATION OF AIR TRAFFIC CONTROL STUDENTS BETWEEN 1960–1963

Michael T. Lategola Mar. 1971 12 p refs

(FAA-AM-71-8) Avail: NTIS

Between 1960–1963, a large number of ATC students in training at the FAA Aeronautical Center in Oklahoma City underwent a broad spectrum of biomedical evaluations conducted by the Civil Aeromedical Research Institute. Approximately 1270 of these students were evaluated for physical fitness. Included in this evaluation were measurements of height, weight, pulmonary vital capacity, maximum breathing capacity and maximum aerobic working capacity. Principal findings were: (1) physical fitness levels comparable to general population norms of health and (2) expected parameter decrements with age. The age-related decrements in the measured physical parameters generally paralleled the ATC training failure rate. These data will serve as baselines for future evaluations of career ATC personnel in relation to job performance and preventive maintenance of optimum cardiovascular health. Author

N71-28006# Federal Aviation Administration, Oklahoma City, Okla. Civil Aeromedical Inst.

ACCEPTANCE TESTS OF VARIOUS UPPER TORSO RESTRAINTS

John J. Swearingen Feb. 1971 13 p refs

(FAA-AM-71-12) Avail: NTIS

The results of a study demonstrate that people can be motivated to utilize and, in fact, eagerly accept the use of upper torso restraint equipment for the prevention of head and chest injuries induced by flailing during crash decelerations, provided that specific design criteria are followed by structural engineers. By giving attention in the study to design of specially constructed restraint equipment to incorporate the maximum in features for comfort, neatness of appearance, ease of stowage, and ease of donning and escape, it was found that over 90% of the test subjects utilized these upper torso restraint systems throughout the 2-year test period. In contrast, only an estimated 3 to 5% utilization of the factory-installed torso restraint equipment in over 10,000,000 automobiles manufactured since 1 Jan. 1968 has been attained to date. It is suggested that general aviation aircraft manufacturers give consideration to these design criteria, along with incorporating inertia reels for ease of motion, before launching an extensive program for installation of upper torso restraint in light aircraft. Author

N71-28022*# Raff Analytic Study Associates, Inc., Silver Spring, Md.

NASA LIST OF POTENTIAL SPACE TOOLS AND EQUIPMENT

Lawrence B. Johnson, Eric Sander, and Stanley Lebow Washington NASA May 1971 350 p refs

(Contract NAS2-5073)

(NASA-CR-1760) Avail: NTIS HC$6.00/MF$0.95 CSCL 06K

A listing of space tools and equipment developed expressly for extravehicular and intravehicular space activities is presented. Descriptions are given of the purpose, previous solutions, current method of operation, related functional categories, performance, advantages and disadvantages, status, photographs and drawings, specifications, references, sponsor, manufacturer, developer, support equipment, and date of development for each space tool and equipment. The space tools and equipment are grouped by their specific functions: bonding and electroadhesor tools and maintenance equipment; cutting tools; hammers; illumination equipment; gas leak, pressure detection, restraint tools and maintenance equipment; tools maintaining electrical and electronic equipment; tool kits and tool sets; screwdriving and torqueing tools; tube connection tools; and welders. Other data of interest to space mission planners and designers are also compiled. Author

N71-28068*# McMaster Univ., Hamilton (Ontario). Dep* of Psychology.

DURATION DISCRIMINATION OF BRIEF VISUAL STIMULI

Lorraine G. Allan, A. B. Kristofferson, and E. W. Wiens Jan. 1970 47 p refs

(Grants NGR-52-059-001; NRC APA-0112; NRC APA-0175)

(NASA-CR-118998; TR-38) Avail: NTIS CSCL 06P

The manner in which human observers discriminate a difference in duration between brief flashes of light was investigated. A decision theory analysis of the data indicated that the comparisons are based on the temporal information available in the stimuli, rather than on the difference in apparent brightness between them. Furthermore, it appears that the variability in the sensory states associated with a particular flash is independent of its physical duration, and that the expected value of the distribution of sensory states is a linear function of the physical duration of the flash. Author

N71-28093# Joint Publications Research Service, Washington, D.C.

INFORMATION CHARACTERISTICS OF SYSTEMS AND THEIR RELATIONSHIP OF PSYCHOPHYSIOLOGICAL INDICATORS OF OPERATOR ACTIVITY

Yu. A. Ivashkin 28 May 1971 13 p refs Transl. into ENGLISH from Prib. Sist. Upr. (Moscow), no. 4, 1969 p 22 25

(JPRS-53244) Avail: NTIS

The capacity and content characteristics of information display systems are discussed and quantitatively expressed using the information theory frame of reference for combinatorial and schematic models. The information characteristics of display systems are related to psychophysiological indicators of human operator activity. Various factors are considered including operator instruction, training, and handling capacity; time for processing information; volume of displayed information; recognition time; and the type of display. J.M.

N71-28094# Joint Publications Research Service, Washington, D.C.

MAN IN OUTER SPACE: PHYSIOLOGY AND PSYCHOLOGY

V. V. Parin et al 8 Jun. 1971 18 p Transl. into ENGLISH from Priroda (Moscow), no. 4, 1971 p 9 17

(JPRS-53311) Avail: NTIS

Medicobiological problems both solved and unsolved in aerospace research are discussed. Life support systems and physiological factors for human habitation outside the earth environment are considered including vacuum, ionizing radiation, weightlessness, microclimate, and biochemical change effects. Space flight problems such as the formation and maintenance of a gaseous environment, nutritional requirements; movement biomechanics under weightless conditions, psychological effects of confined spaces, and psychophysiological responses to pitching motion are cited. J.M.

N71-28136*# McMaster Univ., Hamilton (Ontario). Dept. of Psychology.

DURATION DISCRIMINATION OF BRIEF VISUAL OFF-FLASHES

Marnie E. McKee, Lorraine G. Allan, and A. B. Kristofferson Jun.

1970 80 p refs
(Grant NGR-52-059-001)
(NASA-CR-119009; TR-42) Avail: NTIS CSCL 06P

The manner in which human observers discriminate the difference in duration between brief, visual off-flashes was investigated. Three observers were run in a two-alternative, single stimulus paradigm, and three in a two-alternative, forced-choice paradigm. In both cases the observer's task was to discriminate between a short and a long duration for two different values of initial duration and five different incremental durations added to the initial durations. The data indicated that performance increased as a function of the incremental durations and decreased as a function of the initial duration. Analysis of the data in terms of three models which assume that the observer uses temporal cues to make his judgment, and two which view him as using energy as the cue, revealed that none of the models could account adequately for the results obtained. The role of memory in the forced-choice situation was also investigated. One value of initial duration, two values of incremental duration, and four values of the inter-stimulus interval (ISI) were used. The results indicated no decrement in performance as a consequence of increasing ISI. Author

N71-28168# IIT Research Inst., Chicago, Ill.
EXPLORATORY DEVELOPMENT OF PARTIAL PRESSURE HELMET AND MOBILITY JOINTS FOR EMERGENCY PRESSURE SUIT OUTFITS *Final Report* 1 Jun. 1969 – 31 Aug. 1970
Joseph Slowik, Alfred Marcum and Marvin Burns Wright-Patterson AFB, Ohio AMRL Jan. 1971 65 p refs
(*Contract* F33615-69-C-1592)
(AD-720275; IITRI-J6181-FR; AMRL-TR-70-111) Avail: NTIS CSCL 6/17

Anistropic Dacron net prepared by distortion on the bias and locking with a polyurethane solution was used for expandable panels along with non-expandable fabrics and volume transfer bands to form several experimental joints. Combinations showing proper function in a single plane were not fully adaptable to multiple plane joints without resorting to bulky, rigid parts. The helmet incorporated a manually operated pressure visor, face-ear seals, and a multi-compartmented bladder system which does not cover the crown of the head thus cancelling helmet lifting forces. The helmet is functional and has been worn at 175 mm Hg pressure without undue discomfort. Total weight and bulk are low for a pressure helmet and high altitude trials have been successful. Head mobility (limited by omission of a rotary bearing and suit-bib overlap), better face-ear seals, and automatic visor closing would be attainable in a coordinated helmet/suit system development. Author (GRA)

N71-28183*# Colorado State Univ., Fort Collins.
[EFFECTS OF CONTROLLED ATMOSPHERE CONSTITUENTS AND TRACE METALS ON METABOLISM AND METABOLICALLY VITAL ORGANS] Semiannual Status Report
30 Apr. 1970 65 p refs
(Grant NGR-06-002-075)
(NASA-CR-118955) Avail: NTIS CSCL 06P

A protocol is described for the determination of subtle effects resulting from exposure to a marginally stressful environment. The protocol is based upon the bioenergetic state of the organism. Utilizing this protocol, the metabolic effects of replacing nitrogen with argon, neon, or helium as the diluent gas were investigated. By measuring metabolic parameters in rats exposed to thermally isoconductive environments, comparing the above rare gases with nitrogen under normoxic conditions, changes were observed in metabolic rate which were inversely proportional to (1) the square root of the molecular weight of the diluent gas, (2) the solubility parameter of the diluent gas, and (3) the molar refraction of the diluent gas which is a measure of clathrate-forming capability. These are the identical parameters which show a relationship to the narcotizing capacity of the same gases under hyperbaric conditions. The relationships held for neon, nitrogen, and argon. They did not hold well for helium. It is concluded that diluent gases have both a direct metabolic effect which relates to the chemical characteristic of the diluent gas molecule and an indirect metabolic effect which relates to the thermal conductivity of the diluent gas as it cools the body surface of the animal, and the direct metabolic effect is significant. Author

N71-28186# Naval Personnel and Training Research Lab., San Diego, Calif.
DEVELOPMENT OF METHODS AND MATERIALS FOR SOLDERING TRAINING
L. S. Standlee, E. W. Matlock, and R. J. Harrigan Feb. 1971 32 p refs
(AD-720308; SRR-71-19) Avail: NTIS CSCL 5/9

Two parallel self-instructional packages were developed for teaching soldering rework on printed circuit boards. One package consisted of 12 five-minute sound films. The other consisted of a 168-page spiral bound book. The effectiveness of the self-instructional packages was compared with that of a parallel instuctor-taught course. Subjects for the comparison experiment consisted of 60 students in Basic Electricity and Electronics. Both self-instructional packages--film and book--were found to be effective media for learning soldering skills. No significant difference was found in the soldering skill gains of film-, book-, and instructor-taught students. The soldering book, though, would have the advantage of being simpler and less expensive to reproduce and to administer. Author (GRA)

N71-28187# School of Aerospace Medicine, Brooks AFB, Tex. Radiobiology Div.
EFFECTS OF SINGLE VERSUS MULTIPLE IRRADIATION UPON AVOIDANCE BEHAVIOR IN THE PRIMATE Technical Report, 1 Jan. – 30 Nov. 1970
Donald J. Barnes, G. Carroll Brown, and Richard A. Mason Mar. 1971 32 p refs
(AD-722053; SAM-TR-71-6) Avail: NTIS CSCL 6/18

Fourteen primates (Macaca mulatta) were trained to a high work-rate task, the Multiple Avoidance Program (MAP), and irradiated at the Texas A+M TRIGA reactor. Seven of these primates were exposed to a single 2,500-rad (midhead) pulse of mixed gamma/neutron radiation, while the remaining 7 animals received five 500-rad pulses spaced 15 minutes apart. The behavior of the two groups was monitored for 20 hours following the first pulse for each group, and the rate and quality of postirradiation performance were compared. In general, subjects of the multiple-exposure group appeared to maintain preirradiation levels of response following irradiation, though the variability of their behavior increased. Subjects of the single-exposure group demonstrated a greater degree of performance decrement on all recorded parameters than did their multiple-exposed counterparts. While it is impossible to directly extrapolate these data to the proble functioning of man in a radiation environment, the confirmation of mediation of effect by dose fractionation has important operational ramifications. Author (GRA)

N71-28190# Naval Personnel and Training Research Lab., San Diego, Calif.
DEVELOPMENT AND EVALUATION OF COMPUTER ASSISTED INSTRUCTION FOR NAVY ELECTRONICS TRAINING. 2: INDUCTANCE
Richard E. Hurlock Mar. 1971 34 p refs
(AD-720309; SRR-71-22) Avail: NTIS CSCL 5/9

The report presents results of development and evaluation of a second computer assisted instruction (CAI) course segment for basic electronics. Three tryout and revision cycles were included

in the developmental phase. The test and evaluation phase compared achievement and time measures of students trained on the CAI segment with control students who received regular classroom instruction. Random selection procedures were used to choose 50 students for the CAI treatment and 180 students for the class instructed condition. At the end of the training all students took the standard school examination on this segment and a supplemental test which covered school objectives not tested by the school examinations in use at that time. The CAI students scored significantly higher than classroom controls on the supplemental test and did not differ from classroom students on the school examination. Combined scores for criterion referenced measure showed 10% higher achievement for CAI students. Training time for CAI students averaged 8.75 hours, a time savings of 48% compared to traditional classroom instruction. Author (GRA)

N71-28206*# General Technical Services, Inc., Upper Darby, Pa.
GENERAL DYNAMICS OF THE PHYSICAL-CHEMICAL SYSTEMS IN MAMMALS
A. Iberall, M. Weinberg, and A. Schindler Washington NASA Jun. 1971 74 p refs
(Contract NASw-1815)
(NASA-CR-1806) Avail: NTIS CSCL 06C

Human thermoregulation is discussed with an examination of physical foundations. Several discrepancies between generally accepted hypotheses and physical constraints were resolved by the introduction of two other hypotheses. A consistent steady-state model is described and suggestions for testing the hypotheses are made. The concept of homeokinesis, a general view of dynamically sustained processes, ever-beating in living systems at all levels is presented. The physical-chemical problem of the chemical oscillator is described from its lowest level, the origin of life, and relate it to the higher systems levels. An experimental investigation of the presence of blood glucose oscillations is outlined. New data are presented which substantiate the existence of such oscillations and which begins to explore possible mechanisms involved. Author

N71-28247*# Stanford Research Inst., Menlo Park, Calif. Sensory Sciences Research Center.
EFFECTS ON MUSCLE TENSION AND TRACKING TASK PERFORMANCE OF SIMULATED SONIC BOOMS WITH LOW AND HIGH INTENSITY VIBRATIONAL COMPONENTS
Jerome S. Lukas, Mary E. Dobbs, and Donald J. Peeler Washington NASA Jun. 1971 32 p refs
(Contract NAS1-9286)
(NASA-CR-1781) Avail: NTIS CSCL 05E

To determine the relative contribution of the vibrational component generated in a room from simulated sonic booms on the electromyographic and performance responses of human subjects, four subjects were assigned randomly to each of the following groups: (1) paced tracing task, with booms and with relatively low intensity vibration (subject's chair and tracing table on a vibration-isolation platform); (2) paced tracing task, with booms, and with relatively high intensity vibration (subject's chair and tracing table on floor); (3) reading of light material, with booms, and with low intensity vibration; and (4) paced tracing task only. As a result of simulated sonic booms with a relatively high vibrational component, Group 2 obtained greater electromyographic responses and greater decrements in tracing performance than did Groups 1, 3, and 4. However, the statistical significance of the results is questionable because of the initial variability within and between the groups in contrast with earlier studies which employed subjects who were not adapted to these type noises. Author

N71-28248# Joint Publications Research Service, Washington, D.C.
SPACE BIOLOGY AND MEDICINE, VOLUME 5, NO. 1, 1971
O. G. Gazenko, ed. 17 Jun. 1971 140 p refs Transl. into ENGLISH of the publ. 'Kosmicheskaya Biologiya i Meditsina' Moscow, Medgiz., 9 Feb. 1971 p 1-92
(JPRS-53388) Avail: NTIS

Journal articles are presented on microbiological ecology of manned space flights, exobiology, sterilization, and life support systems.

N71-28249# Joint Publications Research Service, Washington, D.C.
ANTI-INFECTION RESISTANCE AND IMMUNOBIOLOGICAL REACTIVITY IN MAN AND ANIMALS DURING HYPOXIC HYPOXIA
A. S. Kaplanskiy *In its* Space Biol. and Med., Vol. 5, No. 1, 1971 17 Jun. 1971 p 1-11 refs
Avail: NTIS

The literature covering the effects of hypoxic hypoxia on the anti-infection resistance and immunobiological reactivity of the human and animal body is reviewed. The data suggest that a hypoxic state induces a depression of animal resistance to bacterial and protozoal (but not viral) infections. Information on the absorptivity of the reticulo-endothelial system, phagocytic activity of neutrophils and macrophages, and antibody production under hypoxic conditions is included. Author

N71-28250# Joint Publications Research Service, Washington, D.C.
EFFECT OF INERT GASES ON THE ANIMAL BODY ACCOMPANYING HIGH CO2 CONCENTRATIONS AND HIGH AMBIENT TEMPERATURES
M. M. Osipova et al *In its* Space Biol. and Med., Vol. 5, No. 1, 1971 17 Jun. 1971 p 12-20
Avail: NTIS

The physiological effects of helium-oxygen and argon-oxygen atmospheres containing 10 percent CO2 on the animal body (white rats) were studied at different ambient temperatures. In the temperature range 22-36 C the hypercapnic helium-oxygen atmosphere produced a marked cooling effect, whereas the similar argon-oxygen atmosphere exerted no noticeable effect. At 40 C animal heat exchange remained unaltered in all the atmospheres tested. The body temperature was found to be closely correlated with the heart beat of these animals. Author

N71-28251# Joint Publications Research Service, Washington, D.C.
CHANGES IN HUMAN WATER-MINERAL METABOLISM DURING WATER IMMERSION
L. A. Ioffe et al *In its* Space Biol. and Med., Vol. 5, No. 1, 1971 17 Jun. 1971 p 21-27 refs
Avail: NTIS

The effect of a 5-day water immersion test on the state of human mineral metabolism was investigated. An increase in diuresis and a change in urinary electrolyte excretion was observed. Variations in the renal function of water and ion excretion during the immersion experiment were accompanied by an increase in sodium and potassium content in the plasma and erythrocytes. During the first to third days after the experiment water and mineral excretion was delayed. During the experiment the hematocritic index increased substantially, and accordingly the blood concentration. Following the immersion test significant changes were noted in the hematocritic index in response to a standard load. Author

N71-28252# Joint Publications Research Service, Washington, D.C.
EFFECT OF IONIZED AIR ON ACETYLCHOLINE CONTENT AND CHOLINESTERASE ACTIVITY IN MICE OF DIFFERENT LINES

B. V. Anisimov et al *In its* Space Biol. and Med., Vol. 5, No. 1, 1971 17 Jun. 1971 p 28–31 refs
Avail: NTIS

Mice of different lines which were exposed to ionized air for 24 hours exhibited a reduced acetylcholine content in the intestine and an increased cholinesterase activity in the blood serum. Positive ions caused more distinct changes. Analysis of data in the literature and original findings suggest that one of the peculiarities of the physiological effect of atmospheric ions is their influence on the interaction between cholinergic and serotoninergic systems. Author

N71-28253# Joint Publications Research Service, Washington, D.C.

CEREALS AS A POSSIBLE COMPONENT OF THE AUTOTROPHIC LINK IN LIFE SUPPORT SYSTEMS

G. M. Lisovskiy *In its* Space Biol. and Med., Vol. 5, No. 1, 1971 17 Jun. 1971 p 32 36 refs
Avail: NTIS

Standard evaluations of higher plants selected for life support systems and experimental data concerning wheat productivity in an artificial environment, its biochemistry and compatibility with man, suggest that some cereals should be extensively studied to determine their possible use as polyfunctional components of closed ecological systems. Author

N71-28254# Joint Publications Research Service, Washington, D.C.

ANALYSIS OF OXYGEN PRODUCTIVITY OF PLANT CONVEYERS WITH DIFFERENT INTERVALS

Ye. V. Lebedeva et al *In its* Space Biol. and Med., Vol. 5, No. 1, 1971 17 Jun. 1971 p 37 42 refs
Avail: NTIS

Several approaches to the management of conveyer plantations in the cultivation of higher plants in bioregenerative life support systems are discussed. It is shown that oxygen production by the conveyer plantation method is sufficiently uniform if the conveyer interval is not over one-eighth of the total time of plant cultivation in the area of the planting. A reduction of the cultivation period may increase the total amount of oxygen produced. Author

N71-28255# Joint Publications Research Service, Washington, D.C.

DETERMINING LIPIDS, PROTEINS AND CARBOHYDRATES IN A CHLORELLA BIOMASS BY PYROLYSIS AND GAS CHROMATOGRAPHY

Yu. V. Pepelyayev et al *In its* Space Biol. and Med., Vol. 5, No. 1, 1971 17 Jun. 1971 p 43 49 refs
Avail: NTIS

The concentration of lipids, proteins and carbohydrates can be determined using the products of Chlorella pyrolysis at 450 C separated in a gas chromatographic column with aluminogel. The concentrations are determined by curves representing the correlations between the ratios of heights of the S sub 1 and S sub 2 peaks and ratios of concentrations of the investigated substances. The reproducibility of the S sub 1 and S sub 2 sums for the same sample is 2.5% and 3.9% (relative) respectively. The accuracy in determination is 2.1% (absolute) and 7.7% (relative) and the determination requires 30 minutes. Author

N71-28257# Joint Publication Research Service, Washington, D.C.

POSTFLIGHT METABOLISM AND RENAL FUNCTION OF CREW MEMBERS ON THE SOYUZ 6, SOYUZ 7, AND SOYUZ 8 FLIGHTS

I. S. Balakhovskiy et al *In its* Space Biol. and Med., Vol. 5, No. 1, 1971 17 Jun. 1971 p 57–67 refs
Avail: NTIS

Different metabolic parameters of crew members of the Soyuz-6, Soyuz-7, and Soyuz-8 spacecraft were studied before and after the flight. Functional changes were observed, but these constituted no health hazard. Weight losses were associated with an increased excretion of water and minerals, as indicated by the postflight retention of water, chlorine, sodium and potassium in the body. The blood content of cholesterol, lipid phosphorus and sugar remained unchanged. No symptoms of disorders in adrenal function were noted. Author

N71-28258# Joint Publications Research Service, Washington, D.C.

DIURNAL RHYTHM OF HUMAN PHYSIOLOGICAL FUNCTIONS AND PERFORMANCE IN A SCHEDULE WITH FREQUENT ALTERNATION OF SLEEP AND WAKEFULNESS

A. N. Litsov *In its* Space Biol. and Med., Vol. 5, No. 1, 1971 17 Jun. 1971 p 68 78 refs
Avail: NTIS

Fifteen healthy test subjects divided into three groups participated in experiments with frequently alternating work and rest cycles. The diurnal rhythms of basic functions in the human body gradually adjusted to the new stereotypes of work and rest cycles. The adaptation rate was dependent on the deviation of the new cycles from the normal rhythms, psychophysiological capacity of the test subjects for the required restructuring, their knowledge of the daily regime, strict adherence to the schedule, etc. It is concluded that schedules involving significant deviations from normal rhythms can be used for only short periods, to be followed by more favorable cycles. Author

N71-28259# Joint Publications Research Service, Washington, D.C.

CREATING AN OPTIMUM 'COLOR CLIMATE' IN FLIGHT CRAFT CABINS

G. I. Gurvich et al *In its* Space Biol. and Med., Vol. 5, No. 1, 1971 17 Jun. 1971 p 79 85 refs
Avail: NTIS

The higher nervous activities of rats, monkeys and human subjects were studied during their adaptation to monochromatic light of red, yellow, green and blue colors. The data were used in investigating the psychophysiological equivalents of individual regions of visible light. The specific reactions to colors observed in the experiments are discussed in relation to their use in space cabin interiors. Author

N71-28260# Joint Publications Research Service, Washington, D.C.

STUDY OF THE COMPOSITION OF AIR EXHALED BY MAN EXPOSED TO SOME EXTREMAL FACTORS

N. L. Sokolov et al *In its* Space Biol. and Med., Vol. 5, No. 1, 1971 17 Jun. 1971 p 86–90 refs
Avail: NTIS

The results of an analysis of contaminants present in the air exhaled by human subjects exposed to different stress effects (20 day bed confinement, 20 day starvation, 120 day diet of lyophilized foods, high temperature and humidity) are presented. Colorimetric, nephelometric and gas chromatographic methods were used. The most significant air changes were detected during exposures to prolonged starvation and high temperature (40 C). Author

N71-28261# Joint Publications Research Service, Washington, D.C.

EFFECT OF ADEQUATE VESTIBULAR STIMULI ON THE EXTERNAL RESPIRATION FUNCTION AND ACTIVITY OF

RESPIRATION CENTER NEURONS

M. D. Yemelyanov et al *In its* Space Biol. and Med., Vol. 1, No. 1, 1971 17 Jun. 1971 p 91-98 refs

Avail: NTIS

The state of external respiration of subjects exposed to accelerations and resulting in vestibular stimulation, was investigated. There was found to be a correlation between the vestibular analyzer and external respiration; this is indicated by the inhibition of respiration during labyrinth stimulation. The functional state of respiratory neurons in the medulla oblongatus of cats subjected to oscillation was studied. Impulse activity of the neurons increased, inspiratory acts were shortened and expiratory acts were lengthened. Autocorrelation analysis revealed that the spike intervals regularly varied in conformity to the oscillation periods. Changes in the functional state of the respiration center due to the injection of lobeline or severing of the vagus nerve affected responses of respiratory neutrons during animal oscillation. Author

N71-28262# Joint Publications Research Service, Washington, D.C.

EVALUATING VESTIBULAR TOLERANCE

R. R. Galle et al *In its* Space Biol. and Med., Vol. 5, No. 1, 1971 17 Jun. 1971 p 99 107 refs

Avail: NTIS

Clinical symptoms in somatic and autonomic components of vestibular responses of 54 healthy male test subjects examined by the Coriolis acceleration test are reported. Also described is an approach to be used in evaluating human tolerance to vestibular stimulation. Vestibular intolerance is suggested by the development of third degree vestibular-autonomic reactions. With respect to the time of appearance and level of manifestation of the responses, it is suggested that three degrees of vestibular tolerance and three degrees of vestibular intolerance be discriminated, each of which can be characterized by certain clinical and physiological reactions. This approach to vestibular evaluations can be used in screening various types of personnel. Author

N71-28263# Joint Publications Research Service, Washington, D.C.

ANALYSIS OF FORCES ACTING ON THE RECEPTOR FORMATIONS OF THE SEMICIRCULAR CANALS DURING MAN'S MOVEMENTS IN ROTATING SYSTEMS

I. Yu. Sarkisov *In its* Space Biol. and Med., Vol. 5, No. 1, 1971 17 Jun. 1971 p 108 114 refs

Avail: NTIS

Accelerations affecting the receptors in the semicircular canals during man's movements in a rotating environment have been estimated by the vector analysis method. It is shown that only tangential accelerations of the rotating environment and man in this environment, as well as Coriolis accelerations caused by head movements or body rotation about an axis in the moving environment, result in a displacement of the cupula from an equilibrium state, thus inducing impulsation changes in the ampular nerve of the semicircular canal. Vector expressions for the mean resultant acceleration (force) applied to the cupula were derived. Numerical calculations of the mean Coriolis acceleration were made. Author

N71-28264# Joint Publications Research Service, Washington, D.C.

METHOD FOR STUDYING AN OPERATOR'S SENSOMOTOR ACTIVITY DURING PERCEPTION OF STIMULI IN A BROAD VISUAL FIELD

K. K. Ioseliani et al *In its* Space Biol. and Med., Vol. 5, No. 1, 1971 17 Jun. 1971 p 115-121 refs

Avail: NTIS

A model for the complicated sensomotor activity of a spacecraft pilot is depicted. While performing an experimental task at a very high speed the subject had to remember and record various stimuli and their specific characteristics, correct the results, and register them by pressing on the appropriate keys of a ten key adding machine. The procedure has been tested and can be recommended as a method for the psychological screening of aircraft and spacecraft pilots. Author

N71-28265# Joint Publications Research Service, Washington, D.C.

CHANGE IN RESISTANCE OF ANIMAL TISSUES DURING PROLONGED RESTRICTION OF MOTOR ACTIVITY

L. V. Serova et al *In its* Space Biol. and Med., Vol. 5, No. 1, 1971 17 Jun. 1971 p 122 124 refs

Avail: NTIS

Tissue resistance of immobilized rats was determined from sorption of dye in the diaphragm muscles. Already on the 30th day of hypokinesia there was a tendency to an increase in sorption activity which after 45 days was twice as high as in control animals. The difference in sorption levels between the tissues of the hypokinetic and the control rats after 60 days was about 65 percent; this proved a normalization of tissue resistance. It is concluded that an increase in the sorption activity of muscle tissue in animals during prolonged hypokenesia indicates intracellular dehydration. G.G.

N71-28266# Joint Publications Research Service, Washington, D.C.

EFFECT OF OXYGEN INADEQUACY ON THE ERYTHROCYTIC SYSTEM IN SPLENECTOMIZED DOGS

L. S. Gorozhanin *In its* Space Biol. and Med., Vol. 5, No. 1, 1971 17 Jun. 1971 p 125 127 refs

Avail: NTIS

Eleven splenectomized dogs in three different age groups were subjected at different times after the operation to single and repeated exposures to a reduced partial pressure of oxygen in the inhaled air equal to 56 mm Hg. The content of hemoglobin, number of erythrocytes and reticulocytes, hematocritic index, and acid tolerance of the erythrocytes were determined in the blood of these animals. In addition, bone marrow punctuates and the functional state of erythropoiesis were analyzed. Experiments confirmed the important role of the spleen as a depot of red blood corpuscles in the erythrocytic reaction to acute hypoxia and demonstrated the participation of this organ in the acute reticulocytic reaction. Splenectomy sharply slowed down the erythropoietic response in repeated exposures to low partial oxygen pressure. Author

N71-28281*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif. Advance Biotechnology and Power Dept.

TEST REPORT, FINAL TEST PLAN AND PROCEDURE: OPERATIONAL NINETY DAY MANNED TEST OF A REGENERATIVE LIFE SUPPORT SYSTEM

May 1971 512 p refs

(Contract NAS1-8997)

(NASA-CR-111882; MDC-G2282) Avail: NTIS HC $6.00/MF $0.95 CSCL 06K

The plan and procedures for conducting an operational ninety-day manned test of a regenerative life support system are presented. A space station simulator with all the systems and equipment necessary to support four men continuously for ninety days, without resupply, under simulated orbital conditions is described. The regenerative life support system utilizes components designed for zero gravity operation, with the entire system installed, serviced, and maintained by the flight crew. The life support system support equipment, facilities, and procedures are outlined as well

as the logistics and supplies, crew selection, and medical and microbiological experiments. Instrumentation, data management, and pretest procedures are also covered for a five day and ninety day test. J.M.

N71-28283*# McMaster Univ., Hamilton (Ontario).
A STUDY OF ATTENTION AND PSYCHOLOGICAL TIME Final Report
Alfred B. Kristofferson May 1971 8 p refs
(Grant NGR-52-059-001)
(NASA-CR-119023) Avail: NTIS CSCL 05J

Brief summaries of research on attention and psychophysical time, the successiveness discrimination as a two-state quantal process, and sensory attention and duration discrimination of visual flashes are presented. J.M.

N71-28284* Franklin Inst., Philadelphia, Pa. Research Labs.
SPACE RELATED BIOLOGICAL AND INSTRUMENTATION STUDIES Annual Report, Mar. 1970 – Mar. 1971
R. J. Gibson and R. M. Goodman Mar. 1971 75 p refs
(Contract NSR-39-005-018)
(NASA-CR-119024; A-B2299-5) Avail: NTIS CSCL 06D

The evaluation of pressure transducers for use with long-life implantable telemeters is discussed. Preliminary circuit designs for microwatt powering of the transducer were developed. Studies on miniature implantable pH electrodes are described as well as work on high-capacity photo-film recorders for biological data. Author

N71-28289# Army Aeromedical Research Lab., Fort Rucker, Ala.
EFFECT OF ISONIAZID ON PERFORMANCE
Richard O. Nossman and Mark A. Hofmann Feb. 1971 28 p refs
(AD-721624; USAARL-71-14) Avail: NTIS CSCL 6/15

Nine Aviators who converted from negative to positive on a tuberculosinh therapy. INH was administered prophylactically at dosage levels of 300 mg. per day. The tasks consisted of reaction time (auditory and visual), rotary pursuit tracking, mental multiplication and digit span. The data did not indicate that the drug adversely affected performance, on any of the tasks utilized. Author (GRA)

N71-28339# Dunlap and Associates, Inc., Darien, Conn.
HUMFACTS SYSTEM THESAURUS
Jan. 1971 420 p refs
(Contract DAHC04-69-C-0076)
(AD-721657) Avail: NTIS CSCL 5/2

The thesaurus contains words and phrases, concept-terms, which reflect the concepts to be indexed in support of the Human Factors, Engineering Information Retrieval (HUMFACTS) System. The concept-terms indicate structures which display the relationship between terms to at least two levels of detail in meaning. This developmental thesaurus is intended to serve as the authority list for subsequent indexing and retrieval processing but is not considered final. Author (GRA)

N71-28340# Naval Postgraduate School, Monterey, Calif.
INVESTIGATION OF THE EFFECTS OF INCREASED FLYING HOURS OF NAVAL POSTGRADUATE SCHOOL AVIATOR SKILL, KNOWLEDGE, AND STATISFACTION; A COMPARATIVE ANALYSIS
Michael Joseph Hanley (M.S. Thesis) Mar. 1971 125 p refs
(AD-721588) Avail: NTIS CSCL 5/9

Data reflecting the knowledge, skill, and satisfaction of aviators in combat readiness training flight status, was collected. The aviator sample consisted of one group flying the T-1A aircraft at a rate of 4-hours per month and another flying 8-hours per month. he data collection methods are described, and the results and conclusions from a comparative analysis are presented. Author (GRA)

N71-28352 National Lending Library for Science and Technology, Boston Spa (England).
BODY WEIGHT, WING LENGTH, FAT DEPOSITS AND FLIGHT IN BIRDS [VES TELA, DLINA KRYLA, ZHIROVYE OTLOZHENIYA I POLET PTITS]
T. I. Blyumental et al Jan. 1971 10 p refs Transl. into ENGLISH from Zool. Zh. (Moscow), v. 49, no. 7, 1970 p 1069-1072
(NLL-RTS-6197) Avail: Natl. Lending Library, Boston Spa, Engl.: £0.80

Data are collected on the intraspecific relationships between lean weight and wing span for various avian species. Data are included for the large scale ringing of birds on the Kurshskaya kosa in the Baltic. Immediately after capture the birds were weighed, wing length measured, and their fat class determined visually. The classes are nil, poor, medium, and copious. The classes nil (no visible subcutaneous fat reserves, and copious (maximum fat reserves) for the species involved, are the only ones used in this study. Only spring and autumn migrating birds without traces of moult were used. Regressions for wing length-lean weight of nil class birds were calculated by the least squares method. The differences in the weight of birds belonging to different fat reserve classes are presented in tabular form. E.H.W.

N71-28358# Telluron, Santa Monica, Calif.
TRAINABLE SYSTEMS FOR CONTROL AND RECOGNITION APPLICATIONS Final Report
Charles E. Hendrix 31 Mar. 1971 8 p
(Contract N00014-69-C-0368)
(AD-721737; FR-1) Avail: NTIS CSCL 6/4

The research was aimed at the development of electronic circuitry which would mimic, in some degree, the function of the living nerve cell (hence the appellation neuromine) and which could be used as a building block in the construction of complex information-handling or control systems. The systems thus constructed were expected to have the capability of learning to perform certain functions. The program had the threefold goal of development of a suitable neuromime circuit, development of useful trainable machines, and development of a design which would be economically feasible to manufacture in the large quantities which useful trainable networks would probably require. Author (GRA)

N71-28359# Army Behavior and Systems Research Lab., Arlington, Va.
IMPROVED SEARCH TECHNIQUES WITH PASSIVE NIGHT VISION DEVICES
James H. Banks, Jack J. Sternberg, Barry J. Cohen, and Henry De Bow Feb. 1971 44 p refs
(AD-722236; BESRL-TR-1169) Avail: NTIS CSCL 17/8

The NIGHT OPERATIONS Program is concerned with problems in optimizing human performance in relation to night vision devices and related sensors. In the furtherance of this research, studies are being conducted with passive night vision devices. Passive night vision devices developed for the Army have greatly increased night observation and target acquisition capabilities. Effectiveness of these devices, however, is highly dependent upon how and under what conditions they are used. The present study sought to determine whether new search techniques and procedures could increase the effectiveness of soldiers using passive night vision devices. The subjects (54 operators) using the Starlight Scope (SS) or the Night Observation Device, Medium Range (NOD) were given

specialized search training and their training performance was compared with another group previously tested under the same conditions but without special training on search method and pattern. Author (GRA)

N71-28360# Army Behavior and Systems Research Lab., Arlington, Va.

EFFECTS OF SEARCH AREA SIZE ON TARGET ACQUISITION WITH PASSIVE NIGHT VISION DEVICES

James H. Banks, Jack J. Sternberg, John P. Farrell, William A. Dalhamer (Manned Systems Sci., Inc.), and Donald Vreuls (Manned Systems Sci., Inc.) Feb. 1971 48 p ref

(AD-722235; BESRL-TR-1168) Avail: NTIS CSCL 17/8

The NIGHT OPERATIONS Program is concerned with optimizing human performance in relation to night vision devices and related sensors. Specific aspects deal with determining performance effectiveness of sensor systems, factors which affect performance, and means of improving effectiveness. The present study describes research involving the use of such devices in assessing the effectiveness of soldier performance during night operations. The primary objective of the experiment was to investigate the effects of search area size on performance--as it interacts with a number of environmental, target, and human factors--and to determine the implications of findings for operational use, basis of issue; and search deployment, as well as for improvement of soldiers effectiveness in using these devices. Author (GRA)

N71-28447# Texas Technological Univ., Lubbock. Dept. of Industrial Engineering.

WORK PERFORMANCE UNDER THERMAL STRESS

J. D. Ramsey and A. Mortagy Feb. 1971 28 p refs Presented at the Brouha Intern. Conf. on Work Physiol., Quebec, 4 Feb. 1971

(Contract DAAD05-69-C-0102; Proj. Themis)

(AD-721595) Avail: NTIS CSCL 5/10

This is a report on some of the recent and current work in the environmental chamber at Texas Tech University. Specific studies discussed include: an investigation of variable temperature and diet effects on monitoring performance; an analysis of effects of localized heating of the head when performing simple motor and mental tasks in the cold; and a study of psychomotor task performance in the heat. Two additional investigations concerning vigilance task performance are currently in progress and are described herein. These studies represent different schemes of work and rest schedules as influenced by heat. Author (GRA)

N71-28476# Joint Publications Research Service, Washington, D.C.

SPACE BIOLOGY AND MEDICINE, VOLUME 5, NO. 2, 1971

O. G. Gazenko, ed. 24 Jun. 1971 139 p refs Transl. into ENGLISH of the publ. 'Kosmicheskaya Biologiya i Meditsina' Moscow, Medgiz., 17 Mar. 1971 p 1-90

(JPRS-53448) Avail: NTIS

Journal articles are presented on physiological effects of reduced gravity, restricted mobility, gamma irradiation, and magnetic field effects on humans and animals.

N71-28477# Joint Publications Research Service, Washington, D.C.

HUMAN MOVEMENTS UNDER LUNAR GRAVITATION CONDITIONS

V. A. Bogdanov et al *In its* Space Biol. and Med., Vol. 5, No. 2, 1971 24 Jun. 1971 p 1-13 refs

Avail: NTIS

The peculiarities of man's execution of different locomotor acts when reduced gravitation is simulated are presented. A classification of different stands and experimental apparatus making it possible to simulate reduced gravity is proposed, operation of these simulators is analyzed, and their positive and negative properties are considered. An attempt is made at a comparison of experimental data obtained during the simulation of lunar gravity under terrestrial conditions and published data on emergence of the Apollo 11 crew onto the lunar surface. Author

N71-28478# Joint Publications Research Service, Washington, D.C.

EFFECT OF RESTRICTED MOBILITY OF ANIMALS ON THE INTENSITY AND EXCRETION OF SOME GASEOUS PRODUCTS OF VITAL FUNCTIONS

V. V. Kustov et al *In its* Space Biol. and Med., Vol. 5, No. 2, 1971 24 Jun. 1971 p 14-19 refs

Avail: NTIS

The results of a study if the effect of relative restricted immobility on the intensity and excretion of gaseous products by male white rats are presented. It was demonstrated that 15 day reduced activity had an insignificant effect on the elimination of ketones and aldehydes and accelerated the elimination of carbon monoxide and ammonia. Author

N71-28479# Joint Publications Research Service, Washington, D.C.

EFFECT OF HYPOXIC HYPOXIA AND HYPERCAPNIA ON CALCIUM, INORGANIC PHOSPHORUS, AND TOTAL PROTEIN IN THE BLOOD OF RATS DURING HYPODYNAMIA

A. I. Volozhin *In its* Space Biol. and Med., Vol. 5, No. 2, 1971 24 Jun. 1971 p 20-27 refs

Avail: NTIS

The effect of adaptation to hypoxic hypoxia (7,000 meters) and hypercapnia (5 percent CO2) on the content of calcium, inorganic phosphorus, and total protein in the blood of rats performing normal and diminished activity was studied. The hypodynamic animals exhibited an increased calcium concentration and a decreased content of inorganic phosphorus and total protein. Hypoxic hypoxia used as a factor for increasing animal tolerance produced no normalization of these three parameters in hypodynamic rats. The experiments indicated that hypercapnia improved these parameters: (1) the level of inorganic phosphorus and protein in rats exposed to hypodynamia and (2) hypercapnia was higher than in rats exposed to hypodynamia alone. Author

N71-28480# Joint Publications Research Service, Washington, D.C.

STATUS OF ERYTHROPOIESIS IN DOGS EXPOSED TO GAMMA IRRADIATION IN DOSES SIMULATING CONDITIONS ACCOMPANYING PROLONGED SPACEFLIGHT

L. L. Semashko et al *In its* Space Biol. and Med., Vol. 5, No. 2, 1971 24 Jun. 1971 p 28 31 refs

Avail: NTIS

The results of studies of different aspects of erythropoiesis (lifetime of red blood cells, bone marrow production) of dogs exposed to cobalt 60 gamma irradiation for 2.5 years are presented. Two-year chronic irradiations with a dose of 62.5 rad/year, followed by exposures of 42 rad three times a year, shortened the half-life of erythrocytes. However, the damage processes were repaired, as could be judged from the absence of anemia, increase in bone marrow erythroid elements, and acceleration of bone marrow red blood cell production. Repair can be attributed to activated erythroid hemopoiesis. The changes produced by chronic irradiation alone were of a similar nature, but less distinct. Author

N71-28481# Joint Publications Research Service, Washington, D.C.

HEMATOLOGICAL EFFECTS IN DOGS EXPOSED TO CHRONIC AND REPEATED GAMMA IRRADIATIONS

T. Ye. Burkovskaya *In its* Space Biol. and Med., Vol. 5, No. 2, 1971 24 Jun. 1971 p 32 36

Avail: NTIS

Studies of the morphological structure of the peripheral blood and bone marrow in dogs exposed to one year chronic irradiation in doses of 42 and 8 rad at four month intervals are analyzed. The data indicate that the exposure induces no serious homopoietic disturbances and the detected changes remain at the lower physiological level. The response to acute exposures with a dose of 42 rad involves myelopoiesis only, becoming less clearly expressed with an increase in the total dose. These data suggest that the formation of myelocytes is more sensitive than that of other blood corpuscles. Author

N71-28482# Joint Publications Research Service, Washington, D.C.

ARTIFICIAL MINERALIZATION OF WATER REGENERATED DURING SPACEFLIGHT

M. I. Shikina *In its* Space Biol. and Med., Vol. 5, No. 2, 1971 24 Jun. 1971 p 37–42 refs

Avail: NTIS

A need for adding minerals to the water regenerated from human wastes during spaceflight is discussed. Experimental findings concerning the mineralization of regenerated water with solid-phase salts, powdered 2 CaO·SiO2, and salt tablets are presented. This method has certain advantages over current techniques, yielding drinking water with better organoleptic properties and superior physicochemical composition. Author

N71-28483# Joint Publications Research Service, Washington, D.C.

CELLULAR RESPIRATION DURING HIGH ALTITUDE ADAPTATION OF RATS

V. I. Dedukhova et al *In its* Space Biol. and Med., Vol. 5, No. 2, 1971 24 Jun. 1971 p 43–52 refs

Avail: NTIS

The effect of high altitude adaptation on the content of cytochromes and on the parameters characterizing oxidation and oxidative phosphorylation of cerebral homogenates is discussed. Some parameters were measured for hepatic mitochondria as a comparison. The differences in cerebral tissue respiration beginning with a study of the homogenate rather than with isolated mitochondria were investigated. Author

N71-28484# Joint Publications Research Service, Washington, D.C.

CHANGES IN THE SYMPATHICOADRENAL SYSTEM CAUSED BY EXPOSURE IN A PERMANENT MAGNETIC FIELD

B. M. Fedorov et al *In its* Space Biol. and Med., Vol. 5, No. 2, 1971 24 Jun. 1971 p 53–59 refs

Avail: NTIS

The effect of a permanent magnetic field on the sympathicoadrenal system in animals (rabbits) was investigated. The experiments produced a stimulating effect on the sympathetic nervous system. Twenty-four hour exposure to hypokinetic conditions considerably reduced the noradrenaline content in the hypothalamus and myocardium, but exerted no effect on the adrenaline content in the medullary layers of the suprarenals. Twenty-four hour exposure to a permanent magnetic field of 1,000 oe prevented any decrease in the noradrenaline content in the hypothalamus and myocardium of hypokinetic rabbits. Author

N71-28485# Joint Publications Research Service, Washington, D.C.

EFFECT OF AMYTETRAVITE AND ATP ON HEMOPOIESIS IN DOGS DURING REPEATED EXPOSURES AGAINST A BACKGROUND OF CHRONIC GAMMA IRRADIATION

V. D. Rogozkin et al *In its* Space Biol. and Med., Vol. 5, No. 2, 1971 24 Jun. 1971 p 60 65 refs

Avail: NTIS

The results of radiation experiments with three groups of dogs are presented. Two groups received a dose of 188.5 rad/year, whereas the third served as a control. The 30 irradiated dogs were administered radio-protective drugs: amytetravite and ATP. Hemopoietic parameters exhibited higher stability in response to the drugs. Author

N71-28486# Joint Publications Research Service, Washington, D.C.

SIMULATION OF EXPOSURE TO RADIATION APPLICABLE TO PROLONGED SPACE FLIGHTS

V. I. Popov et al *In its* Space Biol. and Med., Vol. 5, No. 2, 1971 24 Jun. 1971 p 66–70 refs

Avail: NTIS

The effects of exposing laboratory animals to chronic radiation exposure are discussed. The galactic cosmic radiation and solar flare radiation conditions were simulated from cobalt 60 gamma radiation. The experimental program provided for three acute irradiations per year for simulating the effect of radiation from solar flares in doses of 10 and 50 rem. The depth distributions of the radiation were used in computing the mean tissue doses received by the animals. Author

N71-28488# Joint Publications Research Service, Washington, D.C.

PRINCIPLES APPLICABLE IN FORMULATING WORK AND REST SCHEDULES FOR MAN IN SPACE

B. S. Alyakrinskiy *In its* Space Biol. and Med., Vol. 5, no. 2, 1971 24 Jun. 1971 p 76–83 refs

Avail: NTIS

A rationally formulated work and rest schedule for the efficiency and safety of space flights is discussed. The basic principle in formulating a rational work and rest regime is the rhythm principle. A work and rest schedule is an artificially created rhythm of sleep and wakefulness and those primarily working operations which constitute the content of man's occupational activity. High performance in any activity is ensured only in a case when the preprogrammed rhythm of life is correctly matched with the natural rhythms of psychophysiological functions characteristic of the body. Author

N71-28489# Joint Publications Research Service, Washington, D.C.

MECHANISM OF pH AND GAS REGULATION IN HUMAN BLOOD ACCOMPANYING A CHANGE IN PCO2 IN BREATHED AIR

V. V. Zhuravlev *In its* Space Biol. and Med., Vol. 5, No. 2, 1971 24 Jun. 1971 p 84 90 refs

Avail: NTIS

Six volunteers participated in a prolonged experiment in an isolation chamber with varying CO2 partial pressure. Acid-alkali equilibrium, pO2 and pCO2 were measured. It was concluded that the changes were of an individual nature and were related to the respiratory factor. These changes were compensated by responses of the external respiration and renal system. Author

N71-28490# Joint Publications Research Service, Washington, D.C.

EFFECT OF SPACEFLIGHT FACTORS ON HUMAN MUSCLE TONE

L. I. Kakurin et al *In its* Space Biol. and Med., Vol. 5, No. 2, 1971 24 Jun. 1971 p 91 99 refs

Avail: NTIS

Data from examinations of Soyuz-3, Soyuz-4, and Soyuz-5 crew members are presented. The effect of weightlessness on muscle tone was studied by measuring the firmness and bioelectric activity of muscles. Prior to the flight muscle firmness was greater for the cosmonauts than for their associates. Subsequent to the flight they exhibited a decrease in the firmness and strength of posture muscles and an increase in reflex excitability at rest and bioelectric activity during work. Limb circumference remained unchanged. The nervous and muscular systems exhibited a greater reduction in reflex excitability in response to a physical load. Author

N71-28491# Joint Publications Research Service, Washington, D.C.

EXPERT MEDICAL EXAMINATION OF CIVIL AVIATION FLIGHT PERSONNEL FOR ATHEROSCLEROSIS

B. L. Gelman et al *In its* Space Biol. and Med., Vol. 5, No. 2, 1971 24 Jun. 1971 p 100 105 refs

Avail: NTIS

The predisposing factors for atherosclerosis are analyzed on the basis of examinations of 311 active civil aviation flight personnel suspected of atherosclerosis and coronary insufficiency, as well as 106 healthy aviators. Various methods employed in the early diagnosis of atherosclerosis are described. The most important methods are studies of lipid metabolism and electrocardiographic examinations accompanying functional tests. Criteria for evaluations of different indices are given. Recommendations for medical certification flight personnel afflicted with atheroscelerosis are presented. Further research on methods to be used in the process of certifying atherosclerotic flight personnel are discussed. Author

N71-28492# Joint Publications Research Service, Washington, D.C.

CHANGES IN SOME HEMODYNAMIC PARAMETERS IN OVERWEIGHT FLIGHT PERSONNEL

V. M. Kondrakov *In its* Space Biol. and Med., Vol. 5, No. 2, 1971 24 Jun. 1971 p 106–110 refs

Avail: NTIS

The hemodynamic parameters of overweight (excess weight 6–23 kg) healthy pilots were studied. The examinations included 112 subjects in the age range 22–48 years, 53 of them serving as controls. The examinations revealed distinct differences in the basic parameters of total hemodynamics. In comparison with the controls, the young and middle-aged flight personnel exhibited reduced cardiac output, strength of the left ventricle, and volume rate of cardiac ejection. The greater the weight of the subjects, the more distinct were the changes. Parameters of vascular hemodynamics were within the normal range. The hemodynamic differences found in these flight personnel were probably related to the different initial level of circulatory system functional capacity. Various techniques making it possible to evaluate the functional state of the cardiovascular system are discussed. Author

N71-28493# Joint Publications Research Service, Washington, D.C.

CHANGES IN CARDIAC ACTIVITY DURING PROLONGED RESTRICTION OF MOTOR ACTIVITY

T. N. Krupina et al *In its* Space Biol. and Med., Vol. 5, No. 2, 1971 24 Jun. 1971 p 111 119 refs

Avail: NTIS

The results of clinical and experimental investigations of animals and human subjects conducted to study the mechanisms underlying the effect of hypodynamia on the cardiac function are presented. Clinical investigations which involved a 120-day bedrest experiment indicated that lessened activity resulted in deterioration of the automatic function and asthenization of the body at later stages. Hypokinetic experiments on rabbits revealed a drastic reduction in noradrenaline content in the hypothalamus at early stages and an inhibition of the adrenal function at later times. Ultrastructural investigations of myocardial cells revealed focal changes in contractile elements (myofibrillar swelling), trophic formations (reduced number of cristae in mitochondria) and increased permeability of the capillary endothelium. Changes in ECG waves which are typical of hypokinetic exposure can be attributed to disturbances in cardiac regulation and trophic support of the myocardium. Author

N71-28494# Joint Publications Research Service, Washington, D.C.

SOME ASPECTS OF THE HUMAN EXTERNAL RESPIRATION FUNCTION DURING WORK

A. S. Barer et al *In its* Space Biol. and Med., Vol. 5, No. 2, 1971 24 Jun. 1971 p 120 125 refs

Avail: NTIS

The relationship between respiration rate and volume and the minute volume of respiration was studied under a wide variety of physical loads, including extreme working conditions. Subjects wearing light coveralls or spacesuits worked on a bicycle-type ergometer and walked on a treadmill or along level hard ground. A well-expressed pattern of dynamic change in respiration rate and volume was observed, dependent on the intensity of the performed work. An increase in pulmonary ventilation is ensured during different parts of the work process by different combinations of reactions of respiratory act components: in some due to an increase in the respiration rate, and in others due to an increase in respiration volume. It is postulated that the basis for the described phenomena is a principle characteristic for all biological control systems; a minimizing of energy expenditures when the optimum effect is attained (in this case with respect to the minute volume of respiration). Author

N71-28495# Joint Publications Research Service, Washington, D.C.

DYNAMICS OF UROPEPSIN EXCRETION IN DOGS UNDER THE INFLUENCE OF SOME EXTREMAL FLIGHT FACTORS

G. I. Gurvich et al *In its* Space Biol. and Med., Vol. 5, No. 2, 1971 24 Jun. 1971 p 126 128 ref

Avail: NTIS

During the activity of a flier and cosmonaut in performing the most complex and emotionally stressed missions the blood and urine content of hormones from the cortex of the suprarenals is increased. An attempt was made to study uropepsin excretion of dogs under the influence of different extremal factors. The experiments were carried out on five female dogs using a bladder fistula. This made possible the periodic collection of urine for analysis at the required time under the best physiological conditions Three weeks after the operation the dogs were familiarized with the experimental conditions. The experiments were initiated only after the dogs had ceased to react to the experimental conditions by a decrease in diuresis. Uropepsin was determined by the Sylvest West, Ellis and Scott method as modified by L. I. Idel'son on an ordinary day and after exposure to hypoxia (altitude 6,000 km, 30 minutes), a thermal factor (temperature 45 deg, 60 minutes), radial accelerations (up to 3 g, two minutes), and impact accelerations (8 g). The experiments were carried out in a pressure chamber, temperature chamber, on a centrifuge, and during catapult training. Author

N71-28496# Joint Publications Research Service, Washington, D.C.
DEPENDENCE OF INTENSITY OF PROPRIOCEPTIVE AFFERENTATION ON REGIONAL CIRCULATION
V. I. Savchuk et al *In its* Space Biol. and Med., Vol. 5, No. 2, 1971 24 Jun 1971 p 129 130
Avail: NTIS

Acute experiments on 52 cats under chloralose-urethane narcosis were used in investigating the bioelectric activity of thin bundles of afferent fibers in the muscular branch of the femoral nerve innervating the intermediate head of the quadriceps femoris under conditions of a controlled level of muscular circulation. The latter was achieved by perfusing a muscle from a donor, humorally isolated in situ, over sufficiently prolonged periods. The activity of proprioceptive afferentation is determined to a considerable degree by the level of organic circulation. In a study of rigorously isolated groups of afferent fibers it was found that the greater the level of muscle circulation, the more intense is the spontaneous impulsation and the activation reaction to muscle dilatation by weights. Analysis of the collected data indicates that the flux intensity of spontaneous impulsation when the arterial pressure is 120 mm is two or three times greater than the level of spontaneous activity when the arterial pressure is 20 mm and corresponds to the intensity of the afferent flux which arises with muscle dilatation by a weight of 50 g when the arterial pressure is 20 mm. Author

N71-28526*# National Aeronautics and Space Administration. *Langley Research Center, Langley Station, Va.*
BIOTECHNOLOGY
Washington 1971 283 p refs Presented at the Proc. of a Conf. held at Blacksburg, Va., 14–18 Aug. 1967 Prepared in cooperation with Va. Polytechnic Inst.
(NASA-SP-205) Avail: SOD $2.75; NTIS CSCL 06B

Psychological, physiological, biological, medical, physical, and engineering factors associated with manned space missions lasting several months or more are examined. Biotechnological problems and possible solutions in the complex man machine systems required for long duration space flights are outlined.

N71-28527*# National Aeronautics and Space Administration. *Langley Research Center, Langley Station, Va.*
FUTURE MANNED SPACE-FLIGHT IMPLICATIONS DERIVED FROM GEMINI
Samuel H. Hubbard *In its* Biotechnology 1971 p 3–10
Avail: SOD $2.75; NTIS CSCL 06B

Bioastronautical achievements in the Gemini program and the resulting applications for future space programs are briefly outlined. Rendezvous and docking maneuvers as well as prolonged station keeping require space engines that may be periodically replenished and used for auxiliary propulsion of manned vehicles. Variable gravity engineering methods for future space explorers seem imperative; these methods include psychobiological and physiological considerations. G.G.

N71-28528*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
PHYSIOLOGICAL AND PSYCHOLOGICAL PROBLEMS IN SPACE FLIGHT
William M. Helvey *In* NASA. Langley Res. Center Biotechnology 1971 p 11 20
Avail: SOD $2.75; NTIS CSCL 06B

A history of the manned space flight experience is provided that categorizes the environmental factors to which an astronaut is subjected and the responses of the major body systems to each of these factors. Included are psycho-physiological factors within the spacecraft as well as those created by the space environment itself. G.G

N71-28529*# Douglas Aircraft Co., Inc., Santa Monica, Calif.
BIOTECHNOLOGY IN SPACECRAFT DESIGN
H. L. Wolbers *In* NASA. Langley Res. Center Biotechnology 1971 p 21–38 refs
(Contracts NAS1-3612; NAS1-2974)
Avail: SOD $2.75; NTIS CSCL 06B

A broad spectrum of earth orbital missions has been investigated during the past four years. These missions include those related to earth centered applications and those related to observations and measurements in the basic sciences, as well as missions related to general technological developments and to the support of extended space flight. These studies have indicated the practicality and research value of extended life space laboratories in the 30,000- to 40,000-lb class with crew complements of six to nine men. Based upon these studies, a prognostication of some of the potential biotechnology problems that will influence spacecraft design is presented and options for possible solutions to some of the problems that may arise during extended manned space flight are suggested. Author

N71-28530*# International Business Machines Corp., Bethesda, Md.
MAN AS AN EXPERIMENTER AND OPERATOR IN SPACE
P. A. Castruccio and G. N. Nomicos *In* NASA. Langley Res. Center Biotechnology 1971 p 39–54
Avail: SOD $2.75; NTIS CSCL 06B

An attempt has been made to identify and analyze man's role as an experimenter and operator in space and to resolve questions about the precise region of application of man's capabilities. The potential space applications for the exploration and exploitation of space are considered. Man's potential role in space is then identified to justify his participation in the space program. A philosophy of man's applicability in space is analyzed to assess his capabilities to contribute to space tasks. A review of simulation results is presented for some specialized areas of man's application. The prognostication of man's suitability is discussed to specify the areas of his utilization. Simulation is proposed to obtain hard numbers on man's performance and determine the best machine aid required for support. Author

N71-28531*# Lovelace Foundation for Medical Education and Research, Albuquerque, N.Mex.
BIOLOGICAL AND ENGINEERING IMPLICATIONS OF SPACE-CABIN ATMOSPHERES
Emanuel M. Roth *In* NASA. Langley Res. Center Biotechnology 1971 p 55 76 refs
(Contract NASr-115)
Avail: SOD $2.75; NTIS CSCL 06B

Bioengineering tradeoff studies presented for optimal spacecraft cabin atmospheres in manned space flight are reported. Considered are basic physiological and pathological aspects, as well as the most prominent environmental and engineering factors in the selection of space cabin atmospheres specific for a mission. Weight savings are combined with weighted factors atmospheres specific for a mission. Weight savings are combined with weighted factors of physiological and engineering hazards and mission constraints in choosing the ideal atmosphere for any space operation. G.G.

N71-28532*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ATMOSPHERIC-CONTROL SYSTEMS FOR EXTENDED-DURATION MANNED SPACE FLIGHT
Daniel C. Popma *In its* Biotechnology 1971 p 77 88 refs
Avail: SOD $2.75; NTIS CSCL 06B

Atmospheric control in spacecraft cabins for prolonged manned space missions requires carbon dioxide removal, water vapor

removal; and provisions of the proper oxygen-nitrogen mixture. In addition to mission orientation, the configuration of the atmospheric control system depends upon the power penalty instituted by the regenerative system. Candidate processes and techniques for Earth orbital and Moon exploration missions are described and some estimates are given as to their weight, power requirements, and supplies for atmospheric control systems. G.G.

N71-28533*# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

MAN'S TOLERANCE TO TRACE CONTAMINANTS

A. A. Thomas *In* NASA. Langley Res. Center Biotechnology 1971 p 89 106 refs

Avail: SOD $2.75; NTIS CSCL 06P

Trace contaminant toxicity in manned spacecraft cabin atmospheres constitutes chemical components of metabolic processes, propellants, and industrial particles from the spacecraft interior. Establishing space threshold limits for man's tolerance to a contaminant mixture during a prolonged mission requires animal experimentation to prove exclusively the important factors in atmospheric contamination. The development of suitable mathematical models of chronic toxicity during long term continuous exposure is advocated for single and mixed contaminants in order to increase the values from animal experimentation with subsequent extrapolation to man. G.G.

N71-28534*# Indiana Univ., Bloomington. Medical Center.

SPACE-CABIN CONTAMINANTS: SOURCES AND CONTROL

J. C. Ross *In* NASA. Langley Res. Center Biotechnology 1971 p 107 112

Avail: SOD $2.75; NTIS CSCL 06B

The theoretically possible sources of contaminants are man, machines, materials, equipment failure, extravehicular, and secondary generation. The major needs are prevention of contamination, rapid detection of toxic substances, adequate knowledge about TLV's for continual occupancy, and methods to maintain nontoxic levels of contaminants. Author

N71-28535*# Institute for Defense Analyses, Arlington, Va.

NUTRITION AND FOOD REQUIREMENTS FOR SPACE VOYAGE

Herbert Pollack *In* NASA. Langley Res. Center Biotechnology 1971 p 113 120

Avail: SOD $2.75; NTIS CSCL 06B

The subject of nutrition and food management for space flight is a very broad one. The problems of short term and extended flights require separate solutions. The short term flights, up to 14 days, actually do not present a serious nutritional problem because man can survive without food for this period. In this period of time, work and performance degradation are not very great and no serious metabolic malfunctions occur. The problem that has occurred in the short term flights has been dehydration. The discussion of the possibilities of the longer term flights, up to 1000 days or more, presents an entirely different problem. Man must be supplied with adequate calories and all the other necessary nutrients. Author

N71-28536*# Douglas Aircraft Co., Inc., Santa Monica, Calif.

WATER MANAGEMENT FOR EXTENDED-DURATION MANNED SPACE MISSIONS

D. F. Putnam *In* NASA. Langley Res. Center Biotechnology 1971 p 121 132 refs

Avail: SOD $2.75; NTIS CSCL 06B

Two water management techniques are evaluated in manned chamber tests for application to extended duration space missions. The two techniques are the open cycle air evaporation system in which humidity control and water recovery from urine are accomplished in a single, combined system; and the multifiltration technique for wash water purification and filtering of humidity condensate and urine distillate. The tradeoff considerations that influenced the selection of these techniques are discussed. Also described are the chemical pretreatment of urine and the control of odors, trace contaminants, and microbes. Data on water quality are included. Author

N71-28537*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

MAN, HIS ENVIRONMENT, AND MICROBIOLOGICAL PROBLEMS OF LONG-TERM SPACE FLIGHT

Judd R. Wilkins *In its* Biotechnology 1971 p 133 144 refs

Avail: SOD $2.75; NTIS CSCL 06B

In manned space flight, microbiologists are concerned with a wide spectrum of possible problems associated with placing man in a closed environment for long periods of time. Progress is being made in many areas toward the goal of long duration manned space flight. A considerable portion of this effort is focused on the total space-cabin environment, including research and development on life support subsystems. Microbiological investigations in support of this entire program are summarized for the current status of this research and some potential problem areas are outlined. Author

N71-28538*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

LIFE SUPPORT SYSTEMS INTEGRATION

Warren D. Hypes *In its* Biotechnology 1971 p 145 164 refs

Avail: SOD $2.75; NTIS CSCL 06B

An optimized design of regenerative environmental control and life support systems requires integration at three levels: subsystem, system, and total spacecraft. Two types of subsystem level integration are desirable. One type is process integration that interfaces mass transfer, reaction rate control, and phase separation techniques. A second type is operational mode integration that interfaces selected techniques and design schemes for producing system operational flexibility. System level integration is paced by thermal balance considerations. These considerations involve the techniques of supplying heat to the endothermic processes and coolant to the system hardware and cabin environment. Tests have been conducted on a full scale research model integrated system. The tests have indicated that the regenerative processes are feasible. Author

N71-28539*# General Dynamics Corp., San Diego, Calif.

SPACE MISSION MODELING AND SIMULATION TECHNIQUES

C. B. Moore *In* NASA. Langley Res. Center Biotechnology 1971 p 165–184 refs

Avail: SOD $2.75; NTIS CSCL 06B

A mathematical model of a simulated space station mission is described and emphasis is placed on the handling of crew related factors in the model logic and library. Because of the flexibility of the model, a determination can be made of the sensitivity of mission effectiveness to a number of crew related factors such as crew task times, crewman proficiency, overtime allowables, work-shift lengths, work policies, crew rotation profiles, work-rest-sleep cycles, life support requirements, and crew illness. There is a discussion of a computerized methodology for use in comparing and balancing capabilities of astronauts versus the requirements and the demands of the total space mission. The methodology is illustrated as a planning tool in establishing requirements and capabilities of long duration space stations. Author

N71-28541*# Illinois Univ., Urbana.
PHYSIOLOGICAL HAZARDS OF EXTENDED SPACE FLIGHTS
Harlow W. Ades *In* NASA. Langley Res. Center Biotechnology 1971 p 193–198
Avail: SOD $2.75; NTIS CSCL 06F

Space flights lasting months or years require advance investigation of possible physiological contingencies that may arise when the flight is 6 or 12 months from earth in an emergency that could not be handled by the crew. There are three main sources of information available that can be utilized in reducing the uncertainties. One of these is ground simulation of conditions aloft. The second is the mass of physiological data accumulated from the Gemini flights themselves. The third is the use of experimental flights with animal subjects that provide the opportunity to observe reactions directly under actual conditions, without human risk. Information that relates to projected flights of several months or more is evaluated and it is shown how the animal experimentation approach may be utilized to handle certain crucial questions that cannot be answered in any other way, short of using human astronauts as experimental subjects. Author

N71-28542*# Douglas Aircraft Co., Inc., Huntington Beach, Calif.
THE 1000-DAY MISSION: NULL GRAVITY AND MAN
W. J. White and D. E. Havens *In* NASA. Langley Res. Center Biotechnology 1971 p 199–206
Avail: SOD $2.75; NTIS CSCL 06B

Existing biomedical information, in terms of 1000 days in space, is insufficient for extrapolation. Discussed is the need for research and development and for data that have significance for vehicle design. The roles of earth and orbiting laboratories in qualifying man for long duration missions are presented. Finally, fault tree analysis is introduced as a means of orienting biomedical research in the direction of mission parameters. Author

N71-28543*# Navy Dept., Washington, D.C.
MAN'S ROLE IN MISSION RELIABILITY
H. G. Moore *In* NASA. Langley Res. Center Biotechnology 1971 p 207–220 refs
Avail: SOD $2.75; NTIS CSCL 06B

In planning for future space flight systems, groundcrew and flightcrew reliability must be addressed as important system characteristics. Objective data on flightcrew or groundcrew performances are used as the basis for crew selection, mission mode decisions, and design concepts where decisions regarding human components or subsystems are needed. Author

N71-28544*# Texas Christian Univ., Fort Worth.
CAPSULE SOCIETY: NEW PROBLEMS FOR MAN IN SPACE ON LONG-DURATION MISSIONS
S. B. Sells *In* NASA. Langley Res. Center Biotechnology 1971 p 221–234 refs
(Grant NGR-44-009-008)
Avail: SOD $2.75; NTIS CSCL 06B

A social system model for the composition and organization of a spacecrew on long duration mission is formulated that considers the problems of human behavior during isolation and close confinement. The spaceship situation is envisioned as a miniature social system shaped by the following major dimensions: objectives and goals, value systems, personnel composition, organization, technology, physical environment, and temporal characteristics. It is proposed that all members of a spacecrew are equivalent to officers so that social distances are lessened between the crew. The inclusion of women in the complement of the spaceship is held not feasible in accordance with the American culture. Comparisons of the social system profile for the long duration spaceship with other relevant social system concepts are included. G.G.

N71-28545*# Kansas State Univ., Manhattan.
THE VISUAL REALM IN SPACE FLIGHT
John Lott Brown *In* NASA. Langley Res. Center Biotechnology 1971 p 235–254 refs
Avail: SOD $2.75; NTIS CSCL 06B

Man's presence on extended space missions is dictated by his unique effectiveness for coping with unusual situations. Critical elements in his performance are his sensory input channels. Visual problems that may be encountered in space flight are reviewed. The unique characteristics of the visual realm on space missions are discussed, from the instrument arrays and other aspects of space vehicle interiors to the extravehicular situations, from rendezvous and docking with other vehicles through landing or extraterrestrial bodies and exploration of their surfaces. The significant characteristics of the human visual system are reviewed in relation to the problems that may be encountered. Author

N71-28546*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
OPERATIONAL CONSIDERATIONS FOR EXTRAVEHICULAR ACTIVITY AS APPLIED TO FUTURE SPACE MISSIONS
Larry E. Bell *In its* Biotechnology 1971 p 255–274

Avail: SOD $2.75; NTIS CSCL 06B

Basic guidelines in future mission planning are: (1) extravehicular activity should be planned as the primary means of accomplishing a given operational or experimental task only if there is no reasonable alternative; (2) tasks should be carefully planned to a timeline to allow for adequate rest periods; (3) rigid mounting restraints should be used wherever practical; and (4) use of umbilicals is practical when working within a fixed envelope of the spacecraft. This allows life support systems to be smaller and allows better utilization of spacecraft expendables, such as oxygen and power. Author

N71-28547*# National Aeronautics and Space Administration, Washington, D.C.
MAN IN THE OPERATIONAL ASPECTS OF SPACE MISSIONS
Charles W. Mathews *In its* Biotechnology 1971 p 275–283

Avail: SOD $2.75; NTIS CSCL 06B

Nearly 2000 man hours of manned space flight experience have shown that man can readily adapt to this environment, as demonstrated in flights of up to 2 weeks; but of more importance, he can make significant contributions to the success of each mission. How man has been utilized in the space flights to date is described and the capabilities that have been demonstrared are illustrated. This information is then projected in consideration of near term future space exploration activities in which man will be engaged, and then in consideration of what might be expected in the longer term and the influence on design approaches and operational concepts. Author

N71-28549# Texas Univ., Austin. Dept. of Psychology.
BEHAVIOR OBSERVER'S MANUAL: PROJECT TEKTITE 2
Robert Helmreich, James Le Fan, and Richard Mach 20 Mar. 1971 51 p refs
(Contract N00014-67-A-0126-0001; Proj. Tektite 2)
(AD-721363; TR-13) Avail: NTIS CSCL 5/10

The report is a training manual for the collection of systematic observational data in a field situation. It is distributed to illustrate a methodology for collecting large amounts of data over long periods of time. Author (GRA)

N71-28550# Texas Univ., Austin. Dept. of Psychology.
THE TEKTITE 2 HUMAN BEHAVIOR PROGRAM

Robert Helmreich 15 Mar. 1971 63 p refs
(Contract N00014-67-A-0126-0001; Proj. Tektite 2)
(AD-721364; TR-14) Avail: NTIS CSCL 5/10

The report describes preliminary findings from a large-scale field research project involving continuous, systematic observations of 10 teams of aquanauts over a period of 182 days. Questions of field methodology are discussed, and the development of an effective new predictive instrument, the Life History Questionnaire, is reported. Author (GRA)

N71-28619* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

LOCOMOTION AND RESTRAINT AID Patent

Hubert C. Vykukal, inventor (to (NASA) Issued 8 Jun. 1971 6 p Filed 12 Dec. 1968 Cl. 104-1 Cl. 35-29; Cl. 104-139; Cl. 119-96; Cl. 238-1; Cl. 248-361; Cl. 272-70; Int. Cl. A63b71/00; Int. Cl. B61b13/00
(NASA-Case-ARC-10153; US-Patent-3,583,322; US-Patent-Appl-SN-783377) Avail: US Patent Office CSCL 06K

A locomotion and restraint aid for humans operating in conditions of zero gravity, comprising a spring biased tension member secured at one end to the operator and at the other to a trolley which moves along a track secured to a space vehicle is described. The track and trolley permit a limited range of movement, including walking, and the tension member simulates gravitational pull to provide stabilization during the performance of manual operation. Official Gazette of U.S. Patent Office

N71-28657# School of Aerospace Medicine, Brooks AFB, Tex.

DIFFERENTIAL EFFECTS OF MULTIPLE AND SINGLE IRRADIATIONS UPON THE PRIMATE EQUILIBRIUM FUNCTION Technical Report, 1 Mar.–1 Sep. 1969

Donald J. Barnes, G. Carroll Brown, and Zane M. Fractor Mar. 1971 23 p refs
(AD-722058; SAM-TR-71-7) Avail: NTIS CSCL 6/18

The Primate Equilibrium Platform (PEP) was utilized in an experiment at White Sands Missile Range, N. Mex., to determine the behavioral effects of single versus multiple irradiations. Eight trained primates (Macaca mulatta) were exposed to a single 1,500-rad pulse, and their performance was compared with the responses of a second group of 8 comparably trained primates receiving three 500-rad pulses spaced 1 hour apart. The subjects receiving multiple 500-rad pulses performed without appreciable change throughout the 20-hour postirradiation observation period, whereas those receiving the single 1,500-rad dose exhibited varying degrees of performance decrement. It was concluded that fractionation of dose within the limits explored herein had a definite mediating effect upon primate response to irradiation. Author (GRA)

N71-28733# RAND Corp., Santa Monica.

TARGET DETECTION THROUGH VISUAL RECOGNITION: A QUANTITATIVE MODEL

H. H. Bailey Feb. 1970 36 p refs
(Contract F44620-67-C-0045; Proj. RAND)
(AD-721446; RM-6158/1-PR) Avail: NTIS CSCL 5/10

The report presents a model for describing analytically the capabilities and limitations of a human observer in the task of looking for and finding known or expected fixed objects. The description takes the form of six algebraic equations which together enable the user to extimate recognition probabilities as a function of the many parameters required to describe a specific situation. The model is tailored to the case of an airborne observer looking at terrain with or without optical aids or electro-optical sensors, but with prior knowledge of the approximate appearance of an object. Author (GRA)

N71-28839 National Lending Library for Science and Technology, Boston Spa (England).

ON THE ACQUISITION OF PSYCHOMOTOR SKILL DURING THE OPERATOR'S PERFORMANCE [O FORMIROVANII PSIKHOMOTORNOGO NAVYKA V OPERATOROSKOI DEIATELNOSTI]

V. A. Plakhtienko et al Jan. 1971 24 p refs Transl. into ENGLISH from Vopr. Psikhologii (Moscow), v. 15, no. 3, 1969 p 81 92
(NLL-RTS-6172) Avail: Natl. Lending Library, Boston Spa, Engl.: 2.30 ; 8 NLL photocopy coupons

The ability to control a motor coordination and concentration complex was studied in 50 individuals taught to perform tracking tasks. One handle and two foot pedals were required to control the psychomotor. The interdependance between the rate of the acquisition of a psychomotor skill and the psychophysiological kd motor characteristics of each individual was also investigated. The psychomotor skill was found to be acquired three stages, characterized by a decrease in error movements and a stability of time spent on one mistaken move, a decrease in both errors and the time spent on one mistaken move, and stabilization of errors and time spend on one error. In the first stage, the acquisition of tracking skill depends mostly on the sensori-intellectual level of readiness and the mobility of the nervous processes. In the second stage the rate of skill acqusition depends increasingly on the motor readiness of the operator, and in the third stage the rate depends on all factors with a prevalence of the sensori-intellectual factor. N.E.N.

N71-28855 Illinois Inst. of Tech., Chicago.

TRACER ANALYSIS OF RECIRCULATING SYSTEMS

Benedict Shang-Jeo Fu (Ph.D. Thesis) 1970 148 p
Avail: Univ. Microfilms Order No. 70-14930

The tracer dynamics of recirculating systems are described by the Volterra integral equation. Based on this formulation, an analytical non-parametric method is developed for analyzing the tracer response of the mammalian circulation. This method requires two point monitoring of the tracer response of the circulation. The whole body circulating blood volume is obtained without employing a model for the entire circulation, if the cardiac output is evaluated from the response curve of the central circulation. The method is applied to cases in which subjects are under normal conditions and under the condition of induced cardiogenic shock. A numerical Fourier transformation method is also developed for correcting the distortions of the response curve due to non-ideal injection and the sampling system. Dissert. Abstr.

N71-28877*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.

TEST REPORT, TEST RESULTS, OPERATIONAL NINETY-DAY MANNED TEST OF A REGENERATIVE LIFE SUPPORT SYSTEM

May 1971 752 p refs
(Contract NAS1-8997)
(NASA-CR-111881; MDC-G2282) Avail: NTIS HC $9.00/MF $0.95 CSCL 06K

The operational 90-day manned test of a regenerative life support system is described. Overall and subsystem operational summaries are presented for atmosphere purification, supply, and pressurization, and water, food, and waste management. Crew and staff selction, training, and performance are outlined as well as the habitability evaluation, behavioral program, manned mission activity analysis, behavioral acoustics, EEG monitoring and sleep studies, glycerol food supplement, noninterference performance assessment, and critical task testing. Biomedical pretest, test, and post-test procedures are given with baseline data and test results. J.M.

N71-28970*# Techtran Corp., Glen Burnie, Md.

STEREOISOMERISM IN ANIMATE NATURE AND ITS ROLE IN PROCESSES OF THE ORIGIN OF LIFE ON EARTH

N71-29149

[STEREOIZOMERIIA V ZHIVII PRIRODI - LI ROL'U PROTSESAKH POKHODZHENNIA ZHITTIA NA ZEMLI]

R. I. Khilchevska Washington NASA Jun. 1971 19 p refs Transl. into ENGLISH from Akad. Nauk Ukr. RSR Fiziol. Zh. (Kiev), v. 16, Nov.–Dec. 1970 p 810–817

(Contract NASw-2037)

(NASA-TT-F-13677) Avail: NTIS CSCL 06C

A review of scientific studies on the origin of life on Earth is presented. It discusses the significance of stereoisomerism in organic structures. It has an outline of contemporary conceptions of the successive stages of evolution which includes five eras, environmental conditions in each era, the basic sources of energy, and developments which occur in each era. Author

N71-29149# Joint Publications Research Service, Washington, D.C.

USE OF ELECTROENCEPHALOGRAM IN AVIATION PHYSIOLOGY PRACTICE

A. M. Klochkov et al 2 Jun. 1971 7 p refs Transl. into ENGLISH from Zh. Vysshei Nervnoi Deyatelnosti (Moscow), v. 21, no. 2, 1971 p 560–565

(JPRS-53269) Avail: NTIS

The informativeness of using spectral characteristics of the EEG and its derivative for evaluating changes in the EEG of a pilot during flight was studied. The EEG recordings were made in experiments simulating flight conditions. It is shown that the changes in the EEG caused by emotional excitation are reflected in the EEG power spectrum with sufficient clarity, but the EEG changes during intellectual activity by a pilot against a background of emotional excitation are not revealed clearly. The power spectrum of the EEG derivative is more effective in disclosing changes in the high frequency area, and it may be used to evaluate changes in the EEG caused by intellectual activity, even where the EEG contains slow oscillations. Author

N71-29200*# Translation Consultants, Ltd., Arlington, Va.

STUDY OF HISTOPATHOLOGY AND EVOLUTION OF CHRONIC OCCUPATIONAL X-RAY DERMATITIS OF THE FINGERS [ETUDE HISTOPATHOLOGIQUE ET EVOLUTIVE DES RADIODERMITES CHRONIQUES PROFESSIONNELLES DES DOIGTS]

F. Lagrot et al Washington NASA Jun. 1971 19 p Transl. into ENGLISH from Semaine Hop. Paris (Paris), v. 46, no. 13, Mar. 1970 p 866–876

(Contract NASw-2038)

(NASA-TT-F-13664) Avail: NTIS CSCL 06E

A systematic anatomico-clinical study of chronic professional radio-dermatitis of the fingers is reported. Out of 96 patients operated on 51 had epitheliomas and 1 had sacroma. These cancers were developed on the parts of the hand most exposed to radiations (backs of the last joints of the three axial fingers, with a juxta-ungual maximum(and signs of a severe radiodermatitis in the vicinity of the neoplasia were always found. The importance of vascular disorders of the dermis and dysplasia of the Malpighian layer of the epidermis in the onset of carcinoma is emphasized. The changes are considered premalignant from their onset. The lesions are classified as follows:(1) Simple radiodermatitis, Grade 1 involutive, Grade 2 dysplasia; (2) X-ray dermatitis carcinoma in situ; (3) X-ray dermatitis with invasive carcinoma. The mechanism of this malignant degeneration from pre-cancer to carcinoma in situ and from the latter to invasive carcinoma is discussed. Author

Subject Index

AEROSPACE MEDICINE AND BIOLOGY / *A Continuing Bibliography (Suppl. 93)* SEPTEMBER 1971

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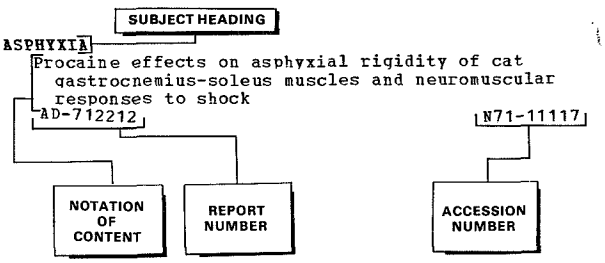

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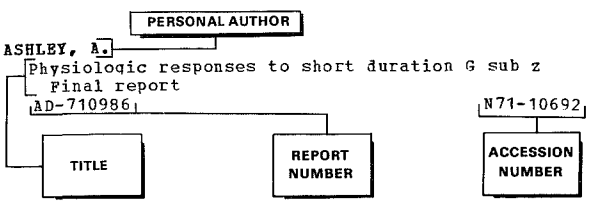

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