



N73-18094  
NASA SP-7011 (109)

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**AEROSPACE MEDICINE  
AND BIOLOGY**

**A CONTINUING BIBLIOGRAPHY**

**WITH INDEXES**

**(Supplement 109)**

**DECEMBER 1972**

**NATIONAL AERONAUTICS AND SPACE ADMINISTRATION**

## ACCESSION NUMBER RANGES

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

STAR (N-10000 Series)    N72-29991—N72-31987

IAA (A-10000 Series)    A72-40077—A72-43202

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# AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY  
WITH INDEXES

(Supplement 109)

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in November 1972 in

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



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# INTRODUCTION

This Supplement of *Aerospace Medicine and Biology* (NASA SP-7011) lists 430 reports, articles and other documents announced during November 1972 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*. The first issue of the bibliography was published in July 1964; since that time, monthly supplements have been issued.

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

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

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 1972 Supplements.

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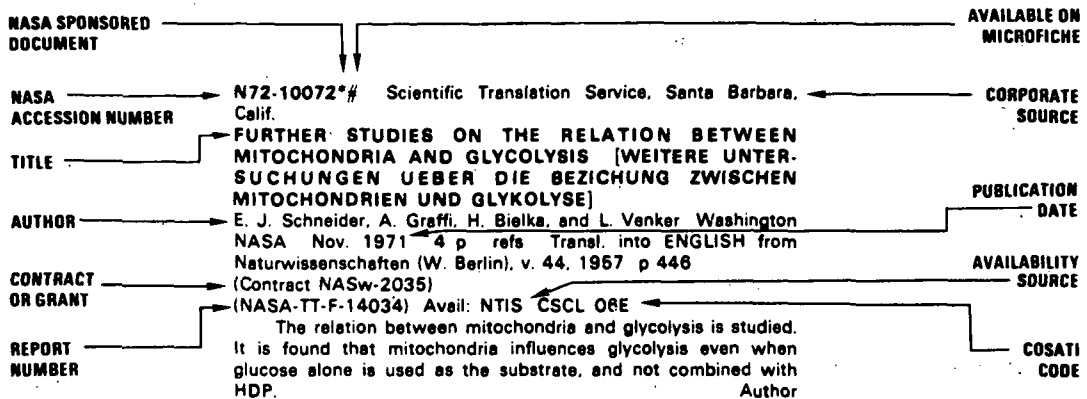
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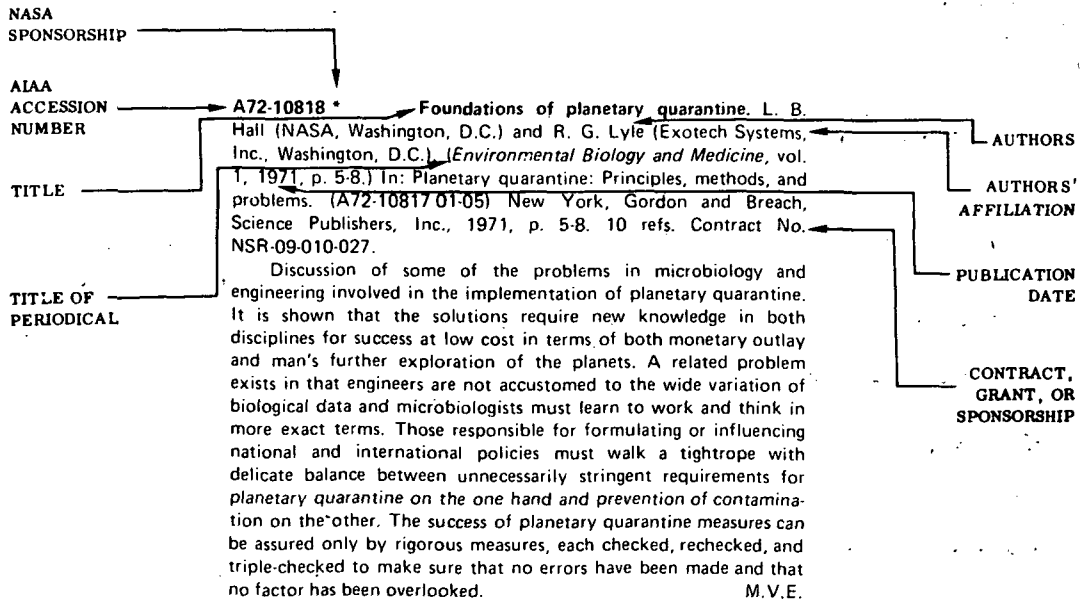
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## TYPICAL CITATION AND ABSTRACT FROM STAR



## TYPICAL CITATION AND ABSTRACT FROM IAA





# AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 109)

DECEMBER 1972

## IAA ENTRIES

**A72-40152 #** Spatial interaction with different-diameter stimuli matched on the basis of threshold, luminance, or total luminous flux. T. E. Frumkes and A. L. Kraft (Queens College, Flushing, N.Y.). *Optical Society of America, Journal*, vol. 62, Sept. 1972, p. 1117, 1118. 7 refs. Grants No. NIH-805-FR-07064-05; No. NIH-EY-99575-07.

**A72-40172 #** Psychological preparation of aviators (Psychologische Vorbereitung der Flieger). K. Platonov and B. Goldstein. (*Grazhdanskaia Aviatsiia*, no. 3, 1972.) *Technisch-ökonomische Informationen der zivilen Luftfahrt*, vol. 8, no. 6, 1972, p. 253-259. In German. (Translation).

The psychological preparation of the aviator involves the systematic activation of the professional capabilities of the aviator. These capabilities are the psychic abilities which guarantee the successful accomplishment of the aviator's work under any conditions. Various aspects of the psychological preparation of the aviator are discussed, giving attention to real flight conditions and to simulators, the attentive planning of the flight, the correct and methodical employment of simulators, the understanding of the causes for probable errors in the perception of the flight situation, and the requirement to take into account the psychic condition of the pilot before the flight. G.R.

**A72-40300 #** Space ergonomics (Kosmicheskaia ergonomia). A. I. Men'shov. Leningrad, Izdatel'stvo Nauka, 1971. 300 p. 283 refs. In Russian.

The principal results of investigations of the system composed of the human operator and space technology are reviewed. The application of these results to the design, construction, and operation of manned space vehicles is discussed on the basis of specific examples with allowance for space flight factors. Methods and criteria for evaluating the effectiveness of human operation under space flight conditions are proposed, and are used for obtaining quantitative estimates on the characteristics of the human operator/space vehicle system for several space vehicle designs. The characteristics of the human operator, the functional tasks of a space vehicle crew, and the characteristics of life-support and safety systems are examined. V.P.

**A72-40345 #** Discrimination of temporal gaps. S. M. Abel (California, University, San Diego, Calif.). *Acoustical Society of America, Journal*, vol. 52, Aug. 1972, pt. 2, p. 519-524. 16 refs. NIH-supported research.

Investigation of the human observer's ability to judge differences in duration without the benefit of such cues as differences in energy and energy spectrum. Three observers compared two silent

durations, T and T + delta T, in a two-alternative forced-choice procedure. The value of T ranged from 0.63 to 640 msec. For each T seven values of delta T were chosen to cover the range of the psychometric function. The duration and amplitude of noise markers bounding the temporal gaps were varied across three experimental conditions. For silent durations less than 160 msec the results showed that discrimination depended on the parameters of the marker. For each marker condition the function relating the Weber fraction and T was nonmonotonic, reaching a local minimum at about 2.5 msec and a local maximum at 10 msec. These results were used to evaluate current theories about the central processing of duration. (Author)

**A72-40346 #** Effect of fringe on masking-level difference when gating from uncorrelated to correlated noise. D. W. Bell (Stanford Research Institute, Menlo Park, Calif.). *Acoustical Society of America, Journal*, vol. 52, Aug. 1972, pt. 2, p. 525-529. 7 refs. Grant No. NIH-5-R01-NB-07908-04.

Investigation of binaural detection of a signal having 180 deg interaural phase difference in broadband correlated noise having no interaural phase difference when broadband uncorrelated noise temporally surrounded the 125-msec observation interval. When the temporal limits of the correlated noise coincided with the observation interval, the masking-level difference (MLD) was less than that found when detecting in continuous correlated noise, even though the correlated noise had been switched from uncorrelated noise of the same level. Switching from uncorrelated noise to correlated noise before the observation interval, or delaying the switch back to uncorrelated noise after the observation interval tended to restore the MLD. (Author)

**A72-40347 #** Measurement of specific mechanical impedance of the skin - Effects of static force, site of stimulation, area of probe, and presence of a surround. T. J. Moore and J. R. Munde (USAF, Wright-Patterson AFB, Ohio). *Acoustical Society of America, Journal*, vol. 52, Aug. 1972, pt. 2, p. 577-584. 14 refs.

**A72-40395** Methods for measurement of the state of health (Methoden zur Messung des Gesundheitszustandes). G. Ritter (Bundeswehr, Institut für Wehrmedizinallstatistik und Berichtswesen, Remagen, West Germany). *Wehrmedizinische Monatsschrift*, vol. 16, Aug. 1972, p. 225-231. 15 refs. In German.

Explanation of the concept of illness in its different meanings, and demonstration of its use in morbidity statistics. General principles, important for a description of morbidity, are outlined. After a short historical review of the German medical statistics of earlier years, medical reports in the armed forces since the year 1960 are described. Electronic data machines were used for these reports. There is a difference in the medical statistics of the armed forces between general morbidity - i.e., statistics about all activities of the medical officers and special morbidity, which means an index of health of sick or injured soldiers compared to the number of healthy soldiers. Various methodological possibilities are shown. (Author)

**A72-40396** The tarsal tunnel syndrome (Das Tarsaltunnelsyndrom). H. Bauer. *Wehrmedizinische Monatsschrift*, vol. 16, Aug. 1972, p. 232-236. 18 refs. In German.

In unexplained foot complaints, especially in trauma in the region of the ankle joint with prolonged healing time and persistent painful symptoms, combined with neurological disturbances of the sole of the foot, the presence of a tarsal tunnel syndrome should be suspected. After preliminary remarks on the anatomy and pathology, the etiology, diagnosis, and treatment of this compression lesion of the posterior tibial nerve are presented with reference to the cases published in the literature to date. (Author)

**A72-40417** Human tryptophan and tyrosine metabolism - Effects of acute exposure to cold stress. R. P. Francesconi, A. E. Boyd, III, and M. Mager (U.S. Army, Biochemistry and Pharmacology Laboratory, Natick, Mass.). *Journal of Applied Physiology*, vol. 33, Aug. 1972, p. 165-169. 35 refs.

**A72-40418** Respiratory effects of hypochloremic alkalosis and potassium depletion in the dog. R. W. Penman, R. G. Luke, and T. M. Jarboe (Kentucky, University, Lexington, Ky.). *Journal of Applied Physiology*, vol. 33, Aug. 1972, p. 170-174. 16 refs. Grants No. PHS-HE-05665-05; No. PHS-AM-13859-01A1.

**A72-40419** Energy cost of pushing loaded handcarts. M. F. Haisman, F. R. Winsmann, and R. F. Goldman (U.S. Army, Research Institute of Environmental Medicine, Natick, Mass.). *Journal of Applied Physiology*, vol. 33, Aug. 1972, p. 181-183. 10 refs.

Seven male volunteers, mean age 21 years, pushed four types of handcarts at 1.56 m sec, on a level treadmill and on an outdoor asphalt circuit. The carts (A, four-wheel; B, C, D, two-wheel) had the following wheel diameters: A, rear 30 cm, front 15 cm; B, 50 cm; C, 40 cm; D, 35 cm. Each cart was loaded to achieve a total weight of 50 kg. Three measurements of energy expenditure were made during each 30-min walk. The mean value for all carts for the treadmill walks was 511 plus or minus 52 (sd) W, which was closely similar to the mean for the outdoor circuit 512 plus or minus 45 W. Cart A was found to require the lowest energy expenditure, 478 plus or minus 37 W, and cart D the highest, 555 plus or minus 41 W. (Author)

**A72-40420** Hypercapnia with relief of hypoxia in normal individuals with increased work of breathing. R. M. Charniack (Manitoba, University, Winnipeg, Canada) and W. B. Chodirker (Winnipeg General Hospital, Winnipeg, Manitoba, Canada). *Journal of Applied Physiology*, vol. 33, Aug. 1972, p. 189-192. 16 refs. Research supported by the Medical Research Council of Canada.

**A72-40421** Muscle lactate, ATP, and CP levels during exercise after physical training in man. J. Karlsson, L.-O. Nordesjo, L. Jorfeldt, and B. Saltin (Gymnastik-och Idrottshogskolan, Stockholm, Sweden). *Journal of Applied Physiology*, vol. 33, Aug. 1972, p. 199-203. 21 refs. Research supported by the Swedish Delegation for Applied Medical Defence Research and Swedish Medical Research Council.

Study of the effect of submaximal and maximal work loads on muscle ATP, CP, glycogen, and lactate. Maximal oxygen uptake increased from 3.3 to 3.7 and 4.1 L per min, respectively, and no significant change in mean body weight was observed. The conditioning program increased the resting ATP concentration in the muscle, while CP concentration was unaffected. The physical conditioning also resulted in less pronounced phosphagen (ATP + CP) depletion at the same absolute submaximal work load but unchanged values were found at identical relative work loads. After training, muscle lactate concentration was significantly lower at the same absolute and relative submaximal work loads. At maximal work lactate concentration was not increased. At the same absolute submaximal exercise

level the utilization of muscle glycogen was significantly less after physical training. (Author)

**A72-40422** Effects of simulated high altitude on renin-aldosterone and Na-homeostasis in normal man. M. Epstein and T. Saruta (USAF, School of Aerospace Medicine, Brooks AFB; Texas, University, Dallas, Tex.; Miami, University; U.S. Veterans Administration Hospital, Miami, Fla.). *Journal of Applied Physiology*, vol. 33, Aug. 1972, p. 204-210. 35 refs.

**A72-40423** Evaluation of cardiopulmonary function and work performance in man during caloric restriction. T. A. Daws, C. F. Consolazio, S. L. Hilty, H. L. Johnson, H. J. Krzywicki, R. A. Nelson, and N. F. Witt (Fitzsimons General Hospital, Denver Colo.). *Journal of Applied Physiology*, vol. 33, Aug. 1972, p. 211-217. 18 refs.

**A72-40424** Regional lung function during early acclimatization to 3,100 m altitude. A. Dawson (Scripps Clinic and Research Foundation, La Jolla, Calif.). *Journal of Applied Physiology*, vol. 33, Aug. 1972, p. 218-223. 19 refs. Grant No. PHS-HE-10009.

Regional ventilation and perfusion were measured in six normal subjects at sea level and on the third day at 3100 m altitude. Ventilation distribution did not differ significantly at sea level and at altitude. Relative upper zone perfusion was greater at altitude than at sea level in both sitting and supine positions, and relative ventilation/perfusion V/P of the upper zones was less in both positions. Sitting regional V/P was more uniform at altitude, but in the supine position the upper zones had a relatively low V/P at sea level, and the increase in their relative perfusion at altitude tended to make regional V/P less uniform. Relative lower zone perfusion increased during 100% oxygen breathing at altitude in both positions. The decreased basal perfusion at altitude suggests selective lower zone vasoconstriction. Since alveolar oxygen tension was probably at least as high in the lower zones as elsewhere in the lungs, it is suggested that the basal vessels are especially responsive to hypoxia. (Author)

**A72-40425** Muscle metabolism during isometric exercise performed at constant force. B. Ahlborg, J. Bergstrom, L.-G. Ekelund, G. Guarnieri, R. C. Harris, E. Hultman, and L.-O. Nordesjo (Karolinska Sjukhuset; St. Ericks Sjukhus; Stockholm, Sweden). *Journal of Applied Physiology*, vol. 33, Aug. 1972, p. 224-228. 30 refs. Research supported by the Swedish Delegation for Applied Medical Defence Research; Swedish Medical Research Council, and Swedish National Association Against Heart and Lung Diseases. DAMDR Project 18,090/68; SMRS Project B70-19X-1002-05B; SMRC Project B70-19X-2647-02B; SMRC Project B70-40X-2847-01.

Study of muscle metabolism in the quadriceps muscle of man during isometric exercise. Seven subjects performed isometric contractions to fatigue with forces of approximately 33, 72, and 98% maximum voluntary contraction force (MVC). Muscle biopsy samples were taken before and at the end of work and were analyzed for glycolytic intermediates, ATP, and phosphorylcreatine (PC). Increased levels of glycolytic intermediates and decreased levels of ATP and PC were found at the end of work. Peak accumulation of lactate + pyruvate found following contractions sustained at 30-60% MVC, and the rate of accumulation was closely correlated to the work load. The results suggest that neither pyruvate nor lactate is accumulated within the muscles with a contraction force of less than 15% MVC. Fatigue above 20% MVC could not be accounted for through depletion of the muscle glycogen stores. (Author)

**A72-40426** Effects of chloralose-urethan anesthesia on temperature regulation in dogs. F. R. Sharp and H. T. Hammel (California, University, La Jolla, Calif.). *Journal of Applied Physiology*, vol. 33, Aug. 1972, p. 229-233. 25 refs. Grant No. PHS-1-R01-GM-17222-02; Contract No. F33615-69-C-1024.

Max-Planck-Institut für experimentelle Medizin, Göttingen, West Germany). *Journal of Applied Physiology*, vol. 33, Aug. 1972, p. 244-246.

When a subject is connected at end expiration to a closed circuit filled with oxygen containing the fraction of an insoluble inert gas (e.g., HE) and provided with a CO<sub>2</sub> absorber, reattainment of this fraction in expired lung gas indicates that a volume of O<sub>2</sub> equal to the functional residual capacity has been absorbed. This principle is shown to have some advantages over conventional closed-circuit techniques. Application to normal subjects yielded results in good agreement with those obtained with the conventional method.

(Author)

**A72-40427** A method for spiographic display of functional residual capacity and other lung volumes. T. Okubo, J. Teichmann, and J. Piiper (Tohoku University, Sendai, Japan; Max-Planck-Institut für experimentelle Medizin, Göttingen, West Germany). *Journal of Applied Physiology*, vol. 33, Aug. 1972, p. 244-246.

When a subject is connected at end expiration to a closed circuit filled with oxygen containing the fraction of an insoluble inert gas (e.g., HE) and provided with a CO<sub>2</sub> absorber, reattainment of this fraction in expired lung gas indicates that a volume of O<sub>2</sub> equal to the functional residual capacity has been absorbed. This principle is shown to have some advantages over conventional closed-circuit techniques. Application to normal subjects yielded results in good agreement with those obtained with the conventional method.

(Author)

**A72-40428** Changes in tidal volume, frequency, and ventilation induced by their measurement. R. Gilbert, J. H. Auchincloss, Jr., J. Brodsky, and W. Boden (New York, State University, Syracuse, N.Y.). *Journal of Applied Physiology*, vol. 33, Aug. 1972, p. 252-254. 9 refs. Research supported by the Heart Association of Upstate New York and NIH.

Use of electromagnetic sensors to study tidal volume, respiratory frequency, and minute ventilation in 14 subjects (6 normal, 8 patients with respiratory disease) during quiet breathing unhindered by respiratory apparatus and again with a nose clip in place and breathing through a respirometer via a mouthpiece (dead space 44 ml). Respiratory frequency fell in every case with the use of the respiratory apparatus (avg 6 breaths/min). Tidal volume rose in all but one case (avg rise 124 ml); changes in minute ventilation were variable. The fall in respiratory frequency is believed to be due to the irritating effects of the nose clip and mouthpiece on nasal and oral mucosa; the rise in tidal volume is presumably compensatory to maintain adequate ventilation. In 16 subjects during quiet, unhindered breathing, tidal volume approximated closely that predicted by the Radford nomogram.

(Author)

**A72-40429** Determination of oxygen consumption by use of the paramagnetic oxygen analyzer. R. W. Hill (Delaware University, Newark, Del.). *Journal of Applied Physiology*, vol. 33, Aug. 1972, p. 261-263.

Oxygen consumption of an animal sealed in a chamber can be determined in open-circuit systems without knowledge of the respiratory quotient by measuring the rate of flow of air into the animal chamber, the oxygen concentration of air entering the chamber, and the oxygen concentration of outflowing air after removal of CO<sub>2</sub>. The procedure used to compute oxygen consumption depends on whether CO<sub>2</sub> has been removed from the inflowing air. Earlier formulations are accurate when the animal is supplied with metered CO<sub>2</sub> free air and oxygen analysis is performed on CO<sub>2</sub> free inlet air. Those formulations also are essentially accurate when CO<sub>2</sub> has not been removed from metered air supplied to the animal but has been removed from samples of inlet air used for oxygen analysis. The earlier formulations can, however, lead to substantial errors in the estimation of oxygen consumption when both the air supplied to the animal and the samples used for oxygen analysis have not had CO<sub>2</sub> removed.

(Author)

**A72-40430** Lack of effect of high altitude on hemoglobin oxygen affinity. R. B. Weiskopf and J. W. Severinghaus (California University, San Francisco, Calif.). *Journal of Applied Physiology*, vol. 33, Aug. 1972, p. 275, 276. 13 refs. Grants No. NIH-HL-06285; No. PHS-1-PO1-GM-15571-04.

The affinity of hemoglobin for oxygen was studied in 16 normal sea-level natives acclimatizing to 12,470 or 14,246 ft for 3 to 10 days. The effect of high altitude on hemoglobin oxygen affinity was found to be significantly less than has been reported previously at these and lower altitudes.

M.V.E.

**A72-40431** # Mathematical model of two-component alga-bacteria biocenosis (Matematicheskaja model' dvukhkomponentnogo biotsenoza vodorosli-bakterii). N. S. Abrosov and B. G. Kovrov. *Kosmicheskaja Biologija i Meditsina*, vol. 6, May-June 1972, p. 3-9. 14 refs. In Russian.

**A72-40432** # Calcium metabolism conditions in calcified tissues of rats during a lasting hypodynamia and thyrocalcitonin administration (Sostoianie kal'tsievogo obmena v obyvestvlennykh tkaniakh krys pri dlitel'noi gipodinamii i primenenii tirokal'tsionina). A. I. Volozhin, P. V. Vasil'ev, N. N. Uglova, and V. E. Potkin. *Kosmicheskaja Biologija i Meditsina*, vol. 6, May-June 1972, p. 10-15. 16 refs. In Russian.

**A72-40433** # Effect of hypoxia on the condition of skeleton muscles in rats under hypokinesia (Vliianie gipoksii na sostoianie skeletnoi muskulatury krys pri gipokinezii). V. V. Portugalov, E. I. Il'ina-Kakueva, and V. I. Starostin. *Kosmicheskaja Biologija i Meditsina*, vol. 6, May-June 1972, p. 15-17. 9 refs. In Russian.

**A72-40434** # Toxicological evaluation of some synthetic materials designed for airtight space equipment (Toksikologicheskaja otsenka nekotorykh sinteticheskikh materialov, prednaznachennykh dlja oborudovaniia germoob'emov). G. I. Solomin, G. M. Gorban', and V. A. Shchirskaja. *Kosmicheskaja Biologija i Meditsina*, vol. 6, May-June 1972, p. 18-21. 8 refs. In Russian.

**A72-40435** # Sanitary-hygienic evaluation of the extraction method for water recycling in atmospheric moisture condensates (Sanitarno-gigienicheskaja otsenka ekstraktsionnogo sposoba regeneratsii vody iz kondensata atmosfernoii vlagi). Iu. E. Siniak, L. A. Kuznetsova, M. I. Shikina, A. G. Fil'chakov, and V. V. Krasno-shchekov. *Kosmicheskaja Biologija i Meditsina*, vol. 6, May-June 1972, p. 22-24. 7 refs. In Russian.

**A72-40436** # Some transport techniques for liquid human wastes and wash water under space flight conditions (Nekotorye sposoby transportirovki zhidkikh otkhodov zhiznedeiatel'nosti ekipazha i sanitarno-bytovykh vod v usloviakh kosmicheskogo poleta). V. P. Efimov and V. A. Frolov. *Kosmicheskaja Biologija i Meditsina*, vol. 6, May-June 1972, p. 24-28. In Russian.

**A72-40437** # Effect of hyperoxic media on the stability of rats during acute carbon monoxide exposure (Vliianie giperoksi-cheskoi sredy na ustoiчивost' krys k ostromu vozdeistviiu okisi ugleroda). B. I. Abidin, V. I. Belkin, A. N. Mal'kuta, and G. D. Lukhnovskii. *Kosmicheskaja Biologija i Meditsina*, vol. 6, May-June 1972, p. 28-30. In Russian.

**A72-40439** # Labyrinth reactions in dogs during lasting chronic irradiation (Labirintnye reaktsii sobak pri dlitel'nom khroni-

cheskom obluchenii). P. I. Kumets. *Kosmicheskaja Biologija i Meditsina*, vol. 6, May-June 1972, p. 33-37. 20 refs. In Russian.

Vestibular analyzer reactions to negative angular accelerations of 30, 60, 90, 120, and 180 deg/sec were investigated in 39 control dogs and 20 dogs exposed to simulated galactic radiation of 62.5 rad/year from a Co 60 gamma source over a period of 3 years. The nystagmus thresholds and vestibular reactions in test dogs and control dogs showed no differences at the end of the period. V.Z.

**A72-40440 #** Incorporation of methionine-S 35 in the proteins of the digestive organs of rabbits under the action of radiation and vibration (Vkliuchenie metionina-S 35 v belki organov pishchevaritel'noi sistemy krolikov pri deistvii obluchenii vibratsii). A. V. Kirillicheva, R. I. Iui, V. I. Denisov, and L. S. Prikhod'ko. *Kosmicheskaja Biologija i Meditsina*, vol. 6, May-June 1972, p. 42-45. 16 refs. In Russian.

**A72-40441 #** Problem of artificial gravitation in terms of experimental physiology (Problema iskusstvennoi gravitatsii s pozitivnoi eksperimental'noi fiziologii). E. M. Iuganov and M. D. Emel'ianov. *Kosmicheskaja Biologija i Meditsina*, vol. 6, May-June 1972, p. 45-49. 14 refs. In Russian.

**A72-40442 #** Acceleration tolerance of man after a lasting exposure to conditions of simulated weightlessness (K voprosu o perenosimosti chelovekom uskorenii posle dlitel'nogo prebyvaniia v usloviiakh, imitiruiushchikh nevesomost'). A. S. Barer, E. I. Sorokina, and K. I. Murakhovskii. *Kosmicheskaja Biologija i Meditsina*, vol. 6, May-June 1972, p. 49-53. 11 refs. In Russian.

**A72-40443 #** Effect of psychotropic substances on human resistance to acceleration (Vliianie psikhotropnykh veshchestv na rezistentnost' cheloveka k deistviu uskorenii). P. V. Vasil'ev, V. E. Belai, R. A. Vartbaronov, and G. D. Glod. *Kosmicheskaja Biologija i Meditsina*, vol. 6, May-June 1972, p. 53-59. 23 refs. In Russian.

**A72-40444 #** Study of hemodynamics during the action of decompression and accelerations (Issledovanie gemodinamiki v usloviiakh vozdeistviia dekompressii i uskorenii). P. M. Suvorov, V. G. Voloshin, L. N. D'iachenko, and V. F. Krivets. *Kosmicheskaja Biologija i Meditsina*, vol. 6, May-June 1972, p. 59-64. In Russian.

Hemodynamic changes induced in man by decompression of 50 and 70 mm Hg applied to the lower body are compared with such changes induced by accelerations of 3 to 7 g for 30 sec. Observed similarities and differences are described and discussed. M.V.E.

**A72-40445 #** Changes in the functional state of analysts in flying personnel during long flights (Ob izmenenii funktsional'nogo sostoiianiia analizatorov u letnogo sostava pri dlitel'nykh poletakh). E. V. Bondarev, V. A. Egorov, and O. F. Zakharova. *Kosmicheskaja Biologija i Meditsina*, vol. 6, May-June 1972, p. 64-67. In Russian.

**A72-40446 #** Psychological principles of active rest during long space flights (O psikhologicheskikh printsipakh aktivnogo otdykh v dlitel'nykh kosmicheskikh poletakh). G. M. Zarakovskii and S. L. Rysakova. *Kosmicheskaja Biologija i Meditsina*, vol. 6, May-June 1972, p. 67-71. 8 refs. In Russian.

**A72-40447 #** Morpho-functional changes in the endocrine system during oxygen starvation (O morfo-funktsional'nykh izme-

neniiakh v endokrinnoi sisteme pri kislorodnom golodanii). G. A. Gribanov. *Kosmicheskaja Biologija i Meditsina*, vol. 6, May-June 1972, p. 71-78. 69 refs. In Russian.

**A72-40448 #** Functional reliability of the biological component of a life support system (O nadezhnosti funktsionirovaniia biologicheskogo zvena v sisteme zhizneobespecheniia). I. A. Shvytov. *Kosmicheskaja Biologija i Meditsina*, vol. 6, May-June 1972, p. 78-82. 5 refs. In Russian.

**A72-40449 #** Calculation procedures for some parameters of space suit gas medium supply systems (Metodika rascheta nekotorykh parametrov sistem obespecheniia gazovoi sredy kosmicheskogo skafandra). I. P. Abramov. *Kosmicheskaja Biologija i Meditsina*, vol. 6, May-June 1972; p. 83-87. In Russian.

**A72-40450 #** Factors influencing the biological effectiveness of protons (Faktory, vliiaushchie na biologicheskuiu effektivnost' protonov). M. F. Lomanov. *Kosmicheskaja Biologija i Meditsina*, vol. 6, May-June 1972, p. 88-90. 7 refs. In Russian.

Discussion of the electron abundance equilibrium in a proton beam as a factor influencing the biological effect of the protons of a proton beam on animals. It is shown in accord with Larsson et al' results (1960) that the biological action of protons increases with their energies. V.Z.

**A72-40458 #** Climatic conditions and the thermal state of man (Klimaticheskie uslovia i teplovoe sostoianie cheloveka). T. N. Liopo and G. V. Tsitsenko. Leningrad, Gidrometeorologicheskoe Izdatel'stvo, 1971. 154 p. 266 refs. In Russian.

Theoretical and experimental studies in physiological climatology are reviewed with the emphasis on the impact on man of thermal environments in various parts of the Soviet Union. Attention is also given to the physiology of man-environment heat transfer, the thermal balance of human body, and the insulating and thermal-control properties of clothing. Further topics include the methods of estimating the complex effects of meteorological factors on the thermal state of human body, an algorithm for determining the optimal thermal control properties of clothing, the radiation balance of the surface of human body, bioclimatic regionalization of the territory of the Soviet Union in terms of suitable clothing, and a cartographic interpretation of clothing requirements. The monograph is addressed to readers interested in various aspects of human bioclimatology. V.Z.

**A72-40464 #** Neurophysiological background of tactile perception (Neurofiziologicheskie osnovy taktil'nogo vospriiatiia). A. I. Esakov and T. M. Dmitrieva. Moscow, Izdatel'stvo Meditsina, 1971. 132 p. 344 refs. In Russian.

This monograph discusses the functions of the tactile analyzer with particular attention to the complex neurophysiological mechanisms controlling the perception of tactile stimuli. The topics include the organization, excitation and adaptive properties of peripheral receptive fields, the lateral interactions of various tactile receptors, the physiology of reception thresholds, the mechanisms of efferent processes, and tactile receptor control mechanisms. Also covered are the action of chemical agents on the activity of mechanical receptors, the specific characteristics of cutaneous receptors, and subjective and objective methods of studying tactile sensor systems. V.Z.

**A72-40577** Mechanisms of descending control of spinal cord activities (Mekhanizmy nishkodiashchego kontroliia aktivnosti

spinnogo mozga). Edited by P. G. Kostyuk. Leningrad, Izdatel'stvo Nauka, 1971, 208 p. In Russian and English.

Studies of the morphology and neuron structures of efferent systems and of synaptic processes in spinal neurons are included. Control of spinal systems activities, related somato-vegetative reactions, the pharmacology of efferent processes, and integral functions of efferent systems and their role in natural motor activity are covered.

V.Z.

**A72-40578 #** A possible anatomical basis for descending control of impulse transmission through the dorsal horn. J. Szentagothai. In: Mechanisms of descending control of spinal cord activities. Leningrad, Izdatel'stvo Nauka, 1971, p. 9-14. 17 refs.

A specific neuron circuit in laminae II and III of the dorsal horn is proposed on the basis of anatomical studies. A hitherto unknown pyramid-shaped neuron has a central position in this circuit, which by a set of dorsal dendrites could most likely be stimulated di- or polysynaptically by primary efferents. By a set of ventral dendrites it would be in an excellent position to receive impulses from long descending pathways. By a specific and standard synaptic arrangement the pyramid neurons could depolarize terminals of primary efferents and thus presynaptically inhibit the transmission of their impulses. Most anatomical data on which the proposed circuit is based are unequivocal.

F.R.L.

**A72-40579 #** Special features of neuronal organization of the spinal cord in terminal zones of long descending pathways (Osobennosti neuronnoi organizatsii spinnogo mozga v zonakh okonchaniia dlennykh niskhodiashchikh putei). G. P. Zhukova. In: Mechanisms of descending control of spinal cord activities.

Leningrad, Izdatel'stvo Nauka, 1971, p. 14-18. 18 refs.

In Russian.

Investigation of the neuronal structure of the regions in the spinal gray matter of cats where the corticospinal, rubrospinal, and reticulospinal pathways terminate. Using the Golgi method, it is found that the dendrites and somata of many neurons are oriented in these regions along the direction of the descending fibers, thus facilitating the possibility of contact between pre- and postsynaptic surfaces. The neurons of these fields are characterized by high density and a highly developed ramification of dendrites. Large-sized and giant neurons somewhat similar to the giant neurons of the brain stem reticular formation are also represented in these fields. These giant reticular-type neurons are regarded as collectors accumulating excitation from neighboring smaller cells. Axo-axonal contacts are widespread in these fields, and are especially so in the region of the posterior horns bordering on the Rolandic substance.

A.B.K.

**A72-40580 #** Morphological changes in spinal cord neurons of animals due to the decreased intensity of supraspinal stimulation (Morfologicheskie izmeneniia neuronov spinnogo mozga zhivotnykh pri umen'shenii intensivnosti supraspinal'nykh vliianii). P. B. Kazakova. In: Mechanisms of descending control of spinal cord activities. Leningrad, Izdatel'stvo Nauka, 1971, p. 19-22. 30 refs. In Russian.

**A72-40581 #** The ultrastructure of the lateral basilar region of the spinal cord. M. Rethelyi. In: Mechanisms of descending control of spinal cord activities. Leningrad, Izdatel'stvo Nauka, 1971, p. 23-25. 10 refs.

**A72-40582 #** Neuronal organization of descending systems of the spinal cord (Neironnaia organizatsiia niskhodiashchikh sistem

spinnogo mozga). P. G. Kostyuk. In: Mechanisms of descending control of spinal cord activities. Leningrad, Izdatel'stvo Nauka, 1971, p. 28-39. 28 refs. In Russian.

Results of investigations of the electrical reactions of spinal interneurons and motoneurons after activation of descending pathways in the cat. It is found that the main descending systems (reticulospinal, vestibulospinal, rubrospinal, and corticospinal) differ from each other in neuronal organization of their spinal parts. The peculiarities of this organization are found to correlate with the structural features of the corresponding descending tracts (in particular, with the pattern of terminal fiber distribution between spinal neuronal pools). Substantial parts of the corticospinal and rubrospinal fibers ('lateral systems') are found to terminate on specialized relay interneurons localized predominantly in lateral zones of the fifth and seventh Rexed layers and to monosynaptically activate them. In contrast to 'lateral' descending systems, 'medial' systems (reticulospinal and vestibulospinal) can exert monosynaptic influences on motoneurons.

A.B.K.

**A72-40583 #** Propriospinal ducts of the lateral funiculus and their possible role in transmission of pyramidal stimuli (Propriospinal'nye puti lateral'nogo kanatika i ikh vozmozhnaia rol' v peredache piramidnykh vliianii). D. A. Vasilenko. In: Mechanisms of descending control of spinal cord activities. Leningrad, Izdatel'stvo Nauka, 1971, p. 39-44. 11 refs. In Russian.

**A72-40584 #** Synaptic suprasegmental control mechanisms of spinal cord motor neurons (Sinapticheskie mekhanizmy nadsegmentarnogo kontrolya motoneironov spinnogo mozga). A. I. Shapovalov. In: Mechanisms of descending control of spinal cord activities. Leningrad, Izdatel'stvo Nauka, 1971, p. 59-69. 46 refs. In Russian.

Experiments with square voltage pulses delivered into the brain show that the vestibulospinal, reticulospinal and rubrospinal systems can monosynaptically activate and inhibit the lumbar motor neurons in cats. The time characteristics, sensibility and trans-membrane polarization of monosynaptic lumbar EPSPs are found to be very similar to those of monosynaptic segmental EPSPs. The distinguishing feature of disynaptic efferent EPSPs is shown to be their well-pronounced frequency potentiation.

V.Z.

**A72-40585 #** Study of the conductivity of the motor neuron membrane during supraspinal stimulation (Issledovanie provodimosti membrany motoneironov vo vremia supraspinal'nykh vliianii). G. G. Kurchavii. In: Mechanisms of descending control of spinal cord activities. Leningrad, Izdatel'stvo Nauka, 1971, p. 69-73. In Russian.

**A72-40586 #** Intracellular study of rubrospinal neurons and of their synaptic activation during the stimulation of the sensorimotor cortical region (Vnutrikletochnoe issledovanie rubro-spinal'nykh neuronov i ikh sinapticheskikh aktivatsii pri razdrzhenii sensorimotornoi oblasti kory mozga). V. V. Fanardzhian and D. S. Sarkisian. In: Mechanisms of descending control of spinal cord activities. Leningrad, Izdatel'stvo Nauka, 1971, p. 78-82. 16 refs.

In Russian.

**A72-40587 #** Synaptic potentials of sensor and motor neurons of trigeminal nuclei during corticofugal stimulation (Sinapticheskie potentsialy sensornykh i motornykh neuronov troinichnykh iader pri kortikofugal'nykh vliianiiakh). Iu. P. Limanskii and E. V. Gura. In: Mechanisms of descending control of spinal cord activities. Leningrad, Izdatel'stvo Nauka, 1971, p. 82-86. 19 refs. In Russian.

**A72-40588 #** Influence of a preceding afferent stimulation on the pyramidal activation of spinal motor neurons (Piramidnyi kontrol' aktivnosti neironov dorsal'nogo spinno-mozzhechkovogo trakta). B. Ia. Piatigorskii. In: Mechanisms of descending control of spinal cord activities. Leningrad, Izdatel'stvo Nauka, 1971, p. 91-95. 16 refs. In Russian.

**A72-40589 #** Pyramidal control of the activity of interneurons related to various types of peripheral afferents (Piramidnyi kontrol' aktivnosti interneironov, svyazannykh s razlichnymi tipami perifericheskikh afferentov). A. G. Zadorozhnyi. In: Mechanisms of descending control of spinal cord activities. Leningrad, Izdatel'stvo Nauka, 1971, p. 95-101. 17 refs. In Russian.

**A72-40590 #** Systems analysis approach to the study of spinal mechanisms. C. A. Terzuolo, T. A. McKean, and N. P. Rosenthal. In: Mechanisms of descending control of spinal cord activities. Leningrad, Izdatel'stvo Nauka, 1971, p. 105-115. 14 refs.

The investigation discussed is concerned with an application of systems analysis to a study of spinal mechanisms involved in the control of movements. It is assumed that information is carried by frequency modulated impulse trains. The reasons for this assumption are examined. The studies reported are concerned with the myostatic reflex, the frequency response characteristics of the components responsible for the myostatic reflex, the integrative actions of alpha motoneurons, the gain of the length-tension loop, and the application of a systems analysis approach to neuronal systems not accessible to natural stimulation. G.R.

**A72-40591 #** Role of pyramidal and extrapyramidal components of cortically-induced efferent stimuli in the mechanism of cortical motor activity coordination (Rol' piramidnogo i ekstrapiramidnogo komponentov kortikal'no vyzvannykh niskhodiaschikh vliianii v mekhanizme koordinatsii kortikal'noi motornoj deiatel'nosti). E. T. Blagodatova, S. A. Evdokimov, P. A. Kiselev, and K. S. Predtechenskaia. In: Mechanisms of descending control of spinal cord activities. Leningrad, Izdatel'stvo Nauka, 1971, p. 115-120. 23 refs. In Russian.

**A72-40592 #** Possible role of supraspinal formations in the fixation of trace alterations at the segmental apparatus level of the spinal cord (O vozmozhnoi roli supraspinal'nykh obrazovaniy v fiksatsii sledovykh izmenenii na urovne segmentarnogo apparata spinnogo mozga). L. P. Latash, L. I. Tikhomirova, and I. G. Kuman. In: Mechanisms of descending control of spinal cord activities. Leningrad, Izdatel'stvo Nauka, 1971, p. 123-127. 5 refs. In Russian.

**A72-40593 #** A supraspinal motion control mechanism (Ob odnom mekhanizme supraspinal'nogo upravleniia dvizheniiami). V. S. Gurfinkel' and M. L. Shik. In: Mechanisms of descending control of spinal cord activities. Leningrad, Izdatel'stvo Nauka, 1971, p. 128-139. 42 refs. In Russian.

Discussion of a hypothesis according to which some higher sections of the cerebrum and related afferent processes are the activators of automatic neuron mechanisms which control motor activity with a certain degree of autonomy. The changes in the segmentary spinal cord apparatus during single motions of man and the controlled locomotive activity of a mesencephalic cat are discussed to support the hypothesis. V.Z.

**A72-40594 #** Participation of supraspinal structures in the formation and control of a system of arbitrary cyclic motions of man

(Uchastie supraspinal'nykh struktur v formirovaniy i upravlenii sistemoy proizvol'nykh tsiklicheskhkh dvizhenii cheloveka). M. A. Alekseev. In: Mechanisms of descending control of spinal cord activities. Leningrad, Izdatel'stvo Nauka, 1971, p. 144-148. 7 refs. In Russian.

**A72-40595 #** Synchronization in the work of motor neurons during arbitrary motor activity of various types (Sinkhronizatsiia v rabote motoneironov pri raznykh formakh proizvol'noi dvigatel'noi deiatel'nosti). R. S. Person. In: Mechanisms of descending control of spinal cord activities. Leningrad, Izdatel'stvo Nauka, 1971, p. 148-153. 18 refs. In Russian.

**A72-40596 #** Role of efferent influences of tempororhinencephalic cerebral structures in pre-adjustment alterations of spinal motor neuron excitability (Rol' niskhodiaschikh vliianii visochno-rinentsefal'nykh struktur mozga v prednastroechnykh izmeneniakh vozбудimosti spinal'nykh motoneironov). M. N. Fishman. In: Mechanisms of descending control of spinal cord activities. Leningrad, Izdatel'stvo Nauka, 1971, p. 153-156. In Russian.

**A72-40597 #** Vasomotor reflexes and the principle of descending control (Vazomotornye refleksy i printsip niskhodiaschego kontrolya). V. M. Khaiutin. In: Mechanisms of descending control of spinal cord activities. Leningrad, Izdatel'stvo Nauka, 1971, p. 157-170. 48 refs. In Russian.

Consideration of the applicability of the concept of descending control to the reflex activity of the spinal cord involving vegetative processes. The topics include the activity of the bulbar vasomotor center, the latent period of reflex responses, local indications of vasoconstrictor reflexes, inhibition processes in the spinal cord, and the shift of afferent spinal fiber impulses to the functional apparatus of the vasoconstrictor system. Published studies concerning the subjects are discussed. V.Z.

**A72-40598 #** Hypothalamic control of the electrical activity of the spinal cord (Gipotalamicheskaia reguliatsiia elektricheskoi aktivnosti spinnogo mozga). O. G. Baklavdzhian and T. K. Kipriian. In: Mechanisms of descending control of spinal cord activities. Leningrad, Izdatel'stvo Nauka, 1971, p. 170-173. 9 refs. In Russian.

**A72-40599 #** Supraspinal effects in the activity of preganglionic sympathetic neurons delivering axons to the cervical sympathetic nerve (Supraspinal'nye vlianiia na aktivnost' preganglionarnykh simpaticeskikh neironov, posylaiushchikh aksyony v sheinyi simpaticeskii nerv). V. I. Skok and V. N. Mirgorodskii. In: Mechanisms of descending control of spinal cord activities. Leningrad, Izdatel'stvo Nauka, 1971, p. 181-185. 26 refs. In Russian.

**A72-40710 #** Man movements directed at reaching a preset goal (O dvizheniiakh cheloveka, dostigaiushchikh napered zadannoi tseli). G. V. Korenev. *Avtomatika i Telemekhanika*, June 1972, p. 131-142. In Russian.

Study of a man's self-controlled movements directed at reaching his preset goal and self-adjusting to his internal and external environments. These movements are studied in deterministic terms. The human body is regarded as a mechanical plant, and movement control is treated as a deterministic, goal-directed enforcement governed by the laws of mechanics. M.V.E.

**A72-40730** Continuous objective measurement of the accommodation of the human eye (Kontinuierliche objektive Messung der Akkommodation des menschlichen Auges). H. Krueger (München, Technische Universität, Munich, West Germany). (*International Commission for Optics, Symposium on Visual Performance when Using Optical Instruments, Munich, West Germany, July 21-23, 1971.*) *Optica Acta*, vol. 19, May 1972, p. 351-353. 7 refs. Abridged. In German.

**A72-40732** Age dependence of changes in pupil diameter in the dark. F. S. Said and W. S. Sawires (National Research Centre, Cairo, Egypt). (*International Commission for Optics, Symposium on Visual Performance when Using Optical Instruments, Munich, West Germany, July 21-23, 1971.*) *Optica Acta*, vol. 19, May 1972, p. 359-361. 10 refs. Abridged.

The study was made to determine the pupil diameters of Egyptians at different ages, and to compare the results with those obtained from Europeans. The experiment, using a Carl Zeiss fundus camera, was carried out on normal Egyptian males and females whose ages ranged from 7 to 70 yr. It was found that pupil diameter not only varies with age but also with race. The fact that Egyptian pupils are more constricted than those of Europeans of the same age is attributed to the continuous exposure of Egyptian to high levels of luminance, and the highly pigmented iris. F.R.L.

**A72-40733** A model of threshold detection for photopic vision. E. P. Lavin and I. Overington (British Aircraft Corp., Ltd., Guided Weapons Div., Bristol, England). (*International Commission for Optics, Symposium on Visual Performance when Using Optical Instruments, Munich, West Germany, July 21-23, 1971.*) *Optica Acta*, vol. 19, May 1972, p. 365-367. Abridged.

A new basic model of threshold detection for foveal viewing by human observers using the naked eye is proposed. It is based on known physical properties of the human eye and logical assumptions about the primary processing by the neural networks. It assumes detection of simple objects to be defined by the maximum illuminance gradient in the retinal image and the contour length rather than contrast and area. Current applications of the model include its use with known characteristics of an optical system to predict observer performance in a detection task using the system. F.R.L.

**A72-40734** Binoptic summation of liminal stimulation. G. L. Kandel (Rensselaer Polytechnic Institute, Troy, N.Y.). (*International Commission for Optics, Symposium on Visual Performance when Using Optical Instruments, Munich, West Germany, July 21-23, 1971.*) *Optica Acta*, vol. 19, May 1972, p. 369-372. 5 refs. Abridged.

The extent to which the binoptic detection of liminal stimuli is affected when the ratio of the probabilities of detection between both eyes is varied is investigated. Such variation is used to simulate differences in the sensitivities of both eyes. It appears that binoptic detection of liminal flashes for both scotopic and photopic stimuli is superior to detection with one eye. A part of the binoptic superiority can be understood to be a consequence of the randomness of liminal stimulation. F.R.L.

**A72-40735** Discrimination sensitivity and black light density in the mesopic range (Zur Unterschieds-Empfindlichkeit und Schwarz-Leuchtdichte im mesopischen Bereich). S. Kokoschka (Karlsruhe, Universität, Karlsruhe, West Germany). (*International Commission for Optics, Symposium on Visual Performance when Using Optical Instruments, Munich, West Germany, July 21-23, 1971.*) *Optica Acta*, vol. 19, May 1972, p. 373-377. 5 refs. Abridged. In German.

Experimental study of foveal visual activity as a function of wavelength in the mesopic range in an attempt to demonstrate a

Purkinje effect. The foveal visual functions tested were the discrimination sensitivity as a threshold visual function and the black light density as a nonthreshold visual function. In both experiments a shift of the foveal visual functions in the sense of the Purkinje effect is noted, thus suggesting that in the mesopic range the foveal visual functions should not be referred to the photopic light density but to the equivalent light density. A.B.K.

**A72-40736** Study of the diffusing properties of the retina - Application to the optical system of the eye (Etude des propriétés diffusantes de la rétine - Application au système optique de l'oeil). F. Berny (Paris, Université, Institut d'Optique, Orsay, Essonne, France). (*International Commission for Optics, Symposium on Visual Performance when Using Optical Instruments, Munich, West Germany, July 21-23, 1971.*) *Optica Acta*, vol. 19, May 1972, p. 381-383. 6 refs. Abridged. In French.

**A72-40737** Wide-angle optical model of the eye. O. Pomerantzeff, H. Fish, J. Govignon, and C. L. Schepens (Retina Foundation, Boston, Mass.). (*International Commission for Optics, Symposium on Visual Performance when Using Optical Instruments, Munich, West Germany, July 21-23, 1971.*) *Optica Acta*, vol. 19, May 1972, p. 387, 388. Abridged. Research supported by the Massachusetts Lions Eye Research Fund; Grants No. DADA17-69-C-9030; No. PHS-EY-00227.

A mathematic description of the optical system of the eye which truly represents its imaging properties on axis as well as off axis is developed. The internal structural complexity of the crystalline lens, which cannot be studied with biometry in vivo, is the main problem in designing a wide-angle optical model of the eye. In order to define the structure of the crystalline lens optically, it suffices to determine the axial thickness, the aperture, the curvature, and the refractive index of its optical components. F.R.L.

**A72-40738** Meteorological effects on terrestrial scintillation (Meteorologische Einflüsse auf die terrestrische Szintillation). D. Paperlein. (*International Commission for Optics, Symposium on Visual Performance when Using Optical Instruments, Munich, West Germany, July 21-23, 1971.*) *Optica Acta*, vol. 19, May 1972, p. 391-393. 14 refs. Abridged. In German.

Brief analysis of the effects of ground humidity and wind velocity on terrestrial scintillation. It is found that in the presence of adiabatic temperature stratification the scintillation minima occur in humid weather at lower sun elevation angles than in dry weather. In addition, a study is made of the scintillation patterns by day and by night at low elevations above the ground as a function of wind speed. A.B.K.

**A72-40739** Intense spectral light effects on spectral sensitivity. H. G. Sperling (Texas, University, Houston, Tex.) and R. S. Harwerth (Institute of Ophthalmology, Houston, Tex.). (*International Commission for Optics, Symposium on Visual Performance when Using Optical Instruments, Munich, West Germany, July 21-23, 1971.*) *Optica Acta*, vol. 19, May 1972, p. 395-398. 12 refs. Abridged. Grants No. DADA17-67-C-7154; No. NIH-EY-00381.

Exposure of rhesus monkeys to 0.0001 W/ster at the cornea of a 6-nm band centered on 463 nm for 1.5 hours per day for seven consecutive days produced greater than 90% loss of sensitivity over the blue region, which has not recovered in 14 months. The loss closely coincides with the region of the class of cones with 445-nm peak absorption. Exposure for a similar period to 0.001 W/ster at the cornea of a 6-nm waveband centered on 520 nm produced some loss of sensitivity throughout the visible spectrum, but greatest loss in the 500 to 550-nm and 610-nm regions and least loss at 570 to 80 nm, indicating (1) greatest loss of sensitivity of the class of cones with 535-nm peak absorption; and (2) release of the inhibition of the 535-nm class of cones on the 575-nm class of cones which produces the 610-nm peak. (Author)



**A72-40740** Fixation eye movements and the processing of visual information. J. M. Findlay (Durham, University, Durham, England). (*International Commission for Optics, Symposium on Visual Performance when Using Optical Instruments, Munich, West Germany, July 21-23, 1971.*) *Optica Acta*, vol. 19, May 1972, p. 403-407. 12 refs. Abridged.

**A72-40741** A quantitative performance measure for night vision. A. van Meeteren and F. W. Zonneveld (Nederlandse Centrale Organisatie TNO, Soesterberg, Netherlands). (*International Commission for Optics, Symposium on Visual Performance when Using Optical Instruments, Munich, West Germany, July 21-23, 1971.*) *Optica Acta*, vol. 19, May 1972, p. 409-411. Abridged.

A realistic performance measure is described which is based on object recognition experiments. The experiments were performed indoors with simulated scenery in the form of slide projection to allow a better and easier control of parameters than is possible in the field. It is shown that visual performance is improved by the use of an image intensifier. F.R.L.

**A72-40746** Effect of spherical spectacle lenses on the monochromatic aberration of the eye (Über den Einfluss sphärischer Brillengläser auf die monochromatische Aberration des Auges). W. Grimm (München, Universität, Munich, West Germany). (*International Commission for Optics, Symposium on Visual Performance when Using Optical Instruments, Munich, West Germany, July 21-23, 1971.*) *Optica Acta*, vol. 19, May 1972, p. 439-443. Abridged. In German.

**A72-40750** The visibility range when observing an aircraft with and without field-glasses. H.-E. Hoffmann (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Physik der Atmosphäre, Oberpfaffenhofen, West Germany). (*International Commission for Optics, Symposium on Visual Performance when Using Optical Instruments, Munich, West Germany, July 21-23, 1971.*) *Optica Acta*, vol. 19, May 1972, p. 463-466. Abridged.

**A72-40751** Relation of optical and labyrinthian orientation. G. A. Brecher, M. H. Brecher, G. Kommerell, F. A. Sauter, and J. Sellenbeck (Universitäts-Augenklinik, Freiburg im Breisgau, West Germany). (*International Commission for Optics, Symposium on Visual Performance when Using Optical Instruments, Munich, West Germany, July 21-23, 1971.*) *Optica Acta*, vol. 19, May 1972, p. 467-471. 5 refs. Abridged. Research supported by the Deutsche Forschungsgemeinschaft and FAA.

An attempt is made to quantify the contribution of vestibular and optical stimulation for human orientation. Use was made of a Barany chair fixed to a rotating platform and surrounded by an optokinetic drum with black and white vertical stripes. Speeds, accelerations and decelerations of both the chair and the drum could be independently controlled and recorded. It is shown that optical and vestibular stimulation interact. The optical stimulation can even contribute more to orientation or disorientation in space than a counteracting input from the semicircular canals. F.R.L.

**A72-40752** Cortico-visceral interrelations in physiology, biology and medicine (Kortiko-vistseral'nye vzaimootnosheniia v fiziologii, biologii i meditsine). Edited by V. N. Chernigovskii. Leningrad, Izdatel'stvo Nauka, 1971. 207 p. In Russian.

Studies of the influence of the cortex on the physiology of internal organs are included. The relations between the brain and the motor and secretory activities of the digestive system, afferent processes in interoceptive reflexes, the pathology of the cardiovascular system, and erythropoiesis control are covered.

V.Z.

**A72-40753 #** Cerebral apparatuses and internal analysors (Apparaty mozga i vnutrennie analizatory). E. Sh. Airapet'iants (Akademii Nauk SSSR, Institut Fiziologii, Leningrad, USSR). In: Cortico-visceral interrelations in physiology, biology and medicine. Leningrad, Izdatel'stvo Nauka, 1971, p. 29-41. 55 refs. In Russian.

The author's work relating to the mechanisms and morpho-physiological structures of the visceral analysors is reviewed. Evidence is given for the localization of the nuclei of visceral apparatuses in the motor, premotor, frontal and limbic sections of the cerebrum. Studies of the morphology and physiology of limbic fields and of their interrelations with the lateral fields of the visceral-cortex are discussed. The role of thalamic nuclei in the structure of visceral analysors is described with special attention to the afferent switching mechanism of the thalamic apparatus. V.Z.

**A72-40754 #** Role of the hypothalamus and limbic system in the regulation of the motor and secretory functions of the digestive apparatus (Rol' gipotalamusa i limbicheskoi sistemy v regulatsii motornoi i sekretornoj funktsii pishchevaritel'nogo apparata). P. G. Bogach (Kievskii Gosudarstvennyi Universitet, Kiev, Ukrainian SSR). In: Cortico-visceral interrelations in physiology, biology and medicine. Leningrad, Izdatel'stvo Nauka, 1971, p. 41-50. 32 refs. In Russian.

**A72-40755 #** Characteristics of the afferent link of interoceptive reflexes (Osobennosti afferentnogo zvena interotseptivnykh refleksov). I. A. Bulygin (Akademii Nauk Belorusskoi SSR, Institut Fiziologii, Minsk, Belorussian SSR). In: Cortico-visceral interrelations in physiology, biology and medicine. Leningrad, Izdatel'stvo Nauka, 1971, p. 50-63. 45 refs. In Russian.

An analysis of the receptor function of sympathetic ganglions leads to the conclusion that the sympathetic and somatic afferents form discontinuous visceral links between internal organs and the cerebrum. Evidence is also presented for the existence of a polysynaptic sympatho-reticular afferent mechanism in interoceptive reflex fields. These findings are discussed to obtain an understanding of the physiological meaning of the afferent component of interoceptive and exteroceptive reflexes. V.Z.

**A72-40756 #** Pathology of the cardiovascular system in terms of the theory of cortico-visceral interrelations (Patologiya serdechno-sosudistoi sistemy s pozitsii ucheniia o kortiko-vistseral'nykh vzaimootnosheniakh). Z. M. Volynskii. In: Cortico-visceral interrelations in physiology, biology and medicine. Leningrad, Izdatel'stvo Nauka, 1971, p. 70-75. In Russian.

**A72-40757 #** Reticular formation and cortico-visceral interrelations (Retikuliarnaia formatsiia i kortiko-vistseral'nye vzaimootnosheniia). A. I. Karaev. In: Cortico-visceral interrelations in physiology, biology and medicine. Leningrad, Izdatel'stvo Nauka, 1971, p. 76-80. 12 refs. In Russian.

Studies of the effects of stimulation and destruction of various sections of spinal cord reticular formations on the electroencephalogram, cardiac activity and interoceptive glycemic reflexes are discussed. The effects of adreno- and cholino-reactive preparations are also covered, showing a significant role of reticular formations in the activation of interoceptive glycemic reflexes. V.Z.

**A72-40758 #** Conditioned reflex influences in vessels (Ob uslovnoreflektornykh vlianiiax na sosudy). G. P. Konradi and V. V. Orlov (Akademii Nauk SSSR, Institut Fiziologii, Leningrad, USSR). In: Cortico-visceral interrelations in physiology, biology and medicine. Leningrad, Izdatel'stvo Nauka, 1971, p. 90-98. 21 refs. In Russian.

Blood stream measurements were made in human extremities by occlusive plethysmography and the blood pressure was recorded in dogs and rabbits in which various conditioned reflexes were produced in several series of chronic experiments. Statistical analysis of the results showed that the blood vessel reactions characteristic of natural defence reflexes could also be produced by conditioned reflexes in man and animals. The mechanisms of cortical effects in blood vessels are discussed on the basis of the experiments. V.Z.

**A72-40759 #** Mechanisms of cortico-visceral interrelations (Mekhanizmy kortiko-vistseral'nykh vzaimosvyezii). I. T. Kurtzin (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). In: Cortico-visceral interrelations in physiology, biology and medicine. Leningrad, Izdatel'stvo Nauka, 1971, p. 99-120.

158 refs. In Russian.

A review of a large volume of available experimental results leads to the conclusion that a concordant positive opinion concerning the influence of the cortex on the vegetative system of the animal organism has not yet been reached in physiology. The author's studies of biological oxidation processes and of a group of organic phosphorus compounds are quoted as positive contributions to an insight in the mechanisms of cortical effects in the vegetative system. Approaches to further cortico-visceral studies are suggested. V.Z.

**A72-40760 #** Cortical metabolism regulation and effector systems of the adaptation process (Kortikal'naia reguliatsiia obmena veshchestv i effektornye sistemy v protsesse adaptatsii). R. P. Ol'nianskaia and A. D. Slonim (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). In: Cortico-visceral interrelations in physiology, biology and medicine. Leningrad, Izdatel'stvo Nauka, 1971, p. 120-130. 41 refs. In Russian.

The place of conditioned reflexes in modern studies of physiological adaptation is discussed. Experimental data are quoted as evidence for the participation of specific individual muscles and groups of muscles in metabolic processes at rest, during cooling, and during the formation of conditioned reflexes involving gas metabolism during local cooling under small muscular loads. Experiments in which gas metabolism was measured and bioelectrical activity was simultaneously recorded in various muscles are described. V.Z.

**A72-40761 #** Physiological studies of a so-called arbitrary respiration regulation in man (Fiziologicheskie issledovaniia tak nazyvaemoi proizvol'noi reguliatsii dykhaniia u cheloveka). K. M. Smirnov (Gosudarstvennyi Institut Usovshenstvovaniia Vrachei, Leningrad, USSR). In: Cortico-visceral interrelations in physiology, biology and medicine. Leningrad, Izdatel'stvo Nauka, 1971, p. 155-160. 24 refs. In Russian.

Discussion of experiments in which the subjects were to change their breathing rates in response to arbitrary oral instructions in step with the ticking of a metronome. The changes in the functional state of the nervous system, in the tonus of the smooth muscles of the bronchi, and in gas metabolism rates during the experiments are noted and are found to have a nature of reflex responses. The occurrence in the subjects of simultaneous secondary uncontrolled responses is also noted during the experiments. V.Z.

**A72-40762 #** Regulation of the blood system (O reguliatsii sistemy krovi). A. Ia. Iaroshevskii. In: Cortico-visceral interrelations in physiology, biology and medicine. Leningrad, Izdatel'stvo Nauka, 1971, p. 182-187. 16 refs. In Russian.

Blood serum from healthy subjects, anemic subjects and subjects with some skin diseases was added to bone marrow cultures in a study of nervous and humoral stimulation, inhibition and control of erythropoiesis. Experiments were also carried out to determine the effect of hypoxia on erythropoiesis. A general scheme of erythropoiesis control is developed on the basis of the results. V.Z.

**A72-40769** Vectorcardiographic and electrocardiographic differentiation between cor pulmonale and anterior wall myocardial infarction. Y. Watanabe, K. Nishijima, H. Richman, and E. Simonson (Mount Sinai Hospital; U.S. Veterans Administration Hospital, Minneapolis, Minn.). *American Heart Journal*, vol. 84, Sept. 1972, p. 302-309. 6 refs. Grant No. NIH-HE-11325.

**A72-40803 #** Higher nervous activity of monkeys two years after the extirpation of the dorsolateral frontal cortex (Vysshiaia nervnaia deiatel'nost' obez'ian cherez dva goda posle ekstirpatsii dorzo-lateral'noi lobnoi kory). N. I. Lagutina (Akademiia Meditsinskikh Nauk SSSR, Sukhumi, USSR) and L. N. Norkina (Voroshilovgradskii Meditsinskii Institut, Voroshilovgrad, Ukrainian SSR). *Zhurnal Vysshei Nervnoi Deiatel'nosti*, vol. 22, May-June 1972, p. 451-458. 20 refs. In Russian.

**A72-40804 #** Characteristics of certain parameters of memory for visual signals in lower monkeys (Kharakteristika nekotorykh parametrov pamiati na zaritel'nye signaly u nizshikh obez'ian). O. P. Bolotina (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). *Zhurnal Vysshei Nervnoi Deiatel'nosti*, vol. 22, May-June 1972, p. 459-465. 27 refs. In Russian.

Study of the memory for visual stimuli in eight baboons (six intact and two with surgically removed areas of the prefrontal cortex), using Konorski's and Chorazyna's methods of food reinforcement. A positive reflex was elaborated to a chain stimulus consisting of two different photic signals separated by a three-second interval and varying in color. An inhibitory reflex was also elaborated to a chain stimulus, but to one consisting of identical signals. The nervous traces from the first stimulus of the chain in the case of a sudden prolongation of the pause between the components persisted in the intact and operated animals no longer than two minutes. The reflexes (long-term memory), and in particular, the positive reflex, were elaborated more rapidly in the intact than in the operated monkeys. After a two- to three-month interval the retention of both the intact and operated monkeys was impaired to about the same degree. A.B.K.

**A72-40805 #** Effect of electrical excitation of various auditory analyzer levels on a conditioned motor reflex (Vliianie na dvigatel'nyi uslovnyi refleks elektricheskogo razdrzheniia razlichnykh urovnei slukhovogo analizatora). D. P. Postolake (Akademiia Nauk Moldavskoi SSR, Institut Zoologii, Kishinev, Moldavian SSR). *Zhurnal Vysshei Nervnoi Deiatel'nosti*, vol. 22, May-June 1972, p. 483-490. 33 refs. In Russian.

**A72-40806 #** Evoked potentials of the primary auditory cortical zone produced by positive and inhibitive conditioned stimuli (Vyzvannye potentsialy pervichnoi slukhovoii zony kory na polozhitel'nyi i tormoznyi uslovnye razdrzhiteli). I. N. Tveritskaia (Akademiia Nauk SSSR, Institut Vysshei Nervnoi Deiatel'nosti i Neirofiziologii, Moscow, USSR). *Zhurnal Vysshei Nervnoi Deiatel'nosti*, vol. 22, May-June 1972, p. 498-503. 29 refs. In Russian.

**A72-40807 #** Role of afferent and efferent connections in the formation and reproduction of trace processes in man (Rol' priamnykh i obratnykh svyazei v formirovanii i vosproizvedenii sledovykh protsessov u cheloveka). V. F. Kononov (Akademiia Nauk SSSR, Institut Biologicheskoi Fiziki, Pushchino-na-Oka, USSR). *Zhurnal Vysshei Nervnoi Deiatel'nosti*, vol. 22, May-June 1972, p. 520-528. 39 refs. In Russian.

Bipolar electroencephalograms of left and right occipital and rolandic areas, wrist muscle electrical activity, cutaneous galvanic reactions and oculomotor reactions were recorded in 45 to 60-min experiments on 36 subjects. Trace processes in response to con-

ditioned tactile and proprioceptive stimuli were evoked by exposure to light 3, 6, 9, 12, 15, 30, and 45 sec following stimulation. The formation and reproduction of trace processes during exposures to light is found to be linked to the afferent and efferent elements of analysors receiving conditioned and trace-evoking stimuli. V.Z.

**A72-40808 #** Some structural and functional characteristics of a retina projection onto the visual cortex of cats (Nekotorye strukturno-funktsional'nye kharakteristiki proektsii setchatki v zritel'nykh koru koshki). N. N. Liubimov, V. M. Krol', and A. G. Skripnikov (Akademiia Meditsinskikh Nauk SSSR; Akademiia Nauk SSSR, Institut Problem Upravleniia, Moscow, USSR). *Zhurnal Vysshoi Nervnoi Deiatel'nosti*, vol. 22, May-June 1972, p. 576-581. 17 refs. In Russian.

**A72-40809 #** Role of the reticular formation of the mid-brain in the storage and recreation of a system of conditioned reflexes (Rol' retikulirnoi formatsii srednego mozga v protsesse sokhraneniia i vosproizvedeniia sistemy uslovnnykh reflektsov). E. M. Farberova (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR). *Zhurnal Vysshoi Nervnoi Deiatel'nosti*, vol. 22, May-June 1972, p. 610-612. 9 refs. In Russian.

**A72-40810 #** An assembly for studying the perceptive motor reactions of man under one-dimensional follow-up conditions (Ustanovka dlia izucheniia perseptivno-motornykh reakttsii cheloveka v usloviakh odnomernogo sledzheniia). V. S. Shneiderov (Akademiia Pedagogicheskikh Nauk SSSR, Leningrad, USSR). *Zhurnal Vysshoi Nervnoi Deiatel'nosti*, vol. 22, May-June 1972, p. 628-630. In Russian.

**A72-40811 #** Conditioned reflex theory, the principle of association, and new criticisms of it (Uslovnoreflektornaia teoriia, printsip assotsiatsii i novye ikh kritiki). E. A. Asratian (Akademiia Nauk SSSR, Institut Vysshoi Nervnoi Deiatel'nosti i Neurofiziologii, Moscow, USSR). *Zhurnal Vysshoi Nervnoi Deiatel'nosti*, vol. 22, May-June 1972, p. 631-649. In Russian.

Review of the development of Pavlov's conditioned reflex theory and of his contribution to determining the role of association in brain activity, and evaluation of various criticisms of Pavlov's work. The specific features of the manifestation of the basic principles of general reflex theory in its conditioned reflex variant are noted, as well as Pavlov's concept of the fundamental identity between association and conditioned reflex, and his biological classification of various types of associations. In contrast to Pavlov's conception of the conditioned reflex as the central phenomenon in higher nervous activity and of association as the basis of psychic activity, a number of critics of Pavlov who tend to reduce his concepts to an extremely mechanistic and overly simplistic level are noted. A.B.K.

**A72-40912** Thickness control in the living cornea. M. H. Friedman (Johns Hopkins University, Silver Spring, Md.). *APL Technical Digest*, vol. 11, Jan.-Feb. 1972, p. 15-23. 13 refs. Grant No. PHS-NS-07226.

The mechanisms by which the normal cornea maintains its thickness and hence its transparency in vivo are elucidated by an unsteady-state description of corneal mass transport. All modes of transport - diffusion and convection of solute, hydraulic and osmotic flow of solvent, and active transport by the corneal cells themselves - are of necessity included in the analysis. An a priori calculation of corneal dynamics based on this model shows good agreement with experiment. The physiological insights thus gained have clinical implications as well, and a number of these are mentioned briefly.

(Author)

**A72-40917** A mathematical model of the chemoreflex control of ventilation. J. Duffin (Hammersmith Hospital, London, England). *Respiration Physiology*, vol. 15, July 1972, p. 277-301. 54 refs.

Description of a mathematical model of the chemical control of ventilation mediated by the central and peripheral chemoreceptors. The chemoreflex model consists of algebraic equations relating ventilation and arterial oxygen and carbon dioxide partial pressures. It includes the subdivision of the ventilatory response to CO<sub>2</sub> into central and peripheral components, and the interaction of hypoxia and CO<sub>2</sub> at the peripheral chemoreceptors. The common basis of the chemoreflex equations is a pharmacological model - namely, the rectangular hyperbolic stimulus-response curve. The chemoreflex equations were linked to a simple, mathematical model of the respiratory process, consisting of a single alveolus lung and a tissue storage compartment, to form a model of the respiratory control system. The resulting set of nonlinear first-order differential equations was solved by simulation on an analog computer. The performance of the respiratory control system model during changes in the inspired fractions of O<sub>2</sub> and CO<sub>2</sub> approximates that of man, and it was concluded that the chemoreflex equations approximate the exact mathematical description of the chemoreflex control of ventilation. (Author)

**A72-40918** Separation of central effects of CO<sub>2</sub> and nicotine on ventilation and blood pressure. L. E. McCarthy and H. L. Borison (Dartmouth Medical School, Hanover, N.H.). *Respiration Physiology*, vol. 15, July 1972, p. 321-330. 21 refs. Grant No. PHS-NS-04456.

**A72-40919** Comparative studies of the respiratory functions of mammalian blood. D. S. Dhindsa, J. Metcalfe, and A. S. Hoversland (Oregon, University, Portland, Ore.). *Respiration Physiology*, vol. 15, July 1972, p. 331-342. 18 refs. Research supported by the Oregon Heart Association; Grants No. NIH-HE-05499; No. NIH-HE-06042.

Study of the respiratory characteristics of blood from 12 ring-tailed and 10 black lemurs. The animals were adults of both sexes. The results of the study indicate a trend toward decreasing blood oxygen affinity as one ascends the primate evolutionary scale, which may be secondary to the trend toward a larger adult body weight. M.V.E.

**A72-40924** Impaired hearing of the aviator (Hipoacusias del aviador). P. Gómez Cabezas (Ministerio del Aire, Madrid, Spain). *Revista de Aeronáutica y Astronáutica*, vol. 32, July 1972, p. 495-504. In Spanish.

An audiological survey of more than 2000 pilots with more than 1500 hours of flight time revealed perceptible hearing loss in more than 16 per cent of the group. Aircrew are subjected to high noise levels, vibrations, accelerations, and more or less sudden changes of atmospheric pressure. Impaired hearing due to transmission and perception, the interaction of transmission and perception systems, and the influence of jet flight are discussed. Procedures for prophylaxis and treatment are outlined. F.R.L.

**A72-40973** Aerospace medical research in defense systems development. G. E. Schafer (USAF, Aerospace Medical Div., Brooks AFB, Tex.). *Defense Management Journal*, vol. 8, July 1972, p. 39-44.

The work of the Aerospace Medical Division (AMD) of the Air Force Systems Command is directed towards establishing a clearer understanding of man's capabilities and limitations. The laboratories of AMD are engaged in closely interrelated research and development which ranges from defense research sciences to engineering development. The AMD maintains a strong in-house program and a relatively

small contractual effort. AMD's capabilities include a dynamic environmental simulator, a vibration and impact research facility, a human centrifuge, a sixteen-man test cell, a climatic chamber, a human engineering facility, and a toxicology research facility. G.R.

**A72-40991 # Laser beam effect in the rabbit liver (Vliianie luchei lazera na pechen' krolika).** B. V. Ognev, A. A. Vishnevskii, R. A. Troitskii, E. V. Kegum, B. A. Razygrin, and G. F. Fedotkin (Akademii Meditsinskikh Nauk SSSR; Ministerstvo Zdravookhraneniia SSSR, Tsentral'nyi Institut Usovershenstvovaniia Vrachei, Moscow, USSR). *Biulleten' Eksperimental'noi Biologii i Meditsiny*, vol. 73, June 1972, p. 20-23. 8 refs. In Russian.

Pulsed laser light caused local necrosis of the liver tissue in rabbits, leading to hemorrhage and blood vessel thrombosis. Experiments showed that bloodless incisions of liver parenchyma could be performed with continuous laser beams. Healing of the scar set in by the 5th day following the operation. Vascularization of the liver tissue after incision by a pulsed laser beam was restored by the 15 to 30th day following the operation. V.Z.

**A72-41015 Two explanations of temporal changes in ability-skill relationships - A literature review and theoretical analysis.** K. M. Alvares and C. L. Hulin (Illinois, University, Chicago, Ill.). *Human Factors*, vol. 14, Aug. 1972, p. 295-308. 34 refs. Contract No. F41609-70-C-0027.

**A72-41016 Team size and decision rule in the performance of simulated monitoring teams.** W. L. Waag and C. G. Halcómb (Texas Tech University, Lubbock, Tex.). *Human Factors*, vol. 14, Aug. 1972, p. 309-314. 5 refs. Grant No. DAAD05-69-C-0102. Project THEMIS.

**A72-41017 Proximity and direction of arrangement in numeric displays.** R. M. Woodward, Jr. (North American Rockwell Corp., Los Angeles, Calif.). *Human Factors*, vol. 14, Aug. 1972, p. 337-343. 5 refs.

Comparison of number pairs as studied by Williams (1966) is made, and in addition to the vertical-horizontal factor, the effects of proximity and the effects of rows vs columns of number pairs are examined. The experiment shows that, for the task of comparing three-digit numbers, performance time is a function both of arrangement orientation and of proximity of the numbers being compared. F.R.L.

**A72-41018 Another look at blinking displays.** S. L. Smith and N. C. Goodwin (Mitre Corp., Bedford, Mass.). *Human Factors*, vol. 14, Aug. 1972, p. 345-347. Contract No. F19628-71-C-002.

Twelve subjects scanned displayed prose passages to detect randomly inserted letter substitution errors. In comparison with steady displays, this check-reading task was performed 10% more slowly but with equal accuracy when the displayed material blinked at a 3-Hz rate. Although the potential value of blink coding confirmed in previous research is not questioned, the reduction in readability of blinking displays demonstrated in the present study suggests that some precautions must be taken in the practical application of this display coding technique. (Author)

**A72-41019 # Body orientation under vertical sinusoidal vibration.** W. L. Johnston (Texas A & M University, College Station, Tex.) and M. M. Ayoub (Texas Tech University, Lubbock, Tex.). *Human Factors*, vol. 14, Aug. 1972, p. 349-356. Grant No. DAAD05-69-C-0102. Project THEMIS.

Investigation of human performance during a low-frequency vibratory environment. The performance measures of interest were

the accuracy and total time of a whole-body orientation task. A zero-vibration condition, as well as frequencies of 2, 5, and 8 Hz, were studied. Amplitude was held constant at 0.09 in., resulting in acceleration intensities from 0.04 to 0.58 g. Twenty male subjects participated in the investigation in both sitting and standing body positions. The task used in this investigation was a body orientation task that required subjects to orient their bodies as quickly and as accurately as possible toward one of a series of colored lights located at angles of 15, 30, and 60 deg on either side of a zero reference plane. The results indicated that the shortest travel time was obtained under zero-vibration conditions but that most accurate performance was obtained under vibrations of 2 Hz. Differences in performance were also found between the two body positions and direction of orientation. (Author)

**A72-41020 The measurement of orthostatic tolerance.** E. Shvartz (Tel-Hashomer Hospital, Israel). *Human Factors*, vol. 14, Aug. 1972, p. 357-362. 18 refs.

The problem of orthostatic tolerance is discussed with respect to the factors affecting it, methods of assessment, and the analysis of orthostatic data. Orthostatic heart rate and blood pressure and responses of fainters and nonfainters measured by different methods are illustrated. It is shown that different tilt tables result in similar orthostatic responses, that results obtained in standing are not necessarily related to tilt-table responses, that qualitative and quantitative orthostatic responses are closely related, and that reclining heart rate alone can indicate tilt tolerance. (Author)

**A72-41021 Perceptual differentiation of sequential visual patterns.** J. S. Lappin and H. H. Bell (Vanderbilt University, Nashville, Tenn.). *Perception and Psychophysics*, vol. 12, no. 2A, Aug. 1972, p. 129-134. 16 refs.

Two experiments examined the ability to perceive a difference between two sequentially presented visual patterns. An otherwise undetectable camouflaged target form was made visible by the sequential presentation of two random-contoured patterns that were identical except for the presence of the camouflaged form in one of the patterns. Experiment 1 found that form identifications became less accurate as a function of the luminance and contours of an intervening stimulus pattern and as a function of the ISI, falling to nearly a chance level by only 30 msec. Experiment 2 illustrated contrasts in stimulus conditions and in temporal characteristics of the differentiation and the integration of sequential visual patterns. (Author)

**A72-41022 Target distance and adaptation in distance perception in the constancy of visual direction.** H. Wallach, G. S. Yablick, and A. Smith (Swarthmore College, Swarthmore, Pa.). *Perception and Psychophysics*, vol. 12, no. 2A, Aug. 1972, p. 139-145. 9 refs. NIH-supported research.

Experimental demonstration that the natural combination of accommodation and convergence can provide information needed by the nervous system to compensate for target displacement when the head of the viewer is in turning or nodding motion. It is also found that an adaptation in terms of constancy of visual direction can be achieved in viewers with eyeglasses. Details are given on two adaptation experiments with near targets and eyeglasses. V.Z.

**A72-41023 The detectability of a brief gap in a pulse of light as a function of its temporal location within the pulse.** L. H. Theodor (York University, Downsview, Ontario, Canada). *Perception and Psychophysics*, vol. 12, no. 2A, Aug. 1972, p. 168-170. 6 refs. National Research Council of Canada Grant No. APA-300.

A signal detection experiment was carried out to test the hypothesis that the detectability of a brief gap of fixed duration in a pulse of light would vary with its temporal location in the pulse. For five of six Os, as the gap occurred later and later in the pulse, gap

detectability increased until just prior to the end of the pulse, where a sharp decrease was found. The finding was replicated in a seventh O and the decrease in detectability near the end was found to be attributable to the temporal proximity of the end of the pulse. The results are interpreted in terms of the effects of light adaptation and masking. (Author)

**A72-41024**      **Apparent movement and change in perceived location of a stimulus produced by a change in accommodative vergence.** H. Ono, A. Wilkins, P. Muter, and L. Mitson (York University, Toronto, Canada). *Perception and Psychophysics*, vol. 12, no. 2A, Aug. 1972, p. 187-192. 7 refs. National Research Council of Canada Grant No. A-0296.

The apparent movement of stimuli which accompanies accommodative vergences can be explained by Hering's principles of visual direction with an additional postulate. The model predicts that the extent of movement is determined by the orientation of the two eyes and the location of the egocenter. Experiment 1 demonstrated the importance of phoria and the possible importance of the location of the egocenter in determining movement. In Experiment 2, the convergence error for one stimulus was eliminated. The change in procedure produced changes in movement consistent with the model. The fact that phorias of both eyes affect the extent of movement cannot be reconciled with Walls's hypothesis that the visual system monitors only the efference to one eye. (Author)

**A72-41110**      **Flight noise of aircraft and the subjective judgment of its annoyance.** M. I. Nekipelov (Irkutskii Gosudarstvennyi Meditsinskii Institut, Irkutsk, USSR). (*Akusticheskii Zhurnal*, vol. 18, Jan.-Mar. 1972, p. 74-81.) *Soviet Physics - Acoustics*, vol. 18, July-Sept. 1972, p. 58-63. 18 refs. Translation.

Description of noise measuring equipment which was used at the Irkutsk airport and in nearby areas to determine aircraft noise at different distances from the landing strip for its assessment as a public nuisance. The equipment operated at 45 Hz through 11.2 kHz and included a microphone, a noise measurer, a recorder, a magnetophone, and a 45 Hz to 23 kHz spectrometer. Noise data were collected for 1500 flights of Tu-104 turboprops and from questionnaires passed over to 2260 local residents. The spectral changes in aircraft noise were found to be consistent with the Doppler effect. Combinations of various factors influencing the reactions of local residents to noise are discussed. V.Z.

**A72-41188 #**      **Behavior of some enzymatic activities of serum in polytraumatized subjects (Comportamento di alcune attività enzimatiche del siero in politraumatizzati).** G. Paolucci, G. Blundo, and A. Balla (Aeronautica Militare, Centro di Studi e Ricerche di Medicina Aeronautica e Spaziale, Rome, Italy). (*INATO, AGARD, Congresso, Oporto, Portugal, June 23-26, 1971.*) *Rivista di Medicina Aeronautica e Spaziale*, vol. 35, Jan.-June 1972, p. 3-17. 11 refs. In Italian.

Results of a study of the changes occurring in certain blood serum enzymes in human subjects who were seriously injured in automobile accidents. The particular enzymes studied were glutamic-oxalacetic transaminase, glutamic-pyruvic transaminase, lactic dehydrogenase, malic dehydrogenase, aldolase, and both alkaline and acid phosphatase. It is found that the activity of these enzymes increases noticeably as a result of serious traumatism, and that there is a close correlation between enzymatic activity and bodily damage. It is concluded that it is possible to evaluate the seriousness of a trauma by measuring enzymatic activity. A.B.K.

**A72-41189 #**      **Experimental studies of the production of erythropoietin in relation to the intensity and duration of hypoxia (Indagini sperimentali sulla produzione dell'eritropoietina in rappor-**

to all'intensita' e durata dell'ipossia). G. F. Sasso, F. Rossanigo, A. Donnanno, G. Forchi, and C. Peschle (Napoli, Università, Naples; Roma, Università; Aeronautica Militare, Centro di Studi e Ricerche di Medicina Aeronautica e Spaziale, Rome, Italy). *Rivista di Medicina Aeronautica e Spaziale*, vol. 35, Jan.-June 1972, p. 18-26. 10 refs. In Italian.

**A72-41190 #**      **Studies of renal and extrarenal production of erythropoietin in male and female rats (Indagini sulla produzione renale ed extrarenale di eritropoietina in ratti di sesso maschile o femminile).** G. F. Sasso, F. Rossanigo, G. Forchi, and C. Peschle (Napoli, Università, Naples; Roma, Università; Aeronautica Militare, Centro di Studi e Ricerche di Medicina Aeronautica e Spaziale, Rome, Italy). *Rivista di Medicina Aeronautica e Spaziale*, vol. 35, Jan.-June 1972, p. 27-35. 5 refs. In Italian.

**A72-41191 #**      **Hematological modifications due to acute exposure to heat (Modificazioni ematologiche per esposizione acuta al calore).** P. Rota (Aeronautica Militare, Centro di Studi e Ricerche di Medicina Aeronautica e Spaziale, Rome, Italy). *Rivista di Medicina Aeronautica e Spaziale*, vol. 35, Jan.-June 1972, p. 36-50. 14 refs. In Italian.

Study of the immediate and delayed modifications of morphological elements of the blood in mice exposed acutely to radiant heat of varying intensity as a possible emergency condition arising in the course of aircraft and space flights. It is found that in mice exposed to acute dosages of infrared radiation numerous modifications of these morphological elements took place, in particular, a significant delayed reduction in the number of red blood corpuscles, and a noticeable and significant reduction, both immediately and some time afterward, in the number of platelets, accompanied by evidence of tissular microscopic hemorrhages. A.B.K.

**A72-41192 #**      **The use of cholesteric liquid crystals in the study of skin temperature and their applications in aviation medicine (L'impiego dei cristalli liquidi di colesterolo nello studio della temperatura cutanea e loro applicazioni in medicina aeronautica).** A. Balla, A. Romanin, and P. Rota (Aeronautica Militare, Centro di Studi e Ricerche di Medicina Aeronautica e Spaziale, Rome, Italy). *Rivista di Medicina Aeronautica e Spaziale*, vol. 35, Jan.-June 1972, p. 51-61. 6 refs. In Italian.

Consideration of the use of cholesteric liquid crystals as heat detectors in studies of skin temperature. These substances are distinguished by the fact that they pass from the solid state to the liquid state through an intermediate liquid-crystal state in which the mechanical properties of liquids and the optical properties of solids coexist. With an increase in temperature these liquid crystals undergo a whole range of color changes which make these crystals suitable for skin temperature studies. On the basis of the authors' personal experience with these materials recommendations are made concerning the proper method of applying them to skin areas under study, the results of the use of cholesteric liquid crystals in actual skin tests are cited, and the possibility of using these crystals as cutaneous heat detectors in aviation medicine is considered. A.B.K.

**A72-41193 #**      **The Macruz index and its clinical evaluation in electrocardiography with regard to the selection and control of air crews (L'indice di Macruz e la sua valutazione clinica in elettrocardiografia in tema di selezione e controllo del personale navigante).** E. Busnengo (Aeronautica Militare, Centro di Studi e Ricerche di Medicina Aeronautica e Spaziale, Rome, Italy). *Rivista di Medicina Aeronautica e Spaziale*, vol. 35, Jan.-June 1972, p. 62-72. 33 refs. In Italian.

**A72-41194 #** Variations of the blood coagulation phenomenon in traumatized animals (Variazioni del fenomeno coagulativo del sangue in animali traumatizzati). G. Paolucci (Aeronautica Militare, Centro di Studi e Ricerche di Medicina Aeronautica e Spaziale, Rome, Italy). *Rivista di Medicina Aeronautica e Spaziale*, vol. 35, Jan.-June 1972, p. 73-83. In Italian.

Study of the blood coagulation behavior in rats subjected to discretely intense trauma resulting from a fall from a height. In these tests a hypercoagulability of the blood, clearly evident an hour after the trauma, was noted, but after 24 hours the phenomenon regressed. It is suggested that this phenomenon may be attributed to an increase in extrinsic thromboplastin in the circulation, coming from the damaged tissues. A.B.K.

**A72-41195 #** Effect of neurohomologous phospholipids associated with other substances on experimental intoxication by asymmetrical dimethylhydrazine. II - Biochemical aspects of the pyridoxine-phospholipid association (Effetto dei fosfolipidi neuroomologhi associati ad altre sostanze sull'intossicazione sperimentale da dimetilidrazina asimmetrica. II - Aspetti biochimici dell'associazione piridossina-fosfolipidi). G. Maniero, G. Toffano, and P. Vecchia. *Rivista di Medicina Aeronautica e Spaziale*, vol. 35, Jan.-June 1972, p. 84-96. 5 refs. In Italian.

**A72-41196 #** Catecholamines - Adrenaline and noradrenaline (Le catecolamine - Adrenalina e noradrenalina). G. Paolucci and G. Blundo (Aeronautica Militare, Centro di Studi e Ricerche di Medicina Aeronautica e Spaziale, Rome, Italy). *Rivista di Medicina Aeronautica e Spaziale*, vol. 35, Jan.-June 1972, p. 97-114. 52 refs. In Italian.

Review of the metabolic stages of production of adrenaline and noradrenaline and of their mechanism of action, and evaluation of studies of catecholamine secretion under various physiological and pathological conditions. It is found that the two catecholamines considered increase under various conditions of stress and normal activity and reach extraordinarily high values in some pathological situations (medullo-adrenal tumors). It is concluded that the determination of catecholamines could be used as a method of detecting emotional states undergone in flight, particularly by young pilot cadets during the training and flight apprenticeship phase. A.B.K.

**A72-41231 #** Design of vibration absorbers minimizing human discomfort. N. Fujiwara and Y. Murotsu (Osaka Prefecture University, Sakai, Osaka, Japan). In: Japan National Congress for Applied Mechanics, 20th, Tokyo, Japan, October 23, 24, 1970, Proceedings. Tokyo, Central Scientific Publishers, 1971, p. 39-44. 7 refs. Research supported by the Sakkokai Foundation.

**A72-41250** Parametric adjustment to a shifting target alternating with saccades to a stationary reference point. G. E. Weisfeld (Tufts University, Medford, Mass.). *Psychonomic Science*, vol. 28, July 25, 1972, p. 72-74. 8 refs.

**A72-41253** The effect of size, retinal locus, and orientation on the visibility of a single afterimage. J. Atkinson (Cambridge University, Cambridge, England). *Perception and Psychophysics*, vol. 12, no. 2B, Aug. 1972, p. 213-217. 36 refs.

**A72-41254** Interactions between spatial and kinetic dimensions in movement aftereffect. C. Bonnet and V. Pouthas (Paris V, Université, Laboratoire de Psychologie Experimentale et Comparée, Paris, France). *Perception and Psychophysics*, vol. 12, no.

2B, Aug. 1972, p. 193-200. 18 refs.

In some conditions, the surface of the test figure on which one sees an aftereffect of movement does not fit with that part of the visual field previously adapted to a movement. Such an effect, called kinetic-figural effect, may be conceived of as resulting from an interaction between two perceptual systems, each one giving specific information: one for the kinetic aspects which are spatially defined, the other for the spatial relationship inside the visual field. Experiments are presented which indicated the validity of a 'law of location' for a movement aftereffect, together with some effects of the spatial relationships between adapting and test fields upon the movement aftereffect. (Author)

**A72-41255** Temporal and spatial characteristics of selective encoding from visual displays. C. W. Eriksen and J. E. Hoffman (Illinois University, Urbana, Ill.). *Perception and Psychophysics*, vol. 12, no. 2B, Aug. 1972, p. 201-204. 8 refs. Grant No. PHS-MH-1206.

The time required for Ss to voice a target letter in a visual display was studied as a function of the spatial proximity of two kinds of noise elements (letters or disks) to the target and as a function of when the noise elements were presented following the onset of the target letter. The results were not consistent with a focusing model of attention or selective encoding. Instead, there appears to be a small area in the visual field (about 1 deg of angle) in which all stimuli are processed in detail. (Author)

**A72-41305 \* #** An integrated medical system for long-duration space missions. S. L. Pool and N. Belasco (NASA, Manned Spacecraft Center, Houston, Tex.). *Journal of Spacecraft and Rockets*, vol. 9, Aug. 1972, p. 613, 614.

A description is given of the Integrated Medical and Behavioral Laboratory Measurement System (IMBLMS) being developed for onboard medical support of the crew and for medical research during space missions. The system is suitable for use during early extended space flights and for accommodating measurement and diagnostic apparatus as well as treatment and surgical facilities developed for later missions. V.P.

**A72-41402** Displays and controls; Proceedings of the Advanced Study Institute, Berchtesgaden, West Germany, March 15-26, 1971. Institute sponsored by NATO. Edited by R. K. Bernotat and K.-P. Gärtner (Forschungsinstitut für Anthropotechnik, Meckenheim, West Germany). Amsterdam, Swets en Zeitlinger, 1972. 477 p. \$30.68.

Interdisciplinary problems associated with the field of human engineering are examined in papers dealing with mental workload, measurements, display layout, static and dynamic adaptation of controls, remote control, and the theory of manual control. Specific topics considered include subjective and objective performance evaluation methods, adaptive displays based on prediction techniques, airborne visual flight simulation, analysis of the coordination of manual movements, electronic prosthesis control systems, models describing the control behavior of the human operator, human engineering requirements in aircraft system development, and tele-operator systems. T.M.

**A72-41403** Goals and approaches of anthropotechnics. R. K. Bernotat (Forschungsinstitut für Anthropotechnik, Meckenheim, West Germany). In: Displays and controls; Proceedings of the Advanced Study Institute, Berchtesgaden, West Germany, March 15-26, 1971. Amsterdam, Swets en Zeitlinger, 1972, p. 3-13.

The task of man-machine optimisation is treated in two parallel approaches. On the one hand, in the human factors field psychologists and medical men intend to fit man to machine by selection, training, and protective measures. On the other hand, human

engineering (anthropotechnics) strives to adapt machines to men. This involves interdisciplinary cooperation between vehicle design engineers, control systems engineers, information theorists, psychologists, and physiologists. The central research problem is seen to be the steering and controlling of dynamic systems by man, particularly guidance of air, sea, and land vehicles. The complexities of the task of vehicle control demand detailed knowledge of the vehicle and the structural and temporal characteristics of its guidance and control system, as well as of environmental influences. The anthropotechnician thus becomes a specialist, acquiring a broad range of knowledge of numerous disciplines. (Author)

**A72-41404** Display layout. C. R. Kelley (Dunlap and Associates, Inc., Santa Monica, Calif.). In: Displays and controls; Proceedings of the Advanced Study Institute, Berchtesgaden, West Germany, March 15-26, 1971. Amsterdam, Swets en Zeitlinger, 1972, p. 41-52. 8 refs.

The problem of display layout should begin with a consideration of the information requirements of the operator. The information required determines certain characteristics of the display, but typically leaves many options. Displays can be classed by form of information presented or by function of the information (planning, command, status). A fundamental problem is the motion compatibility between display, controller, and controlled element. Arrangement of displays should be made with regard to functions and relation between indicators as well as frequency of use and expectations and habits of the operator population. Displays of output and derivative functions in high-order systems should follow some simple rules with respect to location, relations between, and scaling of the display. (Author)

**A72-41405** Manual vs automatic control. C. R. Kelley (Dunlap and Associates, Inc., Santa Monica, Calif.). In: Displays and controls; Proceedings of the Advanced Study Institute, Berchtesgaden, West Germany, March 15-26, 1971. Amsterdam, Swets en Zeitlinger, 1972, p. 53-59.

The general characteristics of control over an aspect of the environment by an organism are analyzed, and the role played by consciousness in the process is considered. Biological automation of control processes during evolution shows the character of automatic control reactions. The hierarchical development of biological control systems evolves new outer loops which include older loops within them. Automation of a biological control process involves the elimination of consciousness and of choice from that control process. Mechanization of a control process also involves elimination of consciousness and choice in a control operation. This makes it possible to define a set of essential differences between manual and automatic control. It also clarifies the fundamental problem involved in attempting to understand manual control processes by use of mechanical analogies or models. (Author)

**A72-41406** Adaptive display using prediction. C. R. Kelley and D. J. Prosin (Dunlap and Associates, Inc., Santa Monica, Calif.). In: Displays and controls; Proceedings of the Advanced Study Institute, Berchtesgaden, West Germany, March 15-26, 1971. Amsterdam, Swets en Zeitlinger, 1972, p. 61-73. Contract No. F44620-69-C-0129.

Control is the process of modifying the future by plan. It requires the ability to predict the probable outcomes of alternative actions, evaluate these outcomes, and choose the action that brings the outcome desired. Prediction also plays the key role in execution of control, manual control consisting of action to reduce the difference between what is planned and what is predicted to occur if no further action is taken. Prediction also plays a key role in human operator adaptation. Adaptation occurs as a result of a discrepancy between what is predicted and what occurs. Data is presented from laboratory studies of prediction in a manual control task, and from the development of an adaptive display formed by combining predictive and historical information. (Author)

**A72-41407** General theory of presentation of information. W. T. Singleton (Aston, University, Birmingham, England). In: Displays and controls; Proceedings of the Advanced Study Institute, Berchtesgaden, West Germany, March 15-26, 1971. Amsterdam, Swets en Zeitlinger, 1972, p. 75-81. 7 refs.

From the point of view of the experimental psychologist, display design can be regarded as the application of principles of sensation and perception. Relevant data on vision and audition are mentioned. The concept of perceptual activity as a skill which develops with experience and can be modified by training emphasises the importance of fitting the man to the information as a complementary activity to fitting the information to the man. The concept of the display itself as a component of training is described. (Author)

**A72-41408** Some experiments on information presentation. W. T. Singleton (Aston, University, Birmingham, England). In: Displays and controls; Proceedings of the Advanced Study Institute, Berchtesgaden, West Germany, March 15-26, 1971. Amsterdam, Swets en Zeitlinger, 1972, p. 83-93. 6 refs.

Recent studies of stress have been proceeding on a very broad front using a great variety of techniques. It is suggested that some heterogeneous sources of evidence will need to be utilised to achieve a more complete understanding of the problems of both presenting information and of evaluating methods of presenting information either generally or as solutions to particular design problems. Examples of recent work using laboratory performance measures, test measures, field observation methods, electrical measures, and biochemical measures are described. The problems of individual differences are reemphasized. (Author)

**A72-41409** Prediction displays based on the extrapolation method. R. K. Bernotat (Forschungsinstitut für Anthropotechnik, Meckenheim, West Germany). In: Displays and controls; Proceedings of the Advanced Study Institute, Berchtesgaden, West Germany, March 15-26, 1971. (A72-41402 21-05) Amsterdam, Swets en Zeitlinger, 1972, p. 95-114. 16 refs.

After a general introduction into the field of prediction some comments on human prediction are made. It is stated that in most control tasks computer predicted information results in a higher control quality and essentially shorter learning time. A classification and general comparison of the different prediction methods are given followed by a more detailed description of the extrapolation method. Some diagrams demonstrate the usefulness of this latter concept. (Author)

**A72-41410** The airborne visual simulation as an electronic display. K. P. Gärtner (Forschungsinstitut für Anthropotechnik, Meckenheim, West Germany). In: Displays and controls; Proceedings of the Advanced Study Institute, Berchtesgaden, West Germany, March 15-26, 1971. Amsterdam, Swets en Zeitlinger, 1972, p. 115-132. 20 refs.

By means of easily interpretable integrated flight displays the pilot is provided with the visual information needed. The information is given by presentation of analogically moving signs and alphanumeric symbols. Today CRTs are the most often used flexible electronic displays enabling the presentation of complex image information. With the raster shape principle, aerial images are generated while the calligraphic method allows merely the presentation of linear image structures. The raster shape principle renders the possibility to supplement or substitute the alphanumeric and symbolic images by an airborne generated stylized image of the out-of-the-window scene. (Author)

**A72-41411** Controller output transformations. D. P. Hunt (New Mexico State University, Las Cruces, N. Mex.). In: Displays

and controls; Proceedings of the Advanced Study Institute, Berchtesgaden, West Germany, March 15-26, 1971.  
Amsterdam, Swets en Zeitlinger, 1972, p. 135-146. 14 refs.

The functional relationship between the outputs of the human controller and the inputs to the machine is explicitly considered. This controller output transformation is conceptually distinct from the other aspects, such as the system dynamics of the man-machine system, and may be separately manipulated for experimental (and machine design) purposes. Some examples and previous experiments which clarify this concept are described, and some speculations are offered. (Author)

**A72-41412** Problems arising in the transfer of training from simulated to real control systems. M. Hammerton (Medical Research Council, Applied Psychology Unit, Cambridge, England). In: Displays and controls; Proceedings of the Advanced Study Institute, Berchtesgaden, West Germany, March 15-26, 1971.  
Amsterdam, Swets en Zeitlinger, 1972, p. 147-154.

**A72-41413** A model for analysing the coordination of manual movements. K.-F. Kraiss (Forschungsinstitut für Anthropotechnik, Meckenheim, West Germany). In: Displays and controls; Proceedings of the Advanced Study Institute, Berchtesgaden, West Germany, March 15-26, 1971.  
Amsterdam, Swets en Zeitlinger, 1972, p. 155-174. 12 refs.

Starting with the properties of muscles, muscle senses, and the nervous system, a model for manual movements is developed. The components of the control-loop are simulated using recent experimental results of the anatomy and physiology. The validity of this simulation is tested by the comparative evaluation of original and simulated control-movements. These experiments are distinguished into a nervous and a mechanical stimulation of the simulated servo-system (intended and reflex movement). While intended movements are initiated by the central innervation of the peripheral control loop, there is no contribution of central nervous signals when the controlled system is stimulated mechanically. By this method, the properties of central coordination and the peripheral manual servo-system can be analysed separately. (Author)

**A72-41414** Measures of manual workload. V. D. Hopkin (RAF, Institute of Aviation Medicine, Farnborough, Hants., England). In: Displays and controls; Proceedings of the Advanced Study Institute, Berchtesgaden, West Germany, March 15-26, 1971.  
Amsterdam, Swets en Zeitlinger, 1972, p. 175-191. 7 refs.

Manual workload has traditionally been measured by such methods as time and motion study. Manual workload may be determined primarily by the control itself, by the display control relationships, by features of the display, or by acquisition of skill with the control. Features of the control which influence workload are its demands for manual dexterity and its sensitivity, and workload is also influenced by requirements for speed and accuracy in the task. Distinctions can usefully be drawn between manual and mental workload and in attempts to reduce workload it is important to make these distinctions. Normally manual workload must be assessed with reference to both the speed and the accuracy of the work. (Author)

**A72-41415** Flow diagrams. V. D. Hopkin (RAF, Institute of Aviation Medicine, Farnborough, Hants., England). In: Displays and controls; Proceedings of the Advanced Study Institute, Berchtesgaden, West Germany, March 15-26, 1971.  
Amsterdam, Swets en Zeitlinger, 1972, p. 193-212.

Flow diagrams are a means of describing how a system functions or is intended to function, and the role of displays and controls in that system. As such, they are a valuable research tool. Both the man

and the machine can be described, and interactions clearly depicted. Flow diagrams normally show events, in relation to some of their determinants and consequences. Illustrative examples use flow diagrams of a simple keying task, and of a task in a guided weapons system with complex displays and controls. The method of construction and the level of detail of the flow diagram should depend on its purpose. Constraints are often imposed by inadequate descriptions of how the system is intended to function, and by ill-defined procedures. (Author)

**A72-41416** Teleoperators and remote control. T. B. Sheridan (MIT, Cambridge, Mass.). In: Displays and controls; Proceedings of the Advanced Study Institute, Berchtesgaden, West Germany, March 15-26, 1971.  
Amsterdam, Swets en Zeitlinger, 1972, p. 215-226. 10 refs.

In lieu of sending astronauts, aquanauts, or human workers into hazardous space, undersea, or industrial environments, a teleoperator, a remotely controlled general purpose mechanism which includes mechanical hands, video and tactile sensors, a small computer, and some propulsion devices may be a preferable substitute. Recent developments in teleoperators are reviewed, with emphasis on interactions between mechanisms and human or computer controls. Experiments are described which deal with communication time delays in the control loop, both with respect to visual and force feedback. A means of dealing with problems of time delay as well as other human operator difficulties is through the use of supervisory control, wherein the human operator intermittently commands a computer which is attached to the remote manipulator. (Author)

**A72-41417** Supervisory control of teleoperators. T. B. Sheridan (MIT, Cambridge, Mass.). In: Displays and controls; Proceedings of the Advanced Study Institute, Berchtesgaden, West Germany, March 15-26, 1971.  
Amsterdam, Swets en Zeitlinger, 1972, p. 227-241. 12 refs.

A means of dealing with problems of time delay as well as other human operator difficulties is through the use of supervisory control, wherein the human operator intermittently commands a computer which is attached to the remote manipulator. The computer interprets subgoal statements from the human operator, made either through joystick (analog) or teletype (symbolic) controls. It then utilizes various internal models (state space optimization algorithms, task tree heuristics) of the external environment (position and orientations of physical objects) to plan and implement teleoperator movements. Related applications of remote positioning devices for medical telediagnosis are also described. (Author)

**A72-41418** Lectures on theory of manual-vehicle control. D. McRuer (Systems Technology, Inc., Hawthorne, Calif.). In: Displays and controls; Proceedings of the Advanced Study Institute, Berchtesgaden, West Germany, March 15-26, 1971.  
Amsterdam, Swets en Zeitlinger, 1972, p. 279-326. 22 refs.

The analytical basis of manual vehicular control theory is a combination of feedback systems analysis and mathematical models for human operators engaged in control tasks. Simplified representations for the operator-system combination are provided by the 'crossover-model'. The system dynamics and average performance of the crossover model system are developed. Two aircraft control examples are presented to illustrate the types of result which can be obtained from application of the operator-vehicle control theory. These examples demonstrate the use of the theory and its empirical correlates to estimate operator dynamic characteristics, system performance, pilot ratings, pilot commentary, design implications, and some experimental guidelines. (Author)

**A72-41419** Some contributions to the theory of linear models describing the control behaviour of the human operation. G.



Schweizer (Dornier-Werke GmbH, Friedrichshafen, West Germany). In: Displays and controls; Proceedings of the Advanced Study Institute, Berchtesgaden, West Germany, March 15-26, 1971. Amsterdam, Swets en Zeitlinger, 1972, p. 327-348. 10 refs.

**A72-41420** A method for the development and optimization of controller-models for man-machine systems. G. Johannsen (Forschungsinstitut für Anthropotechnik, Meckenheim, West Germany). In: Displays and controls; Proceedings of the Advanced Study Institute, Berchtesgaden, West Germany, March 15-26, 1971. Amsterdam, Swets en Zeitlinger, 1972, p. 349-366. 33 refs.

**A72-41421** The design of a nonlinear multi-parameter model for the human operator. G. Johannsen (Forschungsinstitut für Anthropotechnik, Meckenheim, West Germany). In: Displays and controls; Proceedings of the Advanced Study Institute, Berchtesgaden, West Germany, March 15-26, 1971. Amsterdam, Swets en Zeitlinger, 1972, p. 367-388. 27 refs.

**A72-41422** The functional organisation of object directed human intended movement and the forming of a mathematical model. G. Vossius (Karlsruhe, Universität, Karlsruhe, West Germany). In: Displays and controls; Proceedings of the Advanced Study Institute, Berchtesgaden, West Germany, March 15-26, 1971. Amsterdam, Swets en Zeitlinger, 1972, p. 389-414. 45 refs.

**A72-41423** Human engineering requirements in aircraft system development. R. Seifert (Messerschmitt-Bölkow-Blohm GmbH, Munich, West Germany). In: Displays and controls; Proceedings of the Advanced Study Institute, Berchtesgaden, West Germany, March 15-26, 1971. Amsterdam, Swets en Zeitlinger, 1972, p. 419-422.

Human engineering personnel can only fulfill the assigned task if they serve as catalysts between the operational and the design staff. The roles of time and availability of data are examined. The hand controller used by the navigator in a two-seat fighter aircraft is cited as an example of how the design requirements cannot be developed from the operational requirements without taking account of human performance characteristics. Constraints given by factors other than human engineering are discussed. F.R.L.

**A72-41424** Applied research into the effects of vibration upon displays. E. J. Lovesey (Royal Aircraft Establishment, Human Engineering Div., Farnborough, Hants., England). In: Displays and controls; Proceedings of the Advanced Study Institute, Berchtesgaden, West Germany, March 15-26, 1971. Amsterdam, Swets en Zeitlinger, 1972, p. 423, 424.

Recent experiments have shown that low frequency vibration along the lateral (sway) axis has a greater adverse effect upon comfort and performance than vibration in the vertical (heave) axis. To reduce the effect of vibration on man's performance the display image may be collimated at infinity, or the man may be isolated from the disturbing vibration. Both methods rely upon the reduction of relative movement between man and his display. F.R.L.

**A72-41425** A fingerstick with variable control gain. G. Rothbauer (Forschungsinstitut für Anthropotechnik, Meckenheim, West Germany). In: Displays and controls; Proceedings of the Advanced Study Institute, Berchtesgaden, West Germany, March 15-26, 1971. Amsterdam, Swets en Zeitlinger, 1972, p. 425-429.

In this control circuit there is normally a defined relationship

between the deflection of the manipulator and the alteration of position of the controlled point on the screen. With a manual control with continuously variable control gain the advantages of a high and low gain are provided simultaneously, and the human controller may select the proper gain for his control deflection according to the momentary status of the system. Some examples for the utilization of such a manual controller are considered. F.R.L.

**A72-41426** A new concept of flight displays compatible with digital airborne computers. J. Wernicke (Berlin Technische Universität, Berlin, West Germany). In: Displays and controls; Proceedings of the Advanced Study Institute, Berchtesgaden, West Germany, March 15-26, 1971. Amsterdam, Swets en Zeitlinger, 1972, p. 431-444.

**A72-41427** Mental workload summary. R. K. Bernotat (Forschungsinstitut für Anthropotechnik, Meckenheim, West Germany) and R. Seifert (Messerschmitt-Bölkow-Blohm GmbH, Munich, West Germany). In: Displays and controls; Proceedings of the Advanced Study Institute, Berchtesgaden, West Germany, March 15-26, 1971. Amsterdam, Swets en Zeitlinger, 1972, p. 447-449.

The objectives of measuring and differentiating mental and physical effort, or workload, are to achieve high performance of the man-machine system, and to develop job satisfaction in the human operator. To acquire these objectives reliable evaluation methods are necessary. The machine is adapted to man by changing, modifying, and optimizing displays, controls, and the dynamics of the controlled element. The same physiological functions are involved in mental as well as in physical work. F.R.L.

**A72-41428** The foot as input device for control operation. K. H. E. Kroemer (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, Ohio). In: Displays and controls; Proceedings of the Advanced Study Institute, Berchtesgaden, West Germany, March 15-26, 1971. Amsterdam, Swets en Zeitlinger, 1972, p. 451, 452.

Brief review of the properties of the foot as a control operation input device, covering perception and control of leg and foot motions, forces applicable to pedals, speed and accuracy of foot motions between pedals, and effectiveness of pedal operations vs hand control operations. The scarcity of experimental studies of this subject is pointed out and more studies in the biomechanics of the leg and foot are suggested. V.Z.

**A72-41429** Influence of stick efficiency on tracking error applying two slightly different control elements. F. Schwegler (Messerschmitt-Bölkow-Blohm GmbH, Munich, West Germany). In: Displays and controls; Proceedings of the Advanced Study Institute, Berchtesgaden, West Germany, March 15-26, 1971. Amsterdam, Swets en Zeitlinger, 1972, p. 453-455.

**A72-41430** A psychologist's laboratory approach to a human factors problem. V. Cohen (New Mexico State University, Las Cruces, N. Mex.). In: Displays and controls; Proceedings of the Advanced Study Institute, Berchtesgaden, West Germany, March 15-26, 1971. Amsterdam, Swets en Zeitlinger, 1972, p. 457-465. 8 refs.

A digital counter, a moving pointer and a moving scale display with exposure durations of 0.75, 1.0 and 1.25 sec were used in pilot tests of reading performance as an approach to studying human data processing psychology. The role of memory in reading capability is discussed and is shown in diagrams on the basis of these experiments. V.Z.

**A72-41431** Results of the investigation of different extrapolation displays. D. Dey (Berlin, Technische Universität, Berlin, West Germany). In: Displays and controls; Proceedings of the Advanced Study Institute, Berchtesgaden, West Germany, March 15-26, 1971. Amsterdam, Swets en Zeitlinger, 1972, p. 467-481. 6 refs.

Experiments on 5 subjects show that the steering reliability can be increased and the 'lapse time' can be reduced when a prediction display is used in manual aircraft control. It is concluded that a prediction display gives the pilot more exact and faster information about the action of his stick signals and thereby assists in generating an optimal-time steering operation. V.Z.

**A72-41432** The influence of a prediction display on the human transfer characteristics. D. Dey (Berlin, Technische Universität, Berlin, West Germany). In: Displays and controls; Proceedings of the Advanced Study Institute, Berchtesgaden, West Germany, March 15-26, 1971. Amsterdam, Swets en Zeitlinger, 1972, p. 483-491. 5 refs.

A quasi-linear human operator model is proposed to describe the effect of a prediction display on the transfer characteristics of a human operator at stick controls. It is shown that a prediction display diminishes the mean square value of human control deviations in manual attitude stabilization of a hovering VTOL aircraft. V.Z.

**A72-41460** Analysis of the activity evoked in the cerebellar cortex by stimulation of the visual pathways. H. A. Buchtel, G. F. Marchesi, L. Provini, P. Strata (Pisa, Università; CNR, Laboratorio di Neurofisiologia, Pisa, Italy), and G. Iosif. *Experimental Brain Research*, vol. 15, no. 3, 1972, p. 278-288. 33 refs.

**A72-41461** Visual experience as a determinant of the response characteristics of cortical receptive fields in cats. D. N. Spinelli, H. V. B. Hirsch, R. W. Phelps, and J. Metzler (Stanford Medical Center, Stanford, Calif.). *Experimental Brain Research*, vol. 15, no. 3, 1972, p. 289-304. 20 refs. Grant No. NIH-MH-20259.

A memory hypothesis is tested with respect to the prediction that, even though there may be more plasticity in infancy, it should be possible to add new classes of receptive fields to those found in cats at the end of a first selectively restricted visual experiment by allowing these same animals to view a normal environment with both eyes. The results show that visual experience has a direct continuing and lasting effect on the functional connectivity of cells in the visual cortex. M.V.E.

**A72-41462** Patterns of spontaneous and reflexly-induced activity in phrenic and intercostal motoneurons. B. S. Nail, G. M. Sterling, and J. G. Widdicombe (Oxford University, Oxford, England). *Experimental Brain Research*, vol. 15, no. 3, 1972, p. 318-332. 49 refs. Research supported by the Medical Research Society and Royal Society.

**A72-41469** The immediate energy sources of muscular contraction (Les sources d'énergie immédiate de la contraction musculaire). G. Maréchal (Leuven, Katholieke Universiteit, Louvain, Belgium). *Journal de Physiologie*, vol. 65, Aug. 1972, p. 5 A-50 A. 156 refs. In French.

The concepts of measuring the chemical potential energy and of identification of the chemical reservoirs are considered as a preliminary to the concrete study of muscular energy. Physical and chemical methods of identifying the biochemical reactions of contraction are described, and the energy balances of muscular shaking and contraction are discussed. During muscular shaking, the metabolism comprises at least the following metabolic posts: metabolism of activation, metabolism of work, metabolism of maintenance, metabolism of shortening, and metabolism of releasing. In the case of

contractions, the energetics of the steady state, of transitory phases, and of work are studied. In general, the energy (heat and work) which supplies a muscle is accompanied by a hydrolysis of phosphorylcreatine. F.R.L.

**A72-41470** Energetics of muscular exercise (Energétique de l'exercice musculaire). P. E. di Prampero (CNR, Centro per lo Studio della Fisiologia de Lavoro Muscolare, Milan, Italy). *Journal de Physiologie*, vol. 65, Aug. 1972, p. 51 A-86 A. 118 refs. In French.

The transformation which takes place almost continuously in muscles which use chemical energy to develop mechanical energy and heat intervenes in a striking fashion during muscular exercise. Such exercise is, consequently, the condition of choice for the study of energy transformations (bioenergetics) of the entire organism. The sources of energy of muscular contraction, oxidations, glycolysis, the alactic anaerobic mechanism, and intermittent exercise are considered. It is shown that after about 40 sec of maximal effort the two anaerobic mechanisms (alactic and lactic) are completely exhausted. F.R.L.

**A72-41520** Plasma FFA in relation to maximum power output in man. C. T. M. Davies and C. A. Barnes (London, University, London, England). *Internationale Zeitschrift für angewandte Physiologie einschliesslich Arbeitsphysiologie*, vol. 30, no. 4, 1972, p. 247-257. 24 refs.

The relation of plasma free fatty acids (FFA) to lactic acid (LA) concentration and maximum aerobic power is studied on seven healthy male subjects. The results are in agreement with those of Issekutz et al. (1965) and with the view that the availability of carbohydrate (glycogen) is the major limiting factor to exercise of high intensity and long duration. M.V.E.

**A72-41521** Comparison of various tremor pickup methods (Methodenvergleich verschiedener Tremoraufnehmer). M. Sälzer (Darmstadt, Technische Hochschule, Darmstadt, West Germany). *Internationale Zeitschrift für angewandte Physiologie einschliesslich Arbeitsphysiologie*, vol. 30, no. 4, 1972, p. 292-301. 6 refs. In German.

Consideration of the results of simultaneous hand tremor measurements performed by means of three different swing-proportional, two velocity-proportional, and one accelerometer tremor-measuring system. A comparison of the results indicate that there is no completely consistent correspondence among them. Recommendations are presented for selecting the optimal tremor-measuring system for each given task. M.V.E.

**A72-41522** Effect of hypoxia and physical activity on plasma enzyme levels in man. D. A. Cunningham and J. B. Critz (Western Ontario, University, London, Ontario, Canada). *Internationale Zeitschrift für angewandte Physiologie einschliesslich Arbeitsphysiologie*, vol. 30, no. 4, 1972, p. 302-308. 23 refs. Research supported by the Fitness and Amateur Sport Directorate, Medical Research Council, and Defence Research Board.

**A72-41523** Nitrogen excretion as a measure of protein metabolism in man under different conditions of renal function. W. A. Kachadorian, R. E. Johnson, and R. E. Buffington (Illinois, University, Urbana, Ill.). *Internationale Zeitschrift für angewandte Physiologie einschliesslich Arbeitsphysiologie*, vol. 30, no. 4, 1972, p. 309-313. 6 refs.

**A72-41524** Effects of physical exercise on spinal reflectivity in man (Effets de l'exercice physique sur la réflectivité spinale chez l'homme). R. Henane and J. A. Macarez (Ministère des Armées, Service de Santé, Lyon, France). *Internationale Zeitschrift für*

*angewandte Physiologie einschliesslich Arbeitsphysiologie*, vol. 30, no. 4, 1972, p. 315-334. 34 refs. In French.

Consideration of the effects of submaximal and maximal physical exercise on spinal reflectivity in man. The parameters investigated are the monosynaptic reflex and the direct excitability of soleus muscle. The analysis of the results obtained suggests that physical exercise affects directly muscular fiber excitability. M.V.E.

**A72-41531** Aspects of motion perception. P. A. Kolers. Oxford and New York, Pergamon Press (International Series of Monographs in Experimental Psychology. Volume 16), 1972. 232 p. 282 refs. \$12.

The historical background of motion perception is examined, and some of the major findings about illusory and veridical motion are analyzed together with the theories they have generated. A number of experiments which were carried out to evaluate some of the theories are also described. Wertheimer's contribution is considered along with some basic measurements, questions of motion and form, attractions, repulsions, and signals. Other topics discussed include the perception of depth, characteristics of figures, theories of apparent motion, and the effects of attitudes, skills, and practice on motion perception. G.R.

**A72-41622** Hypoxic pulmonary steady-state diffusing capacity for CO and alveolar-arterial O<sub>2</sub> pressure differences in growing rats after adaptation to a simulated altitude of 3500 m. Z. Turek, A. Frans, and F. Kreuzer (Nijmegen, University, Nijmegen, Netherlands). *Pflügers Archiv*, vol. 335, no. 1, 1972, p. 1-9. 28 refs.

**A72-41623** Cardiac output, arterial and mixed-venous O<sub>2</sub> saturation, and blood O<sub>2</sub> dissociation curve in growing rats adapted to a simulated altitude of 3500 m. Z. Turek, B. E. M. Ringnald, L. J. C. Hoofd, A. Frans, and F. Kreuzer (Nijmegen, University, Nijmegen, Netherlands). *Pflügers Archiv*, vol. 335, no. 1, 1972, p. 10-18. 34 refs.

**A72-41624** Cardiac hypertrophy, capillary and muscle fiber density, muscle fiber diameter, capillary radius and diffusion distance in the myocardium of growing rats adapted to a simulated altitude of 3500 m. Z. Turek, M. Grandtner, and F. Kreuzer (Nijmegen, University, Nijmegen, Netherlands). *Pflügers Archiv*, vol. 335, no. 1, 1972, p. 19-28. 22 refs.

**A72-41625** Influence of intracellular convection on the oxygen release by human erythrocytes. R. Zander (Mainz, Universität, Mainz, West Germany) and H. Schmid-Schönbein (München, Universität, Munich, West Germany). *Pflügers Archiv*, vol. 335, no. 1, 1972, p. 58-73. 74 refs. Research supported by the Deutsche Forschungsgemeinschaft.

There is general agreement today that intracellular diffusive transport of HbO<sub>2</sub> and O<sub>2</sub> limits the rate of oxygen uptake or release by the blood in the exchange vessels. Recent hemorheological results have shown that the mammalian erythrocyte exhibits fluidity as its most unique rheological property. The results of the present study strongly suggest that intracellular flow resulting from the physiological erythrocyte deformation in flow can supplement the O<sub>2</sub> release from intact cells through a convective transport of HbO<sub>2</sub> and O<sub>2</sub> molecules. The example of osmotic shrinking shows that red cell fluidity is not only a precondition for normal flow in the microcirculation, but also for the normal gas exchange of the cells. (Author)

**A72-41673** # Localization and structural-functional organization of the system of vagus nerve nuclei constituting the 'cardiac

center' of the medulla oblongata (Lokalizatsiia i strukturno-funktsional'naia organizatsiia sistemy iader bluzhdaiushchikh nervov, sostavliaiushchikh 'serdechnyi tsentr' prodolgovatogo mozga). V. I. Ionavichute, G. E. Samonina, and M. G. Udel'nov (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR). *Uspekhi Fiziologicheskikh Nauk*, vol. 3, Apr.-June 1972, p. 3-23. 109 refs. In Russian.

**A72-41674** # Organization of afferent connections in the cerebellar cortex (Organizatsiia afferentnykh svyazei kory moz-zhechka). Iu. I. Arshavskii (Akademiiia Nauk SSSR, Institut Problem Peredachi Informatsii, Moscow, USSR). *Uspekhi Fiziologicheskikh Nauk*, vol. 3, Apr.-June 1972, p. 24-53. 186 refs. In Russian.

Analysis of morphological and electrophysiological data concerning the passage of signals from various receptors and a number of central formations into the cerebellar cortex. It is concluded that such signals travel to the cerebellar cortex along three different channels - namely, fast-conducting, topographically organized paths terminating in the form of mossy fibers; diffuse paths passing through the reticular nuclei of the brain stem and terminating in the form of mossy fibers; and paths passing through the inferior olives and terminating in the form of climbing fibers. The functional differences between the two channels terminating in the form of mossy fibers are considered for the case of spinal-cerebellar connections. It is shown that only the fast conducting paths have a direct effect on the activity of the output neurons of the cerebellar cortex. The reticular input merely plays a regulating role. Via the interneurons of the cerebellar cortex it modulates the effectiveness of the signals traveling along fibers of fast conducting paths. A.B.K.

**A72-41675** # The role of analysors in systemic activity (O roli analizatorov v sistemoi deiatel'nosti). T. S. Naumova and N. S. Popova (Moskovskii Meditsinskii Stomatologicheskii Institut; Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR). *Uspekhi Fiziologicheskikh Nauk*, vol. 3, Apr.-June 1972, p. 54-115. 428 refs. In Russian.

Analysis of analyzer activity in the light of Anokhin's concept of a functional system. Literature and experimental electrophysiological data (on EEG indices and evoked potentials) are presented which make it possible to assert that in the formation of a conditioned defense reflex, in addition to the unconditioned reaction analyzer, the conditioned signal analyzer and related analysors enter the operational structure of a functional system. It is shown that these analysors participate in all nodal mechanisms of a functional system - afferent synthesis, decision making, the correction of the results of an action, etc. At all levels of the analysors signs of trace processes and anticipatory reactions appear. Data are presented which attest to the fact that both in the cortical terminus and at the stem levels of these analysors convergence of heteromodality influences occurs. It is suggested that all analyzer levels, starting from the first switching relays, are a substrate of the integration of heterogeneous excitations which is the basis of their participation in nodal mechanisms of formation of a functional system. A.B.K.

**A72-41747** # Potassium chloride test for electrocardiogram evaluation in flight personnel medical appraisal (Proba s khloristym kaliem v otsenke elektrokardiogrammi pri ekspertize letnogo sostava). L. N. Aleksentseva. *Voennõ-Meditsinskii Zhurnal*, May 1972, p. 60,61. In Russian.

**A72-41748** # Increased resistance to blinding with the aid of pharmacological media and monocular shielding (O povyshenii ustoiichivosti k oslepleniui pomoshch'iu farmakologicheskikh preparatov i monokuliarnoi zashchity). V. M. Gaidai. *Voennõ-Meditsinskii Zhurnal*, May 1972, p. 76-78. In Russian.

Experiments performed with military drivers from 18 to 21 years of age show that the coverage of one eye during exposure to

temporary blinding light (equivalent to automobile headlights from oncoming traffic at night) will result in a faster restoration of normal visual acuity than would be the case if both eyes were exposed to the light. Additional tests show that visual acuity under twilight conditions can be distinctly improved by ingestion of special vitamin complexes or tablets containing ATP with pyridoxal. T.M.

**A72-41749 #** Influence of high temperature on the onset of motion sickness (Vliianiia vysokoi temperatury na proiavlenie ukachivaniia). E. M. Iuganov<sup>1</sup> and E. V. Lapaev.<sup>2</sup> *Voенно-Meditsinskii Zhurnal*, June 1972, p. 86-88. In Russian.

Subjects exposed to controlled temperature and humidity conditions were subjected to chair rotations (180 deg per sec) producing continuous buildup of Coriolis accelerations. Results indicate that a high temperature of the ambient medium leads to a substantial drop in the resistance of the human organism to motion sickness. The initial symptoms of this reduced resistance become apparent at a temperature of 40 C, and the adverse influence of temperature was most acute in the range from 45 to 50 C. T.M.

**A72-41750 #** Influence of prolonged longitudinal accelerations on control habits (Deistvie dlitel'nykh prodol'nykh uskorenii na navyki upravleniia). V. I. Zorile and A. A. Kupriianov. *Voенно-Meditsinskii Zhurnal*, June 1972, p. 89-94. In Russian.

Simulated flight-control performance was evaluated in the presence of +Gz accelerations (2 to 5 g magnitude at rates of 0.1 to 0.5 g/sec) applied for durations of 30 sec to 5 min. The control task involved movement of a control stick (by extension and retraction of the arm) in a manner ensuring the minimum deviation of a fluctuating (according to a preset program) gauge pointer from a zero position. Measurements encompassed control errors, the nature and velocity of control movements, and the interfering electrical activity of functionally differing arm muscle groups. Results indicate substantial changes in the control habits of the operator when exposed to the accelerations. In addition, accelerations increase the number, the amplitude, and the duration of control errors. The degree of change in control performance is affected by the magnitude, period, and gradient of acceleration. T.M.

**A72-41825 #** Control of the circulating blood mass in the case of a functional detachment of various amounts of pulmonary tissue (Reguliatсия massy tsirkuliruiushchei krovi pri funktsional'nom otkliuchenii razlichnykh kolichestv legochnoi tkani). Iu. N. Kamenskii and E. B. Shul'zhenko. *Biulleten' Eksperimental'noi Biologii i Meditsiny*, vol. 73, May 1972, p. 7-9. 11 refs. In Russian.

**A72-41898 #** Effect of selenium on the formation of the electrical potential in the retina (Effekt vliianiia selenā na formirovaniie elektricheskogo potentsiala setchatki). G. B. Abdullaev, N. A. Gadzhieva, G. G. Gasanov, and V. L. Obolenskaia (Akademiia Nauk Azerbaidzhanskoi SSR, Institut Fiziki and Institut Fiziologii, Baku, Azerbaidzhan SSR). *Akademiia Nauk Azerbaidzhanskoi SSR, Doklady*, vol. 27, no. 10, 1972, p. 19-30. 18 refs. In Russian.

A selenium water-soluble compound was injected subcutaneous-ly in rabbits in a study of electrical retinal potential responses to sequences of light stimuli of various intensities. Particular attention was given to the recovery of the potential during intermissions following stimulation cycles. The amplitudes of electroretinograms were greater in test rabbits than in control rabbits without selenium injections. A large number of electroretinograms are included to show the recovery cycles of retinal responses. V.Z.

**A72-41925 #** Changes produced in the nerve structures of the stellate ganglion by total X-ray irradiation (Zmini nervovikh struktur zirchastogo vuzla, vliikani zagal'nim Rentgeniv'skim oprominenniam). G. G. Demidova (Akademiia Nauk Ukrain'skoi RSR, Institut Mikrobiologii i Virusologii, Kiev, Ukrainian SSR).

*Akademiia Nauk Ukrain'skoi RSR, Dopovidi, Seriya B - Geologiya, Geofizika, Khimiia i Biologiya*, vol. 34, May 1972, p. 457-461. 23 refs. In Ukrainian.

**A72-41934 \*** Unresponsiveness of pial precapillary vessels to catecholamines and sympathetic nerve stimulation. A. J. Raper, H. A. Kontos, E. P. Wei, and J. L. Patterson, Jr. (Virginia Commonwealth University, Richmond, Va.). *Circulation Research*, vol. 31, Aug. 1972, p. 257-266. 38 refs. Grants No. NIH-HL-11077; No. NIH-HL-14251; No. NIH-HL-5573; No. NGL-47-002-001.

**A72-41936 \*** The effect of membrane parameters on the properties of the nerve impulse. N. H. Sabah (Beirut, American University, Beirut, Lebanon) and K. N. Leibovic (New York, State University, Amherst, N.Y.). *Biophysical Journal*, vol. 12, Sept. 1972, p. 1132-1144. 24 refs. Grant No. NGR-33-016-016.

The effect of varying some membrane parameters is explored, basing the investigation on computer simulation of the Hodgkin-Huxley equations for the squid giant axon, including variations in the membrane capacitance, conductances, and the rate constants. It is shown that by reducing the degree of regeneration in the excitable membrane, the character of the nerve signal can be smoothly changed from that of the axonal spike to essentially electrotonic spread, with all gradations in between. The reduction in the degree of regeneration can most simply be brought about by a decrease in the density of active membrane patches. F.R.L.

**A72-41949** Development and optimization of a nonlinear multiparameter human operator model. G. Johannsen (Forschungsinstitut für Anthropotechnik, Meckenheim, West Germany). *IEEE Transactions on Systems, Man, and Cybernetics*, vol. SMC-2, Sept. 1972, p. 494-504. 22 refs.

Description of a systematic method for the development, optimization, and comparison of human controller models. The method is suitable for any model, including multiparameter systems. The evaluation criteria for assessing model quality are based on three separate components: (1) the cost or criterion function, (2) a comparison between the input/output functions of the human operator and those of the model, and (3) characteristic values and functions of statistical signal theory. A nonlinear multiparameter human operator model is presented which considers the complex input information rate in a single display. The nonlinear features of the model are brought about by a modified threshold element and a decision algorithm. A random search technique is used for parameter optimization. A comparison with the well-known quasi-linear describing function for the human operator shows a marked superiority of the nonlinear model. (Author)

**A72-41950** Human operator dynamics for aural compensatory tracking. E. W. Vinje (United Aircraft Research Laboratories, East Hartford, Conn.) and E. T. Pitkin (Connecticut University, Storrs, Conn.). *IEEE Transactions on Systems, Man, and Cybernetics*, vol. SMC-2, Sept. 1972, p. 504-512. 10 refs.

The effects of aural and combined aural and visual displays of tracking error on human operator dynamics were investigated using a compensatory tracking task. The aural displays indicated error magnitude with tone pitch and error polarity by either modulating the tone or by switching it between the ears. Describing functions, remnants, and rms tracking performance were measured with test conditions which were similar to those for previous studies of visual tracking performance. Human operator control characteristics measured for aural displays agree closely with those which result for visual displays. Also, operators could control equally well with either one- or two-ear displays. However, the reduction in operator time delays, expected because of the generally faster human response to aural stimuli, was not clearly evident in the results. Results also indicate that the combined aural and visual presentation of tracking error improved operator performance slightly. (Author)

**A72-41983 #** Circulatory reflexes during the action of acceleration (Odruchy krążenia podczas działania przyspieszenia). K. Niewiadomska-Skolasinska (Akademia Medyczna, Warsaw, Poland). *Postępy Astronautyki*, vol. 5, no. 1, 1972, p. 5-13. 48 refs. In Polish.

Review of available information about rapid changes occurring in the circulatory system under the influence of accelerations. It is shown that the cardiac rhythm can be either accelerated or decelerated, depending on the direction of the applied stimulus. Blood displacement in some blood vessel areas produces collapse or extension of vessel walls which in turn acts as a stimulus on receptors located in these areas. Reflexes from the region of the head may affect distribution of blood through the sympathetic cholinergic system, and prolonged accelerations will produce additional responses from receptors in other regions of the body. T.M.

**A72-41984 #** Studies of the reflexive deceleration of the cardiac rhythm during hypoxia (Badania nad odruchowym zwolnieniem rytmu serca w hypoksji). K. Niewiadomska-Skolasinska (Akademia Medyczna, Warsaw, Poland). *Postępy Astronautyki*, vol. 5, no. 1, 1972, p. 15-22. In Polish.

A survey of research on changes in the cardiac rhythm and arterial tension during hypoxia indicates that the discrepancies in results are caused by (1) the use of different species of experimental animals, (2) utilization of both spontaneous and controlled respiration, and (3) the effects of pharmacological media employed in the experiments. Respiration by air in which the oxygen content is reduced to not less than 9% produces acceleration of the cardiac rhythm, and the mechanisms producing this effect are explained. A further drop in the oxygen content of inspired air produces deceleration of the cardiac rhythm, but the path of action of this effect is unknown. T.M.

**A72-41985 #** Selected problems concerning biological rhythms (Wybrane zagadnienia rytmów biologicznych). K. Kwarecki and S. Szmigielski (Wojskowy Instytut Medycyny Lotniczej, Warsaw, Poland). *Postępy Astronautyki*, vol. 5, no. 1, 1972, p. 23-28. 15 refs. In Polish.

Survey of current medical views on the origins of biological rhythms and on mechanisms and effects of disruptions in these rhythms. Factors producing the 24-hr biological cycle in man are described, with emphasis on the modern concept of a biological clock localized at the cellular level. Effects of disrupted rhythms observed in speleologists, astronauts, and airline pilots are discussed. T.M.

**A72-41986 #** Some new achievements of radiobiology and experimental hematology in aerospace medicine (Niektóre nowe osiągnięcia radiobiologii i hematologii doświadczalnej w aspekcie medycyny lotniczej i kosmicznej). S. Szmigielski and K. Kwarecki (Wojskowy Instytut Medycyny Lotniczej, Warsaw, Poland). *Postępy Astronautyki*, vol. 5, no. 1, 1972, p. 29-41. 45 refs. In Polish.

The current state of knowledge about the adverse effects of ionizing radiations on cells is reviewed, with special attention given to disturbances in cell division processes and nucleic acid synthesis. The possibility of using chemical agents that protect the organism from the adverse effects of radiant energy is evaluated, and some new experimental and clinical hematological techniques are described which can be used for precise determination of the level of radiation-induced damage and the course of marrow tissue regeneration. T.M.

**A72-41987 #** Influence of ionizing radiation on the tooth organ (Wpływ promieniowania jonizującego na narząd zębowy). H. Klimek (Wojskowy Instytut Medycyny Lotniczej, Warsaw, Poland). *Postępy Astronautyki*, vol. 5, no. 1, 1972, p. 43-64. 51 refs. In Polish.

Changes in tissues surrounding teeth during acute radiation

sickness are described on the basis of clinical observations and histopathological studies. Histological studies of experimental animals indicate that irradiation produces changes in the ligament apparatus of the teeth. Observed differences in post-irradiation pathological changes in different rats of the same experimental groups are explained to individual differences in the resistance and sensitivity of the animals. T.M.

**A72-41988 #** Psychic adaptation of man to a long-duration stay in space (Psychiczne przystosowanie człowieka do długotrwałego pobytu w przestrzeni kosmicznej). K. Galubinska (Wojskowy Instytut Medycyny Lotniczej, Warsaw, Poland). *Postępy Astronautyki*, vol. 5, no. 1, 1972, p. 65-92. 26 refs. In Polish.

Physical and mental stress conditions imposed upon crewmembers in long-duration space missions are examined in conjunction with task performance requirements. Past experience in group behavior is discussed on the basis of observations of submarine crews, convict populations, hospital patients, polar expeditions, and military aircraft crews. A model of psychological adaptation to life in a small social group under space mission conditions is examined. T.M.

**A72-42067 #** The prediction of the condition of man during a space flight (K probleme prognozirovaniia sostoiianiia cheloveka v usloviakh kosmicheskogo poleta). R. M. Baevskii. *Fiziologicheskii Zhurnal SSSR*, vol. 58, June 1972, p. 819-827. 22 refs. In Russian.

**A72-42068 #** The effect of space flight conditions and prolonged hypokineses on the kidney function in man (Vliianie uslovii kosmicheskogo poleta i dlitel'noi gipokinezii na deiatel'nost' pochek cheloveka). A. I. Grigor'ev. *Fiziologicheskii Zhurnal SSSR*, vol. 58, June 1972, p. 828-835. 20 refs. In Russian.

**A72-42069 #** Prediction of vegetative reactions in the case of stress and extreme effects upon the organism (Prognozirovanie vegetativnykh reaktsii pri stressovykh i ekstremal'nykh vozdeistviakh na organizm). G. N. Kassil' (Akademiiia Nauk SSSR, Laboratoriia Problem Upravleniia Funktsiiami v Organizme Cheloveka i Zhivotnykh, Moscow, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 58, June 1972, p. 836-844. 28 refs. In Russian.

**A72-42070 #** Effect of vibration on the permeability of the blood-brain barrier (Vliianie vibratsii na pronitsaemost' gematentsefalicheskogo bar'era). T. G. Iakubovich and Kh. A. Getsel' (Leningradskii Sanitarno-Gigienicheskii Meditsinskii Institut, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 58, June 1972, p. 845-850. 17 refs. In Russian.

**A72-42071 #** Radiospirometry in the case of work and sports activities (Radiorespirometriia pri trudovoi i sportivnoi deiatel'nosti). V. V. Rozenblat, V. M. Forshtadt, and Z. M. Kuznetsova (Nauchno-Issledovatel'skii Institut Gigieny Truda i Profzabolevanii, Sverdlovsk, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 58, June 1972, p. 941-948. 17 refs. In Russian.

A radiospirometer has been developed on the basis of a contactless tachometric spirowflowmeter with a magnetoelectric transducer. By a telemetric approach the respiration volume can be recorded together with the rate of breathing, the instantaneous volumetric air flow rate, and the duration of the inspiratory phase. The instrument has a range from 0.1 to 5.0 l/sec for air flow rate determinations. The design of the apparatus is discussed, giving attention also to the electric circuit. Data are presented concerning lung ventilation, rate of breathing, and heart rate observed in twenty workers during work in a rolling mill and four athletes during a running exercise. G.R.

**A72-42072 #** Alteration of myocardium characteristics under cooling to 0 deg (Izmenenié svoistv serdechnoi myshtsy pri okhlazhdenii ee do 0 deg). P. M. Starkov and Iu. R. Sheikh-zade (Kubanskii Meditsinskii Institut, Krasnodar, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 58, June 1972, p. 949-957. 25 refs. In Russian.

Study of the automatism, excitability, conductivity, and contractility of the myocardium, when it is cooled to 0 deg C. The obtained results include the finding that complete inhibition of myocardial automatism sets in between 9 and 3 deg C. M.V.E.

**A72-42073 #** New modifications of manipulators for investigations using microelectrodes (Novye modifikatsii manipulatorov dlia mikroelektroodnykh issledovani). G. E. Vorob'ev and V. F. Zakharov (Gor'kovskii Gosudarstvennyi Meditsinskii Institut, Gorki, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 58, June 1972, p. 960-962. 12 refs. In Russian.

Two modified designs are proposed for manipulators fastened to the cranium of experimental animals, and used for brain implantation of microelectrodes in studies of bioelectric nerve cell activity. One is intended for cortical neuron activity studies, the other for investigations of cortical and subcortical brain formations in rabbits. Rapid mounting, reliable fastening, small dimensions, and low weight are among the advantages. M.V.E.

**A72-42156 #** Computation of the shape and velocity of a nerve pulse (Raschet formy i skorosti nervnogo impul'sa). A. I. Undrovinas, V. F. Pastushenko, and V. S. Markin (Akademiia Nauk SSSR, Institut Elektrokhimii, Moscow, USSR). *Akademiia Nauk SSSR, Doklady*, vol. 204, May 1, 1972, p. 229-232. 16 refs. In Russian.

The shape and velocity of a nerve pulse propagating along a smooth fiber are calculated as functions of fiber diameter and membrane resistance. Pulse velocity is plotted against membrane potential in three curves corresponding to three different values of membrane leakage current. It is shown that allowance for finite resistance of the membrane strongly affects the shape of the pulse but has little effect on the propagation velocity. The latter is shown to be proportional to the square root of the fiber diameter. Numerical results are also used to plot pulse velocity as a function of membrane capacitance per unit area. T.M.

**A72-42157 #** Dependence of muscle efficiency on oxygen concentration in the venous blood (O zavisimosti K.P.D. myshts ot kontsentratsii kisloroda v venoznoi krvi). M. A. Khanin and I. B. Bukharov. *Akademiia Nauk SSSR, Doklady*, vol. 204, May 1, 1972, p. 250-252. 6 refs. In Russian.

The dependence of muscle efficiency on both (1) the energetically optimal oxygen concentration in venous blood and on (2) the oxygen consumption under physical strain is calculated on the basis of available data for the dependence of (1) on (2). The expression obtained for muscle efficiency as a function of oxygen concentration in venous blood can be used to determine the dependence of muscle efficiency on the mean oxygen concentration in muscle tissue. T.M.

**A72-42167 #** Role of the thyrotropic region of the hypothalamus in the adaptation activity of the organism (Rol' tireotropnoi oblasti gipotalamusa v adaptatsionnoi deiatel'nosti organizma). M. G. Amiragova (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR). *Akademiia Nauk SSSR, Doklady*, vol. 204, May 11, 1972, p. 493-495. 9 refs. In Russian.

Study of the mechanisms by which thyroid hormones participate in processes of adaptation of cats and dogs to various actions of the surrounding medium. On the basis of an analysis of the effect of microdoses of thyroid hormones on the activity of various hypothalamic nuclei and the thyrotropic region of the hypothalamus it is concluded that there is a functional relation between the cells of the thyrotropic region and other nuclear formations of the hypo-

thalamus. It is further concluded that the thyrotropic (or neurosecretor) region of the hypothalamus is under the direct control of the hypothalamic centers, and that the discharge of thyroid hormones into the general circulation is accomplished by both nervous and humoral actions on the thyrotropic region of the anterior hypothalamus. A.B.K.

**A72-42168 #** Prediction of vegetative reactions to extremal actions on the organism (Prognozirovanié vegetativnykh reakttsii pri ekstremal'nykh vozdeistviakh na organizm). G. N. Kassil', R. V. Beleda, N. N. Artamonov, and S. I. Zakharova (Akademiia Nauk SSSR, Laboratoriia Problem Upravleniia Funktsiami v Organizme Cheloveka i Zhivotnykh, Moscow, USSR). *Akademiia Nauk SSSR, Doklady*, vol. 204, May 11, 1972, p. 503-506. 8 refs. In Russian.

Consideration of the possibility of predicting vegetative reactions in human subjects by means of an insulin test. A study is reported in which the excretion of catecholamines, their predecessors, and 17-oxycorticosteroids in the urine as a result of an insulin injection was determined, and the findings were compared with the results of pressure-chamber tests of the resistance of the subjects to moderate degrees of hypoxia. It is concluded that an insulin test with prior and subsequent determination of catecholamines, their predecessors, and 17-oxycorticosteroids makes it possible to determine the state and the reactivity of the sympathoadrenal apparatus and to predict beforehand possible reactions to extremal actions on the organism. A.B.K.

**A72-42220 #** Motor activity capability of an astronaut in flight (Dvigatel'naia rabotosposobnost' kosmonavta v polete). E. A. Ivanov, V. A. Popov, and L. S. Khachatur'iants. *Kosmicheskii Issledovaniia*, vol. 10, July-Aug. 1972, p. 604-613. 14 refs. In Russian.

Analysis of the motor activity dynamics of an astronaut performing spacecraft command and control operations. The psychophysiological background of such activities is discussed. Motor activity correlation characteristics of Soviet astronauts Beliaev, Leonov, Nikolaev and Sevastianov are included. The occurrence of changes in the motor-coordination function of the cortex during motor activity in a state of lasting weightlessness is noted. These changes are traced to the psychophysiological strains caused by the necessity of continuous alertness and extrapolation of complex associative reactions. V.Z.

**A72-42221 #** Application of sample quantiles to the compression of telemetric transmission and statistical processing of medical information (Primenenie vyborochnykh kvantilei dlia szhatiia, telemetricheskoi peredachi i statisticheskoi obrabotki meditsinskoi informatsii). A. M. Litvinov and D. G. Maksimov. *Kosmicheskii Issledovaniia*, vol. 10, July-Aug. 1972, p. 614-619. 18 refs. In Russian.

**A72-42279 #** Lysosomal enzymes of eye tissues during the action of hydrocortisone (Lizosomal'nye fermenty tkanei glaza pri vozdeistvii gidrokortizona). B. S. Kasavina, P. V. Sergeev, and N. B. Chesnokova (Moskovskii Nauchno-Issledovatel'skii Institut Glaznykh Boleznei; II Moskovskii Gosudarstvennyi Meditsinskii Institut, Moscow, USSR). *Akademiia Nauk SSSR, Doklady*, vol. 204, June 21, 1972, p. 1479-1482. 18 refs. In Russian.

Study of the cellular mechanism of action of hydrocortisone on the activity of lysosomal enzymes of the ciliary body, the aqueous humor, and the vitreous body of the rabbit eye. It is found that in the ciliary body an hour after the introduction of hydrocortisone a decrease in the free fraction of acid phosphatase coming in contact with the substrate occurs together with an increase in the bound, functionally latent fraction. The introduction of hydrocortisone causes similar changes in the activities of beta-glucosidase and beta-galactosidase in the ciliary body. In both the aqueous humor

and the vitreous body no beta-glucosidase and beta-galactosidase activity was noted, and no appreciable change in the acid phosphatase activity in the aqueous humor occurred. However, a considerable increase in the overall activity and in the percentage of bound activity of acid phosphatase occurred in the vitreous body.

A.B.K.

**A72-42280 # Neurophysiological mechanisms of the extinction of the orientating reflex (Neirofiziolohichni mekhanizmi zgasannia orientoval'nogo refleksu).** R. F. Makul'kin and Iu. F. Pedanov (Odes'kii Medichnii Institut, Odessa, Ukrainian SSR). *Fiziologichnii Zhurnal*, vol. 18, May-June 1972, p. 291-298. 59 refs. In Ukrainian.

Neurophysiological mechanisms responsible for extinction of the orientating reflex are examined on the basis of published studies of the functional role played by different elements of analyzer systems in the course of conditioning to repeated low-level stimuli. EEG features of the orientating reflex in the presence of various stimuli are used to characterize the physiological significance and the functional structure of the conditioning phenomenon. Recent results indicate that the functional structure of the orientating reflex must include at least three new elements: inhibitory reticular formation, hippocampus, and orbitofrontal cortex.

T.M.

**A72-42281 # Investigation of the mechanism of the phrenic nerve cross phenomenon (Doslidzhennia mekhanizmu 'perekhresnogo fenomena diafrazmal'nogo nerva').** D. O. Kocherga and P. M. Onishchenko (Akademiia Nauk Ukrain'skoi RSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal*, vol. 18, May-June 1972, p. 299-306. 15 refs. In Ukrainian.

Study of diaphragm 'cross contractions' following hemisection or longitudinal section of the spinal cord in the cervical region in narcotized cats, by electromyography. The results obtained include the finding that section of the phrenic nerve is not necessary for the start of diaphragm cross contractions.

M.V.E.

**A72-42282 # Modulating effect of limbic brain formations on the blood system (Pro moduliuvchii vpliv limbichnikh utvoren' mozku na sistemu krovii).** F. P. Vediaev and V. M. Mikhailov (Kharkiv'skii Medichnii Institut, Kharkov, Ukrainian SSR). *Fiziologichnii Zhurnal*, vol. 18, May-June 1972, p. 307-314. 13 refs. In Ukrainian.

Study of data on the effect of electric stimulation and electric destruction of amygdaloid complex nuclei on blood characteristics in rabbits. The effect is shown to consist in short-term early changes in erythrocyte and reticulocyte numbers and later changes in erythrocyte resistance to acids. Other results of the study include the finding that, among amygdaloid complex nuclei, two distinct and functionally different groups are in existence.

M.V.E.

**A72-42283 # Changes in blood serum proteins under the effect of hyperoxia in intact rats with thyroid gland dysfunction (Pro zmieni bilkiv sirovatki krovii pid vplivom giperoksii u intaktnikh shchuriv ta pri disfunktsii shchitovidnoi zalozi).** V. P. Dudarev (Akademiia Nauk Ukrain'skoi RSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal*, vol. 18, May-June 1972, p. 339-345. 39 refs. In Ukrainian.

**A72-42284 # The function of external respiration in mental activity (Funktsiia, zovnishn'ogo dikhannia pri rozumovii diial'nosti).** S. M. Rashman (Kiiv'skii Pedagogichnii Institut, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal*, vol. 18, May-June 1972, p. 361-366. 12 refs. In Ukrainian.

Investigation of the changes affecting the external respiration and cardiovascular systems during intense mental activity (namely, problem solution in mathematical analysis). Data are reviewed on: changes in arterial blood saturation by oxygen; respiratory fre-

quency, capacity, and minute volume; oxygen consumption and intake coefficient; ventilation equivalent; and a number of psychophysiological indices characterizing the state of cortical processes during intense mental activity.

M.V.E.

**A72-42299 Dynamic characteristics of nervous nets in the visual system (Dynamische Eigenschaften von Nervennetzen im visuellen System).** A. Korn (Institut für Informationsverarbeitung in Technik und Biologie, Karlsruhe, West Germany) and W. von Seelen (Battelle-Institut, Frankfurt am Main, West Germany). *Kybernetik*, vol. 10, no. 2, 1972, p. 64-77. 17 refs. In German. Research supported by the Bundesministerium für Verteidigung.

The preprocessing of optical information in the visual system takes place in the two-dimensional homogeneous nervous nets of the retina and the geniculate body. These networks can be considered as band-pass filters for space-dependent oscillations if the input stimuli are independent of time. If the synapses of the neurons have time-frequency dependent properties the performance of the system in the space domain, which is important for pattern recognition, is determined by the time dependence of input signal. For a description of these networks in this investigation the space spectrum for various values of the time frequency omega is used. The answers of real nervous nets can be interpreted by the model when the two-dimensional input signals are switched, flickered or moved. For this reason these dynamic stimuli are necessary for an analysis of the cortex. The theoretical combination of space- and time-dependent filtering is essential for an understanding of cortical transformations.

(Author)

**A72-42318 On the possibility of an organic magnet.** H. A. Pohl (Cambridge University, Cambridge, England; Oklahoma State University, Stillwater, Okla.). *Philosophical Magazine, 8th Series*, vol. 26, Sept. 1972, p. 593-600. 5 refs. Research supported by the Oklahoma State University, Paint Research Institute, U.S. Army, and NATO.

The conditions needed to produce an organic ring-shaped molecule exhibiting a persistent magnetization are calculated from quantum and chemical considerations. Using a simplified one-particle operator model and known chemical binding energies it is concluded that such a molecule would need to be very large (about 100 Å in diameter) to be stable, and that synthesis would probably need to take place in a preexisting strong magnetic field.

(Author)

**A72-42474 # Molecules and life (Les molécules et la vie).** J. Duchesne. *Académie Royale de Belgique, Classe des Sciences, Bulletin*, vol. 57, no. 12, 1971, p. 1304-1315. 23 refs. In French.

Recent progress, which has sometimes been extraordinary, in biology and molecular biophysics is reviewed. The major question posed when contemplating the invasion of biology by the concepts of physics is to know to what extent life is reducible to the laws of the latter. Some results relating to synthetic semibiological systems are outlined. Molecular pathology, and free radicals and longevity are discussed.

F.R.L.

**A72-42487 Effect of fasting on tolerance to moderate hypoxia.** W. G. Hartzell and P. D. Newberry (Defence and Civil Institute of Environmental Medicine, Downsview, Ontario, Canada). *Aerospace Medicine*, vol. 43, Aug. 1972, p. 821-826. 13 refs.

Blood pressure response to moderate hypoxia was compared in a fasting and a control (nonfasting) state in 10 seated subjects. End-tidal gas tensions were monitored continuously in the tests. In the control state the mean arterial pressure (MAP) was 98% of its resting value after 45 minutes of exposure to a simulated altitude of 17,000 ft. When exposed to the same stress after fasting for 18 hours, the MAP fell to 87% of its resting value. The mean end-tidal oxygen tension was significantly lower in the fasting state and the end-tidal oxygen tension was unchanged. We conclude that acute

fasting significantly increases the orthostatic, hypotensive response to moderate hypoxia. (Author)

**A72-42488** Oxygen consumption in liquid breathing mice. C. E. G. Lundgren and H. Ch. Ornhagen (Lund, Universitet, Lund, Sweden). *Aerospace Medicine*, vol. 43, Aug. 1972, p. 831-835. 13 refs.

Oxygen consumption was measured in mice spontaneously breathing fluorocarbon liquid oxygenated at different pressures. Body temperature was varied from 16 C and upwards and oxygenation pressures ranged from 1.0 to 7.8 atm. Intraperitoneal buffer (THAM) injections did not appreciably influence survival time which was usually too short for oxygen consumption measurements at temperatures above 34 C. It was found that up to a body temperature of about 22 C the oxygen uptake was not influenced by the oxygenation pressure. Above this temperature the oxygen pressure had to be increased to yield a maximal oxygen uptake, about 3.5 atm of oxygen pressure apparently being adequate at all body temperature levels. (Author)

**A72-42489** Effects of externally imposed mechanical resistance on breathing dense gas at exercise - Mechanics of breathing. R. R. Uhl, C. Van Dyke, R. B. Cook, R. A. Horst, and J. M. Merz (California, University; U.S. Navy, Submarine Development Group One, San Diego, Calif.). *Aerospace Medicine*, vol. 43, Aug. 1972, p. 836-841. 30 refs. Navy-supported research.

**A72-42490** New mechanical device for producing traumatic shock in dogs - Circulatory and respiratory responses. C. T. Liu (Baylor University, Houston, Tex.). *Aerospace Medicine*, vol. 43, Aug. 1972, p. 842-848. 23 refs. Research supported by the Texas Heart Association; Grant No. PHS-HE-5435.

**A72-42491** Vascular headache of acute mountain sickness. A. B. King and S. M. Robinson (U.S. Army, Research Institute of Environmental Medicine, Natick, Mass.). *Aerospace Medicine*, vol. 43, Aug. 1972, p. 849-851. 12 refs.

The hypoxia-induced headache of acute mountain sickness was studied in 30 young men during a 30-hour exposure to simulated altitudes of 14,000 or 15,000 feet. Digital compression of the superficial temporal arteries was associated with the disappearance of the headache in the majority of subjects. Valsalva maneuver reduced the amplitude of pulsations in the temporal arteries and partially alleviated head pain. The similarities between the hypoxia-induced headache of acute mountain sickness and the common migraine headache are discussed. (Author)

**A72-42492** Heat strain in hot and humid environments. E. Shvartz (Negev Institute for Arid Zone Research, Beersheba, Israel) and D. Benor (Tel Aviv, University, Tel Aviv, Israel). *Aerospace Medicine*, vol. 43, Aug. 1972, p. 852-855. 15 refs.

Seven subjects attempted a 2-hour walk on a treadmill at 3.5 km/hour in 6 different environments of 25, 30, 35, 40, 45 and 50 C each, while wearing vapor-barrier suits that simulated 100% relative humidity. Heat strain measurements and tolerance times were recorded. At 25 C all subjects completed the 2-hour walk with negligible signs of heat strain, while tolerance times in the other conditions varied between less than 2 hours at 30 C to 28 minutes at 50 C. Heart rate, skin temperature and sweat rate increased with a rise in room temperature. Tolerance time was found to be a function of body heat storage, and was also related to skin temperature at 10 minutes of exposure. (Author)

**A72-42493 \*** Effects of the space flight environment on man's immune system. I - Serum proteins and immunoglobulins. C.

L. Fischer, C. Gill, E. K. Cobb, C. A. Berry, S. E. Ritzmann (NASA, Manned Spacecraft Center, Houston; Texas, University, Galveston, Tex.), and J. C. Daniels. *Aerospace Medicine*, vol. 43, Aug. 1972, p. 856-859. 8 refs. Contracts No. NAS9-6811; No. NAS9-8258; No. NAS9-8122; No. NAS9-11088.

**A72-42494** Hypothermia and resistance of mice to lethal exposures to high gravitational forces. F. R. Tillman and J. A. Miller, Jr. (Tulane University, New Orleans, La.). *Aerospace Medicine*, vol. 43, Aug. 1972, p. 860-866. 25 refs.

**A72-42495 \*** Quantitation of serum proteins on whole blood-electroimmunodiffusion technique applicable to capillary blood. J. C. Daniels, E. K. Cobb, C. J. McClung, C. L. Fischer, and S. E. Ritzmann (Texas, University, Galveston; NASA, Manned Spacecraft Center, Houston, Tex.). *Aerospace Medicine*, vol. 43, Aug. 1972, p. 878-880. 9 refs. Contract No. NAS9-11088.

**A72-42496** Speech intelligibility during exercise at normal and increased atmospheric pressures. T. Murry, E. J. Nelson, and E. W. Swenson (U.S. Navy, Naval Submarine Base New London, Groton, Conn.; Florida, University, Gainesville, Fla.). *Aerospace Medicine*, vol. 43, Aug. 1972, p. 887-890. 9 refs.

**A72-42497** Perplexing case of maxillary sinus barotrauma. J. Idicula (Pennsylvania, University, Philadelphia, Pa.). *Aerospace Medicine*, vol. 43, Aug. 1972, p. 891, 892. 5 refs.

Most cases of sinus barotrauma occur as the ambient pressure rises either while diving or while descending in an aircraft. In the case presented here, the barotrauma occurred while the subject was being decompressed from a 680-foot dive. This is possible, but rare, and is due to a pressure build-up inside the sinus due to blockage of the ostium by a ball-valve mechanism. The other interesting feature was the occurrence of numbness in the distribution of the infraorbital nerve which was especially perplexing because the subject was decompressing after treatment for a knee bend. Post-dive X-rays of the sinuses showed protrusion of the mucous membrane suggestive of chronic sinusitis. (Author)

**A72-42498** Hazard rate of recurrence in germinal cell tumors of the testis. F. G. Conrad, H. R. Bales, Jr., M. F. Allen, and R. G. Rossing (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aerospace Medicine*, vol. 43, Aug. 1972, p. 893-897. 6 refs.

**A72-42499 #** Ocular complications of drug therapy. T. J. Tredici and D. L. Epstein (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aerospace Medicine*, vol. 43, Aug. 1972, p. 898-902. 33 refs.

A brief resume of the neuro-pharmacology of the eye is given. Complications of drugs usually used in glaucoma therapy are stressed; also complications to the eye and vision resulting from the use of steroids, certain topical drugs, oxygen, antimalarial compounds, and several miscellaneous drugs are discussed. Enumerating the variety of drugs and reactions to them should alert the flight surgeon to seek a reliable history and make him better able to advise the flyer accordingly. (Author)

**A72-42500** Airport medical design guide /with comment on certain operational matters/. S. R. Mohler and J. A. Sirkis (FAA, Office of Aviation Medicine, Washington, D.C.). *Aerospace Medicine*, vol. 43, Aug. 1972, p. 903-911. 12 refs.

**A72-42546** The accuracy of aiming at a target - Some further evidence for a theory of intermittent control. W. D. A. Beggs and C. I. Howarth (Nottingham University, Nottingham, England).



*Acta Psychologica*, vol. 36, June 1972, p. 171-177.

Speed and accuracy for subjects who suffered loss of illumination when aiming a dart at a target are analyzed. The intermittency of visual correction by extinguishing the illumination in a lightproof cubicle during the course of aiming had previously been demonstrated by the authors (1970). The relationship between time to impact and distance to impact gives the approach curve for the subjects. The results are in strong support of the hypothesis of intermittent corrections being applied to aiming motions to a target.

F.R.L.

**A72-42547** On threshold mechanisms for achromatic and chromatic vision. M. A. Bouman (Utrecht Rijksuniversiteit, Utrecht, Netherlands) and P. L. Walraven (Institute for Perception TNO, Soesterberg, Netherlands). *Acta Psychologica*, vol. 36, June 1972, p. 178-189. 34 refs.

On the basis of measurements of the achromatic zone for red light in the fovea and for green light in the periphery, a discussion is given on the possible difference in threshold mechanisms for the achromatic (scotopic) and chromatic (photopic) retinal systems. A specific suggestion for this distinction is given that not directly refers to the usual rod-cone concept but is based on the occurrence of multiple coincidence of quantum absorptions by multiple hits per receptor no matter rod or cone as photopic signals, versus multiple coincidences by single hits per receptor in a distinct ommatidium type group of receptors as scotopic signals. (Author)

**A72-42548** Some effects of cognitive similarity on proactive and retroactive interference in short-term memory. A. A. Bunt and A. F. Sanders (Institute for Perception TNO, Soesterberg, Netherlands). *Acta Psychologica*, vol. 36, June 1972, p. 190-196. 20 refs.

**A72-42549** Reaction time to the second of two shortly spaced auditory signals both varying in intensity. P. J. G. Keuss (Amsterdam, Vrije Universiteit, Amsterdam, Netherlands). *Acta Psychologica*, vol. 36, June 1972, p. 226-238. 26 refs. Research supported by the Nederlandse Organisatie voor Zuiver Wetenschappelijk Onderzoek.

**A72-42550** Heart rate variability in a binary choice reaction task - An evaluation of some scoring methods. G. Mulder and W. R. E. H. Mulder-Hajonides van der Meulen (Groningen, Rijksuniversiteit, Groningen, Netherlands). *Acta Psychologica*, vol. 36, June 1972, p. 239-251. 12 refs.

**A72-42583** High altitude physiology: Cardiac and respiratory aspects; Proceedings of the Symposium, London, England, February 17, 18, 1971. Symposium supported by the Ciba Foundation. Edited by R. Porter and J. Knight. Edinburgh, Churchill Livingstone, 1971. 211 p. \$7.80.

Physiological and biochemical effects of high-altitude on the cardiovascular and respiratory functions are described in medical reports dealing with adaptive processes and pathological aspects of chronic mountain sickness. High-altitude acclimatization is discussed in terms of ventilatory response changes, altered blood flow rates, haemoglobin variations, hyperplasia of the carotid body, changes in the myocardial metabolism, heart vascularization patterns, and fluctuations in body growth rates. Ventilatory responsiveness to hypoxia is related with central nervous system functions, and a new concept of chronic mountain sickness as a disease is advanced.

T.M.

**A72-42584** The influence of high altitude on physiology. A. Hurtado (Universidad Peruana, Lima, Peru). In: High altitude physiology: Cardiac and respiratory aspects; Proceedings of the

Symposium, London, England, February 17, 18, 1971. Edinburgh, Churchill Livingstone, 1971, p. 3-8; Discussion, 8-13. 41 refs.

Adaptive processes responsible for natural acclimatization of the human organism to low ambient pressures are discussed under two broadly classified categories. The first includes those processes which act along the oxygen-tension gradient from the inspired air to the tissues, introducing an economy in its fall to compensate for the initial low value and facilitating the acquisition and transport of oxygen. The other group of processes operates at tissue level, favoring diffusion and utilization of oxygen in cellular metabolic activities.

T.M.

**A72-42585** Morphometric evaluation of changes in lung structure due to high altitude. P. H. Burri and E. R. Weibel (Bern, Universität, Berne, Switzerland). In: High altitude physiology: Cardiac and respiratory aspects; Proceedings of the Symposium, London, England, February 17, 18, 1971. Edinburgh, Churchill Livingstone, 1971, p. 15-25; Discussion, p. 25-30. 27 refs. Swiss National Science Foundation Grant No. 3,5,68.

Description of experiments undertaken for the purpose of detecting possible morphometric alterations of the lung structure induced by changes in the environmental oxygen pressure during growth in rats. One series of experiments involved rats maintained at a high-altitude research station (3450 m) from the 23-rd to the 44-th day of life (a period in which the rat triples its body weight). Results provide evidence that the oxygen tension of ambient air influences postnatal growth of the lung during the growth period investigated and, more specifically, that high-altitude hypoxia induces the formation of a larger gas-exchange apparatus. In another series of experiments, rats born under hypoxic, normoxic, and hyperoxic conditions were studied for a prolonged period. The findings of the short-term experiments were essentially confirmed.

T.M.

**A72-42586** Chronic mountain sickness - Pathology and definition. J. Arias-Stella (Universidad Peruana, Lima, Peru). In: High altitude physiology: Cardiac and respiratory aspects; Proceedings of the Symposium, London, England, February 17, 18, 1971. Edinburgh, Churchill Livingstone, 1971, p. 31-40. 26 refs.

Anatomical and histological findings in the autopsy of a suspected case of chronic mountain sickness are compared with quantitative data on the morphology of the cardiovascular system in normal people from high-altitudes. The analysis of this case and a review of eighty cases collected from the literature provide a basis for a new concept of this disease. Three distinguishable clinicopathological forms (chronic soroche, Monge's syndrome, and Monge's disease) are discussed in terms of the pathogenesis, characteristics, and differential features. The case described in detail is an example of what is defined as Monge's syndrome.

T.M.

**A72-42587** Cor pulmonale in chronic mountain sickness - Present concept of Monge's disease. D. Peñaloza, F. Sime, and L. Ruiz (Universidad Peruana, Lima, Peru). In: High altitude physiology: Cardiac and respiratory aspects; Proceedings of the Symposium, London, England, February 17, 18, 1971. Edinburgh, Churchill Livingstone, 1971, p. 41-52; Discussion, p. 52-60. 45 refs. Grants No. PHS-HE-06910-07; No. DAHC19-68-G-0028.

Medical studies carried out in the central Andes of Peru (4375 m a.s.l.) provided information about the heart and circulation of ten male subjects suffering from chronic mountain sickness. Cyanosis, extreme polycythaemia, and very low values of arterial oxygen saturation were frequent findings. X-ray examinations supported by electrocardiographic and vector-cardiographic studies showed enlargement of the cardiac chambers. The clinical symptoms as well as the radiological, electrocardiographic, and haemodynamic data are similar to those occurring in cases of chronic cor pulmonale due to

alveolar hypoventilation. Present evidence indicates that chronic mountain sickness is a particular case of alveolar hypoventilation produced by a deficient respiratory drive. T.M.

**A72-42588** Transarterial leakage - A possible mechanism of high altitude pulmonary oedema. J. W. Severinghaus (California, University, San Francisco, Calif.). In: High altitude physiology: Cardiac and respiratory aspects; Proceedings of the Symposium, London, England, February 17, 18, 1971. Edinburgh, Churchill Livingstone, 1971, p. 61-68; Discussion, p. 68-77. 28 refs. Grant No. PHS-HE-06285.

The hypothesis that hypoxic pulmonary ventilation might produce pulmonary oedema by transarterial leakage was tested in experiments on dogs and rats. When the terminal arterial bed was blocked with polystyrene microspheres, pulmonary hypertension (hypoxic or normoxic) was uniformly found to be associated with perivascular oedema cuffs and sometimes with perivascular hemorrhage. Similar cuffing was associated with nonembolized hypertensive controls, but usually not with nonhypertensive embolized controls. Additional studies were conducted with normal men during early high-altitude acclimatization for the purpose of detecting slight pulmonary dysfunction which may be related to subclinical pulmonary oedema. Overall, results appear compatible with the hypothesis of transarterial leakage as a factor in the pathogenesis of pulmonary oedema. T.M.

**A72-42589** The carotid body in animals at high altitude. C. W. Edwards (Liverpool, University, Liverpool, England). In: High altitude physiology: Cardiac and respiratory aspects; Proceedings of the Symposium, London, England, February 17, 18, 1971. Edinburgh, Churchill Livingstone, 1971, p. 79-84; Discussion, p. 84-88. 9 refs. Research supported by the Medical Research Council.

The size and histology of the carotid bodies of guinea pigs, rabbits, and dogs born and living at high altitudes were compared with the appearances in a similar group of animals from a sea-level environment. The carotid bodies of the high-altitude group were found to be larger than those of the low-altitude animals. In guinea pigs and rabbits, this enlargement was associated with a hyperplasia of light type I cells. It is suggested that the carotid body enlarges in response to chronic hypoxia brought about by the low barometric pressure. The light type I cell may be specifically stimulated. T.M.

**A72-42590** Suprapontine influences on hypoxic ventilatory control. S. M. Tenney, P. Scotto, L. C. Ou, D. Bartlett, Jr., and J. E. Remmers (Dartmouth College, Hanover, N.H.). In: High altitude physiology: Cardiac and respiratory aspects; Proceedings of the Symposium, London, England, February 17, 18, 1971. Edinburgh, Churchill Livingstone, 1971, p. 89-98; Discussion, p. 98-102. 29 refs. Grant No. NIH-HE-02888.

Cats acclimatized to an equivalent altitude of 5500 m exhibit an attenuated ventilatory response to hypoxia. A control, sea-level magnitude of responsiveness can be restored by mid-collicular decerebration, and a supernormal responsiveness can be attained by decortication. A proposed hypothesis explains hypoxic responsiveness as determined in part by descending influences on the medullary control centers. These influences are made up of facilitatory (*diencephalic*) and inhibitory (*cortical*) components, the final effect being a manifestation of the balance between these two components. Hypoxic blunting is believed to be a shift in the balance toward relative inhibitory preponderance. T.M.

**A72-42591** Genetic aspects of the blunted chemoreflex ventilatory response to hypoxia in high altitude adaptation. S. Lahiri (Pennsylvania, University, Philadelphia, Pa.). In: High altitude physiology: Cardiac and respiratory aspects; Proceedings of the Symposium, London, England, February 17, 18, 1971.

Edinburgh, Churchill Livingstone, 1971, p. 103-112; Discussion, p. 112-124. 51 refs. Research supported by the World Health Organization; Grant No. PHS-HE-08805.

**A72-42592** Some observations on the biochemistry of the myocardium at high altitude. P. Harris (Institute of Cardiology, London, England). In: High altitude physiology: Cardiac and respiratory aspects; Proceedings of the Symposium, London, England, February 17, 18, 1971. Edinburgh, Churchill Livingstone, 1971, p. 125-129. 7 refs. Research supported by Wellcome Trust.

Succinic dehydrogenase and lactic dehydrogenase activities in homogenates from myocardial tissues of guinea pigs, rabbits, and dogs were measured and compared with results obtained for the same species of animals from a sea-level environment. A consistent increase in the activity of succinic dehydrogenase was found in the high-altitude animals, but no significant difference in activity was observed for lactic dehydrogenase. All three species of the high-altitude group show consistent increases of the total lipid, total phospholipid, cholesterol, and sphingomyelin contents in the myocardium. T.M.

**A72-42593** Coronary blood flow and myocardial metabolism in man at high altitude. P. R. Moret (Hôpital Cantonal, Geneva, Switzerland). In: High altitude physiology: Cardiac and respiratory aspects; Proceedings of the Symposium, London, England, February 17, 18, 1971. Edinburgh, Churchill Livingstone, 1971, p. 131-144; Discussion, p. 144-148. 13 refs.

Measurements of coronary circulation and myocardial metabolism in young normal men indigenous to three different altitude levels (150, 3700, and 4375 m) are compared with similar data for six patients suffering from chronic mountain sickness. For normal subjects, both the coronary blood flow and the oxygen consumption of the myocardium are lower at higher altitudes, resulting in greater myocardial efficiency. This lower coronary flow is not compensated by any increased oxygen transport capacity of the blood. Substrates usually extracted by the heart (glucose, lactate, pyruvate, and free fatty acids) are the same at both high and low altitudes, but the heart consumes more carbohydrates at high altitudes and there are no signs of anaerobic metabolism. Coronary blood flow was higher in the six afflicted subjects than in the normal groups, and in some cases the myocardium was slightly perfused. T.M.

**A72-42594** Anatomy of the coronary circulation at high altitude. J. Arias-Stella and M. Topilsky (Universidad Peruana, Lima, Peru). In: High altitude physiology: Cardiac and respiratory aspects; Proceedings of the Symposium, London, England, February 17, 18, 1971. Edinburgh, Churchill Livingstone, 1971, p. 149-154; Discussion, p. 154-157. 17 refs.

Ten hearts from deceased individuals indigenous to a 4375-m altitude and ten hearts from comparably aged deceased individuals indigenous to a sea-level environment were studied by preparing casts of the coronary arterial system through aortic injection of rapidly polymerizing acrylic resin. Conclusions gained from observation of vascularization patterns are compared with other results obtained by the postmortem stereoangiographic method. Both studies show that the number of branches leaving the main coronary trunks is greater and that the peripheral ramifications are more numerous at high altitudes. T.M.

**A72-42595** Resistance and capacitance vessels of the skin in permanent and temporary residents at high altitude. J. Durand and J. P. Martineaud (Centre Chirurgical Marie-Lannelongue, Paris, France). In: High altitude physiology: Cardiac and respiratory aspects; Proceedings of the Symposium, London, England, February 17, 18, 1971. Edinburgh, Churchill Livingstone, 1971, p. 159-167; Discussion, p. 167-170. 21 refs.

**A72-42668** Blood flow, oxygen uptake, and capillary filtration in resting skeletal muscle. G. Beer and L. R. Yonce (North Carolina, University, Chapel Hill, N.C.). *American Journal of Physiology*, vol. 223, Sept. 1972, p. 492-498. 26 refs.

**A72-42669** Effect of activity and temperature on metabolism and water loss in snakes. R. Dmi'el (Tel Aviv, University, Tel Aviv, Israel). *American Journal of Physiology*, vol. 223, Sept. 1972, p. 510-516. 27 refs.

**A72-42670** Guinea pig ductus arteriosus. III - Light absorption changes during response to O<sub>2</sub>. F. S. Fay (Massachusetts, University, Worcester, Mass.) and F. F. Jobsis (Duke University, Durham, N.C.). *American Journal of Physiology*, vol. 223, Sept. 1972, p. 588-595. 19 refs. Research supported by the Massachusetts Heart Association and American Heart Association; Grant No. NIH-AM-10532.

Correlations between the oxidation level of respiratory chain components and tension production at various oxygen pressures were studied spectrophotometrically in the intact ductus arteriosus of the newborn guinea pig. Cytochromes a sub 3 and b were present at approximately 8 and 12 micron levels, respectively. The ratio of cytochrome b to a sub 3 was high compared to skeletal muscle, but intermediate between two other types of smooth muscle studied. Illumination of the ductus in the presence of CO and O<sub>2</sub> with monochromatic light induced a contraction. Maximal photoactivated contraction was observed between 420 and 425 nm, reasonably close to the absorption maximum for the cytochrome a sub 3-CO complex. Changes in oxidation level of cytochrome a sub 3 induced by oxygen partial pressure changes always preceded the onset of the tension response. The results strongly support the view that O<sub>2</sub> triggers contraction by a sequence of events, the first of which is the interaction of O<sub>2</sub> with cytochrome a sub 3. (Author)

**A72-42671** Control of cerebral blood flow in the goat - Role of the carotid rete. N. H. Edelman, P. Epstein, N. S. Cherniack, and A. P. Fishman (Pennsylvania, University, Philadelphia, Pa.). *American Journal of Physiology*, vol. 223, Sept. 1972, p. 615-619. 12 refs. Grants No. PHS-HE-08805; No. PHS-HE-17792; No. PHS-HE-05896.

A procedure has been developed for continuously measuring cerebral blood flow in the goat. This method takes advantage of the unique anatomy of the cerebral vasculature of this species in order to measure unilateral cerebral blood flow with an electromagnetic flowmeter. Using this procedure, the cerebral vasculature of the goat was shown to dilate during acute hypoxia and hypercapnia in a manner similar to that observed in other mammals. Separate studies were done to characterize the behavior of the vessels that comprise the carotid rete. These indicated that the vessels of the rete constrict in response to norepinephrine, dilate in response to isoproterenol, and are unaffected by an appreciable increase in arterial CO<sub>2</sub> partial pressure. The carotid rete may protect the brain against extreme elevations of systemic blood pressure by increasing resistance to blood flow and dampening the systemic pressure pulse. (Author)

**A72-42672** Effects of heating and cooling of spinal cord on CV and respiratory responses and food and water intake. M. T. Lin, T. H. Yin, and C. Y. Chai (National Defense Medical Center; Veterans General Hospital, Taipei, Nationalist China). *American Journal of Physiology*, vol. 223, Sept. 1972, p. 626-631. 33 refs. Research supported by the International Foundation and China Medical Board of New York.

In 18 unanesthetized but restrained rats, the spinal cord was heated to 41.2 C or cooled to 32.7 C for 5 min. Heating increased the subcutaneous temperature 4.2 C and respiratory rate 36 breaths/min, while it decreased the heart rate 115 beats/min, arterial

blood pressure 40 mm Hg, and the body temperature 0.6 C. Cooling decreased the subcutaneous temperature 1.0 C and respiratory rate 29 breaths/min, while it increased the heart rate 73 beats/min and arterial blood pressure 28 mm Hg with negligible change of the body temperature. Additional results suggest that there are thermosensitive elements related to regulation of temperature and intake of food and water in the spinal cord. (Author)

**A72-42673** Mitochondrial alterations in heart, liver, and kidney of altitude-acclimated rats. H. G. Shertzer and J. Cascarano (California, University, Los Angeles, Calif.). *American Journal of Physiology*, vol. 223, Sept. 1972, p. 632-636. 30 refs.

Mitochondrial alterations were studied in heart, liver, and kidney of rats maintained at 0.5 atm for 14 days followed by 14 days at 0.4 atm. Systemic responses to hypoxic acclimation were measured: hematocrits increased 58%, heart-weight to body-weight ratios increased 22.5%, while liver and kidney-weight to body-weight ratios remained unchanged. Hypoxic acclimated animals exhibited decreased whole tissue cytochrome oxidase activity per gram wet weight: 26% for heart, 17.2% for liver, and 19.9% for kidney. Cytochrome oxidase activity per unit of mitochondrial protein was unchanged by hypoxic acclimation, while succinic dehydrogenase activity increased on the same basis: 41% for heart and kidney and 135% for liver. Spectral analyses of reduced versus oxidized mitochondrial suspensions are consistent with the enzyme activity data. (Author)

**A72-42674** Influence of respiration and respiratory sinus arrhythmia on aortic regurgitation. R. R. Taylor (Western Australia, University, Perth, Australia) and B. E. Hopkins (Royal Perth Hospital, Perth, Australia). *American Journal of Physiology*, vol. 223, Sept. 1972, p. 668-672. 14 refs. Research supported by the Noel Beaven Heart Foundation of Western Australia and National Heart Foundation of Australia.

The influence of the respiratory cycle and its hemodynamic sequelae on the extent of aortic regurgitation was studied in closed-chest sedated dogs. Forward and backward flow was measured in the ascending aorta using an electromagnetic flow transducer. The latter was implanted at thoracotomy 1 week earlier, when aortic regurgitation was produced. Aortic regurgitation varied with respiratory sinus arrhythmia. In 11 dogs with aortic regurgitation, during tachycardia coincident with inspiration, diastolic regurgitant volume averaged 15 plus or minus 17 (sd) ml less than during bradycardia (P less than 0.02). Total stroke volume averaged 10 plus or minus 9 ml less (P less than 0.005) and regurgitant fraction 0.14 plus or minus 0.12 less (P less than 0.005). Forward effective stroke volume increased during tachycardia by an average of 5 plus or minus 13 ml, which was significantly different from the decrease in stroke volume of 7 plus or minus 6 ml in seven normal dogs (P less than 0.05). (Author)

**A72-42675 \*** Lymphoid involution and delayed homograft rejection in hypoxia-exposed mice. J. M. Kmetz and A. Anthony (Pennsylvania State University, University Park, Pa.). *American Journal of Physiology*, vol. 223, Sept. 1972, p. 673-678. 23 refs. Grants No. PHS-GM-5112; No. NGR-39-009-115.

Investigation of the relationship between histologic and cytochemical response patterns of the thymus, spleen, and lymph nodes of mice exposed to moderate hypoxia (380 mm Hg), and study, by histologic analysis, of the effect of hypoxia exposure on the skin homograft reaction used as an index of immunologic potential. The results obtained include the finding that functional changes in lymphatic organs occur during early weeks of hypoxia acclimation and that these changes probably reduce the ability of an animal to react to an immunological challenge. M.V.E.

**A72-42723 #** Reactions of auditory cortex neurons to geniculocortical fiber stimulation (Reaktsii neuronov slukhovoï kory

na razdrazhenie genikulokortikal'nykh volokon). F. N. Serkov and E. Sh. Ivanovskii (Akademiia Nauk Ukrainsoi SSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Neirofiziologiia*, vol. 4, May-June 1972, p. 227-235. 23 refs. In Russian.

Extracellular and intracellular reactions to electrical stimulation of genicular fibers were recorded in individual auditory cortex neurons of tubocurarine-immobilized cats. The latent periods of reactions were 0.3 to 1.5 microseconds in 15% of neurons and the latent periods of peak potentials in responsive neurons varied from 1.6 to 12 microseconds. The intracellular recordings indicated primary IPSPs in 63.3% of neurons and subthreshold EPSPs in 7% of neurons. Both antidromic and orthodromic responses were recorded. Theoretical considerations are given concerning the functional arrangement of the auditory cortex and inhibitive mechanisms of cortical neurons. V.Z.

**A72-42724 #** Dependence of inhibitory areas of inferior colliculus neurons on the time characteristics of acoustic stimuli (Zavisimost' tormoznykh zon otvetov neironov zadnikh kholmov ot vremennykh parametrov zvukovykh stimulov). I. A. Vartanian (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). *Neirofiziologiia*, vol. 4, May-June 1972, p. 236-244. 15 refs. In Russian.

**A72-42725 #** Effect of a polarizing current on the activity of neurons of the respiratory center (Vliianie polarizuiushchego toka na aktivnost' neironov dykhatel'nogo tsentra). A. B. Kogan, A. A. Chumachenko, V. N. Efimov, and V. A. Safonov (Rostovskii-na-Donu Gosudarstvennyi Universitet, Rostov on Don, USSR). *Neirofiziologiia*, vol. 4, May-June 1972, p. 280-285. 13 refs. In Russian.

**A72-42741** Heat acclimatization by exercise-induced elevation of body temperature. P. Marcus (RAF, Institute of Aviation Medicine, Farnborough, Hants., England). *Journal of Applied Physiology*, vol. 33, Sept. 1972, p. 283-288. 11 refs.

An experiment was undertaken in which eight male subjects performed 17 daily (excluding weekends) exercise periods in a room conditioned at 10 C dry bulb. All of the subjects wore vapor barrier suits, half with much added external insulation and half with little. Those subjects wearing much insulation performed considerably less exercise than those wearing less but they had higher skin temperatures. Tests carried out before and after the runs showed better levels of physical fitness and higher sweat rates and lower body temperatures and heart rates in the heat following the treatment. It is concluded that heat acclimatization may be induced by elevation of body and skin temperatures by exercise in insulated vapor barrier suits. (Author)

**A72-42742** Analysis of femoral venous blood during maximum muscular exercise. F. Pirnay, M. Lamy, J. Dujardin, R. Deroanne, and J. M. Petit (Institut Malvoz; Liège, Université, Liège, Belgium). *Journal of Applied Physiology*, vol. 33, Sept. 1972, p. 289-292. 21 refs.

Blood gases sampled from the deep femoral vein were analyzed during exercise on an uphill treadmill and a bicycle ergometer. Under normal conditions, the venous oxygen partial pressure gradually decreased as the work load increased, falling to 16.6 plus or minus 2.4 mm Hg at the point of exhaustion. When heart rate and cardiac output were reduced by a beta-adrenergic blocking agent, muscle O<sub>2</sub> uptake was always more complete and the venous oxygen partial pressure fell to a mean of 12.9 plus or minus 2.3 mm Hg during maximum exercise. When subjects breathed 100 percent O<sub>2</sub>, the venous oxygen partial pressure was higher than normal at each given work load, even during exhaustion. The lowest mean venous oxygen partial pressure during hyperoxia was only 20.5 plus or minus 1.9 mm Hg. Changes in CO<sub>2</sub> partial pressure and pH were variable and statistically insignificant. These results suggest that O<sub>2</sub> extraction in

leg muscles is not maximal under normal conditions. They support the hypothesis that maximum O<sub>2</sub> consumption is limited by biochemical factors. (Author)

**A72-42743** Oxygen uptake kinetics for various intensities of constant-load work. B. J. Whipp (Harbor General Hospital, Torrance, Calif.) and K. Wasserman (California, University, Los Angeles, Calif.). *Journal of Applied Physiology*, vol. 33, Sept. 1972, p. 351-356. 30 refs. Grant No. PHS-HE-11907.

To elucidate the effects of work intensity on the time course of O<sub>2</sub> uptake ( $\dot{V}$  sub O<sub>2</sub>) during constant-load exercise, signals from a pneumotachograph and rapidly responding O<sub>2</sub> and CO<sub>2</sub> analyzers, transmitted to a digital computer, which calculated and displayed on-line  $\dot{V}$  sub O<sub>2</sub> for each breath. Normal male subjects were studied at six different constant work rates.  $\dot{V}$  sub O<sub>2</sub> steady state was reached within 3 min at low work rates. The steady-state time was progressively delayed at higher work rates. The difference between  $\dot{V}$  sub O<sub>2</sub> at 3 and 6 min at each work level was increasingly greater, the higher the work rate. At high work rates, the nonsteady-state phase is made up of two exponential processes, one being very rapid and the other much slower and describing all changes after about 3 min. The latter is only apparent if the duration of work is sufficiently long to ensure a true  $\dot{V}$  sub O<sub>2</sub> steady-state value. (Author)

**A72-42744 \*** Inert gas effects on embryonic development. H. S. Weiss and M. Grimard (Ohio State University, Columbus, Ohio). *Journal of Applied Physiology*, vol. 33, Sept. 1972, p. 375-380. 21 refs. Grant No. NGR-36-008-004.

It had been found in previous investigations that hatchability of fertile chicken eggs is reduced to 50% or less of controls if incubation takes place in a low nitrogen atmosphere containing He. Although these results suggest some role for nitrogen in embryogenesis, it is possible that a requirement exists for an inert molecule closer in physical characteristics to nitrogen than is He. An investigation is conducted involving incubation at ground level pressure in a gas mixture in which the 79% inert component was either neon or argon. The effect of varying combinations of nitrogen, helium, and oxygen was also studied. G.R.

**A72-42745** Temperature transmission from biopotential radiotelemetry transmitters. J. E. Morhardt (Washington University, St. Louis, Mo.). *Journal of Applied Physiology*, vol. 33, Sept. 1972, p. 397-399.

It is shown how almost any biopotential transmitter can be modified to transmit temperature in addition to the electrical potential. The modification consists of placing a compact temperature-sensing circuit, either a blocking oscillator or an astable multivibrator, near enough to the radiotransmitter so that oscillations in the added circuit modulate the biopotential transmitter. Two subcarrier oscillator circuits which are very simple and very small are described. F.R.L.

**A72-42747** Thermal balance in man during 24 hours in a controlled environment (Bilan thermique de l'homme en ambiance contrôlée pendant 24 heures). J. Timbal, J. Colin, C. Boutelier, and J. D. Guieu (Centre d'Essais en Vol, Laboratoire de Médecine Aéronautique, Brétigny-sur-Orge, Essonne, France). *Pflügers Archiv*, vol. 335, no. 2, 1972, p. 97-108. 25 refs. In French.

Evaporative, radiant, and convective heat losses, metabolism, and heat storage were determined on 8 unclothed, reclining, fasting subjects during 24 hr in a climatic chamber maintained at a strictly constant and neutral temperature. Under these conditions, a basal evolution of the body heat content and the rectal temperature were observed with nearly a disappearance of the diurnal thermal increase but persistency of a nocturnal drop followed by an early morning increase. Nocturnal cooling could be linked essentially with a rising skin temperature very likely through skin vasodilatation. Thus, the

increase in radiant and convective heat losses was predominantly involved in cooling the body in the evening and at night. The part played by the various skin areas was variable with the time, hand and feet temperatures varying paradoxically in an opposite way to temperatures in other skin areas. (Author)

**A72-42748** Factors limiting the increase in stroke volume obtainable by positive inotropism - Investigations regarding the sufficient heart in the case of continued postextrasystolic potentiation (Begrenzende Faktoren für die Steigerungsfähigkeit des Schlagvolumens durch positive Inotropie - Untersuchungen am suffizienten Herzen unter fortgesetzter postextrasystolischer Potenzierung). G. Kissling and R. Jacob (Tübingen, Universität, Tübingen, West Germany). *Pflügers Archiv*, vol. 335, no. 2, 1972, p. 153-166. 27 refs. In German. Research supported by the Deutsche Forschungsgemeinschaft.

**A72-42765** Human tolerance limitations related to aircraft crashworthiness. A. I. King (Wayne State University, Detroit, Mich.). In: Dynamic response of structures; Proceedings of the Symposium, Stanford, Calif., June 28, 29, 1971. New York, Pergamon Press, Inc., 1972, p. 247-263. 56 refs.

A survey of available information regarding human tolerance to impact acceleration is made. The problems encountered in the scaling of animal data to the human level and in the correlation of single-directional tolerance data to actual multi-directional impacts in aircraft crashes are discussed. Examples of the effective use of restraint systems to raise the tolerance limits are given together with the injury potential of these systems. It is recommended that multi-directional impact studies be carried out along with the development and validation of mathematical models to generalize the experimental results. (Author)

**A72-42766 \*** Response of a seat-passenger system to impulsive loading. J. A. Collins and J. W. Turnbow (Arizona State University, Tempe, Ariz.). In: Dynamic response of structures; Proceedings of the Symposium, Stanford, Calif., June 28, 29, 1971. New York, Pergamon Press, Inc., 1972, p. 265-288. Army-Navy-USAF-supported research; Contract No. NSR-33-026-003.

This paper presents a summary of a study of the dynamic response of an aircraft seat-passenger system to impulsive loading typical of aircraft crash situations. A brief description of the computer model SIMULA is presented, and selected data from 305 separate cases which have been studied are discussed. Maximum system forces, displacements, velocities, and accelerations are presented as functions of velocity change, aircraft deceleration, crash pulse shape, passenger weight, and seat belt slack. Data from both single and coupled parameter studies are included. A correlation of SIMULA results with experimentally obtained data is made. (Author)

**A72-42771** Control parameters of the blood-pressure regulatory system. I - Heart rate sensitivity. M. E. Valentinuzzi, H. E. Hoff, L. A. Geddes (Texas, University, Houston, Tex.), and T. Powell (Texas, University, Houston, Tex.; Middlesex Hospital Medical School, London, England). *Medical and Biological Engineering*, vol. 10, Sept. 1972, p. 584-595. 20 refs. Grant No. PHS-HE-05125.

**A72-42772** Control parameters of the blood-pressure regulatory system. II - Open-loop gain, reference pressure and basal heart rate. M. E. Valentinuzzi, H. E. Hoff, L. A. Geddes, J. A. Posey, Jr. (Texas, University, Houston, Tex.), and T. Powell (Texas, University, Houston, Tex.; Middlesex Hospital Medical School, London, England). *Medical and Biological Engineering*, vol. 10, Sept. 1972, p. 596-608. 15 refs. Grant No. PHS-HE-05125.

**A72-42773** Biological system transfer-function extraction using swept-frequency and correlation techniques. W. J. Williams, J. W. Gesink, and M. M. Stern (Michigan, University, Ann Arbor,

Mich.). *Medical and Biological Engineering*, vol. 10, Sept. 1972, p. 609-620. 10 refs. Research supported by the University of Michigan; Grants No. NIH-NS-08470; No. NIH-DE-03731.

The paper describes the application of a swept-frequency-system identification technique to biological systems. By linearly sweeping the frequency of the sinusoidal input signal over the range of frequencies of interest, the frequency-response profile of the biological system can be rapidly determined. System transfer characteristics are extracted from the input-power spectral density and output-input crosspower spectral-density computations. Noise, harmonic distortion and sweep-time considerations are given. Logarithmic frequency-sweeping is suggested as a means of avoiding harmonic distortion. (Author)

**A72-42776** Somatic sensitivity, smell and taste /Physiology of the senses I/ (Somatische Sensibilität, Geruch und Geschmack /Sinnesphysiologie I/). Munich, Urban und Schwarzenberg (Physiologie der Menschen. Volume 11), 1972. 271 p. In German. \$4.65.

Topics discussed include the functional processes responsible for sensory output, the transmission of tactile information required for orientation and control of motor behavior, the localization of cold and heat receptors on the human skin, pain perception and the measurement of responses to pain-inducing stimuli, proprioceptor systems controlling the activity of tendons and muscles, and the structure and functioning of the organs of smell and taste.

A.B.K.

**A72-42777** Introduction to sensory physiology (Einführung in die Sinnesphysiologie). R. Jung (Neurologische Klinik, Freiburg, West Germany). In: Somatic sensitivity, smell and taste /Physiology of the senses I/. Munich, Urban und Schwarzenberg, 1972, p. 1-48. 80 refs. In German.

Detailed review of the functional processes responsible for sensory output. After providing some general information on sensory functions, transformation processes at sensory receptors and nerves are considered. The development of subjective and objective sensory physiology is discussed, as well as the problem of psychophysical and neurophysiological sensory investigation. Other aspects discussed are the use of scaling methods in psychophysics, somatosensory activity, chemoreception of smell and taste, the adaptation and cerebral control of sensory afferents, sensory selection and integration, and the pathophysiology of sensibility. A.B.K.

**A72-42778** Tactile sense and position sense (Tastsinn und Lagesinn). H. H. Kornhuber (Ulm, Universität, Ulm, West Germany). In: Somatic sensitivity, smell and taste /Physiology of the senses I/. Munich, Urban und Schwarzenberg, 1972, p. 51-112. 128 refs. In German.

Consideration of the somatic sensitivity functions responsible for transmitting tactile information required for orientation and control of motor behavior. After a brief introduction to the functions and modalities of somatic sensitivity, the peripheral mechanisms of somatic sensitivity are discussed, dwelling, in particular, on mechanoreceptors contributing to the tactile sense and to the perception of limb position and motion. The transmission and processing of information from these mechanoreceptors in the spinal cord and the medulla oblongata are reviewed. Other topics discussed include the sensitivity of the face, the somatosensitive thalamus nuclei, and the somatosensitive areas of the brain cortex. A.B.K.

**A72-42779** Temperature senses - Cold and heat receptors (Temperatursinne - Kalt- und Wärmerezeptoren). R. F. Schmidt (Kiel, Neue Universität, Kiel, West Germany). In: Somatic sensitivity, smell and taste /Physiology of the senses I/. Munich, Urban und Schwarzenberg, 1972, p. 113-129. 24 refs. In German.

Consideration of the localization of the receptor systems for

cold and heat on the human skin. The neurophysiological principles of temperature sensitivity are reviewed, and the temperature sense in humans is considered in the light of neurophysiological results, dwelling, in particular, on the conditions required for cold and heat perception. The significance of thermoreceptors for the maintenance of body temperature and other autonomous reflexes is discussed.

A.B.K.

**A72-42780** Pain (Schmerz). R. F. Schmidt (Kiel, Neue Universität, Kiel, West Germany). In: Somatic sensitivity, smell and taste /Physiology of the senses I/. Munich, Urban und Schwarzenberg, 1972, p. 131-154. 28 refs. In German.

Consideration of the problem of pain perception and of the measurement of responses to pain-inducing stimuli. Subjective pain perception and pain qualities are described, and the measurement of human response to mechanical, thermal, and chemical pain stimuli is discussed. The anatomical and physiological principles of pain perception are reviewed, and an analysis is made of the pathophysiology of pain, noting special and abnormal forms of pain. The problem of combating and eliminating pain by pharmacological and neurosurgical means is investigated.

A.B.K.

**A72-42781** Proprioceptors in muscles and tendons (Propriozeptoren in Muskeln und Sehnen). R. F. Schmidt (Kiel, Neue Universität, Kiel, West Germany). In: Somatic sensitivity, smell and taste /Physiology of the senses I/. Munich, Urban und Schwarzenberg, 1972, p. 155-168. 18 refs. In German.

Detailed account of the receptor properties of tendon organs and muscle spindles. The impulse activity of tendon organs (or Golgi organs) during muscle extension and contraction is discussed, as well as the efferent innervation of intrafusal muscle fibers, noting the responses of muscle spindles during muscle extension and contraction and the modification of afferent responses by activity in efferent nerves. Other receptors of the muscle are described, as well as the relation between muscle spindles, gamma innervation, and the sensorimotor apparatus.

A.B.K.

**A72-42782** Smell (Geruch). J. Boeckh (Regensburg, Universität, Regensburg, West Germany). In: Somatic sensitivity, smell and taste /Physiology of the senses I/. Munich, Urban und Schwarzenberg, 1972, p. 171-204. 56 refs. In German.

Study of the structure, significance, and functioning of the olfactory apparatus in humans. The structure of the nose cavity and the olfactory mucosa is discussed, as well as the morphology of the olfactory paths and centers. A detailed analysis is made of the neurophysiology of the olfactory system, including the reaction of the receptor cells and the air input to the olfactory epithelium. A study is made of sensory thresholds and of the factors which influence olfactory perception. Physiological arguments and chemical criteria are presented concerning the classification of odors. The biological significance of the sense of smell is discussed.

A.B.K.

**A72-42783** Taste (Geschmack). J. Boeckh (Regensburg, Universität, Regensburg, West Germany). In: Somatic sensitivity, smell and taste /Physiology of the senses I/. (A72-42776 22-04) Munich, Urban und Schwarzenberg, 1972, p. 205-231. 50 refs. In German.

Detailed review of the structure and functioning of the organs of taste. The morphology of the taste cells in the tongue, of the nerves leading to the central nervous system, and of the central connections is discussed. A study is made of taste perception and discrimination thresholds and of the effect of stimulus and excitation parameters on the perception threshold. The classification of taste stimuli into quality classes is considered, as well as the neurophysiology of taste and the theory of taste perception. The biological role of the sense of taste is explained.

A.B.K.

**A72-42784** Hearing, voice, balance /Physiology of the senses II/ (Hören, Stimme, Gleichgewicht /Sinnesphysiologie II/). Munich, Urban und Schwarzenberg (Physiologie der Menschen. Volume 12), 1972. 309 p. In German. \$4.65.

Aspects of auditory physiology are examined, giving attention to the middle ear, the inner ear, and the processing of acoustic information. The vestibular apparatus is discussed, taking into account the central vestibular system, otoliths, and semicircular canals. The structure and the innervation of the human vocal apparatus are also considered together with the processes taking place during linguistic sound formation.

G.R.

**A72-42785** The physiology of hearing. I - The middle and the inner ear (Physiologie des Hörens. I - Das mittlere und das innere Ohr). R. Klinke (Berlin, Freie Universität, Berlin, West Germany). In: Hearing, voice, balance /Physiology of the senses II/.

Munich, Urban und Schwarzenberg, 1972, p. 9-55. 100 refs. In German.

The structure of the auditory organ is discussed, giving attention to anatomy, the hair cells, the innervation of the organ of Corti, and the chemical composition of the liquid of the inner ear. The physics of an adequate stimulus are investigated. The auditory threshold is considered together with sound intensity level and problems of clinical audiometry. The physiology of the hearing process is also examined. The part played in this process by the outer ear and the middle ear is discussed, taking into account the muscle system of the middle ear and the conduction of sonic energy by the bone structure. Aspects of the hydrodynamics of the cochlea are considered along with transducer mechanisms involving the receptors.

G.R.

**A72-42786** The physiology of hearing. II - Central path systems and the processing of acoustic information (Physiologie des Hörens. II - Zentrale Bahnsysteme und Verarbeitung akustischer Nachrichten). E. Dunker (Hamburg, Universität, Hamburg, West Germany). In: Hearing, voice, balance /Physiology of the senses II/.

Munich, Urban und Schwarzenberg, 1972, p. 57-125. 101 refs. In German.

The performance of the organ of hearing is discussed together with the design of the cerebral auditory system, the functions of the primary auditory neurons, the functions of the cochlear nucleus, and the functions of the trapezium and of the olivary nucleus. Other subjects considered include the tuning of sonic frequency, sonic frequency modulation, the maintenance of phase relationship, and afferent binocular action. Relations between the sense of hearing and the entire sensorium are examined along with connections between sensation, excitation, and stimulus.

G.R.

**A72-42787** The vestibular apparatus. I - The physics and physiology of the otoliths and the semicircular canals (Vestibularapparat. I - Physik und Physiologie der Otolithen und Bogengänge). J. J. Groen (Universiteitskliniek voor Keel-, Neusen Oorheelkunde, Utrecht, Netherlands). In: Hearing, voice, balance /Physiology of the senses II/.

Munich, Urban und Schwarzenberg, 1972, p. 127-153. 50 refs. In German.

The anatomy of the organs which maintain the equilibrium of the body is discussed, giving attention to otoliths, semicircular canals, the endolymph, and the perilymph. Receptors and vestibular mechanisms are considered, together with the function of the otoliths and the reasons for the occurrence of motion sickness. Aspects of semicircular canal function are investigated, taking into account the effects obtained in response to stimulation, rotational experiments undertaken with a thornback ray, and studies of characteristic frequencies of the semicircular canal system. The results of clinical tests with human subjects involving the vestibular system are also examined.

G.R.

**A72-42788** The vestibular apparatus. II - The physiology of the central vestibular system (Vestibularapparat. II - Physiologie des zentralen vestibulären Systems). K. P. Schaefer (Psychiatrische Klinik und Poliklinik, Göttingen, West Germany). In: *Hearing, voice, balance /Physiology of the senses II/*. Munich, Urban und Schwarzenberg, 1972, p. 155-214. 73 refs. In German.

The functions of the vestibular system are briefly examined together with the organization of postural mechanisms. Postural reflexes considered by Magnus (1924) are discussed, giving attention to labyrinth reflexes, reflexes involving the neck, and gravity receptors. Reflexes concerning posture corrections are investigated together with progressive reactions, horizontal rotational reactions, and vertical rotational reactions. Other subjects considered include optical-vestibular integration, the neuronal organization of the motor system, and projections of the vestibular system. G.R.

**A72-42789** Voice and language (Stimme und Sprache). H. Lullies (Kiel, Neue Universität, Kiel, West Germany). In: *Hearing, voice, balance /Physiology of the senses II/*. Munich, Urban und Schwarzenberg, 1972, p. 215-257. 35 refs. In German.

The structure and the innervation of the human vocal apparatus are considered. Attention is given to the characteristics of the human voice and disturbances of voice and language. The processes which take place during the formation of the linguistic sounds are analyzed, taking into account aspects of breathing and air current, the vibrations of vocal organs and air space, the pronunciation of vowels and consonants, vibrations in adjoining tissues, the artificial composition and decomposition of linguistic sounds, and special voice and linguistic forms. Aspects of voice and sound generation in the case of animals are also explored. G.R.

**A72-42900** Yield of ischaemic exercise electrocardiograms in relation to exercise intensity in a normal population. G. R. Cumming (Manitoba, University; Children's Hospital, Winnipeg, Manitoba, Canada). *British Heart Journal*, vol. 34, Sept. 1972, p. 919-923. 16 refs.

**A72-42929 \*** Visually directed pointing as a function of target distance, direction, and available cues. J. M. Foley (California, University, Santa Barbara, Calif.) and R. Held (MIT, Cambridge, Mass.). *Perception and Psychophysics*, vol. 12, no. 3, Sept. 1972, p. 263-268. 20 refs. Grants No. PHS-EY-00666; No. PHS-MH-07642; No. NGR-22-009-308.

In pointing at visual targets without sight of the hand, large errors occur. There is a tendency to overreach targets, and this tendency is much greater (about 25 cm) when convergence is the only cue to distance than when there are many cues (2 to 11 cm). Angular errors of up to 10 deg also occur. These tend to be to the side opposite the sighting eye, when the favored hand is used. The variance of the pointing response with convergence alone is reduced by approximately half with the introduction of several spatial cues. These results are interpreted as indicating that, for a target within the reach of the arm and with convergence alone as a cue, the depth signal produced by the visual system corresponds to a greater distance than that produced when many cues are available. The results are also consistent with the hypothesis that perceived direction tends to approximate direction from the sighting eye. (Author)

**A72-42930** Movement detection thresholds and stimulus duration. R. L. Cohen (Toronto, University, Toronto, Canada) and C. Bonnet (Paris, Université, Laboratoire de Psychologie Expérimentale et Comparée, Paris, France). *Perception and Psychophysics*, vol. 12, no. 3, Sept. 1972, p. 269-272. 18 refs.

Movement detection thresholds were measured for varying exposures of a moving spot. A tradeoff was found in which an increase in duration (T) was offset by a decrease in the velocity

required for detection (V). In the range of durations studied (about 50 to 700 msec),  $V \times T$  was constant. The  $V \times T$  constancy was interpreted in terms of the direct detection of movement as motion, and a comparison was made with Bloch's law. (Author)

**A72-42931** Interactions of signal and background variables in visual processing. W. K. Estes (Rockefeller University, New York, N.Y.). *Perception and Psychophysics*, vol. 12, no. 3, Sept. 1972, p. 278-286. 23 refs. Grant No. PHS-GM-16735.

Three variables which determine the opportunities for signal-noise confusions, display size, number of redundant signals per display, and number of alternative signals were studied in relation to nature of the noise elements, confusable or nonconfusable with signals. Data were obtained in a forced-choice visual detection situation, the displays being linear arrays of letters on a CRT screen. For all three performance measures used, strong interactions were obtained between all of the other variables and signal-noise confusability. The functions obtained, together with other data bearing on the role of confusions and on spatial relations among characters within the display, suggest a model whose initial phase is a parallel feature extraction process involving inhibitory relations among input channels. (Author)

**A72-42932** Visual angle and apparent size of objects in peripheral vision. L. R. Newsome (Queensland, University, St. Lucia, Queensland, Australia). *Perception and Psychophysics*, vol. 12, no. 3, Sept. 1972, p. 300-304. 17 refs.

**A72-42933** Simultaneous detection and recognition of chromatic flashes. G. B. Rollman and J. Nachmias (Pennsylvania, University, Philadelphia, Pa.). *Perception and Psychophysics*, vol. 12, no. 3, Sept. 1972, p. 309-314. 14 refs. National Research Council of Canada Grant No. APA-392; Grant No. PHS-NB-03682.

Studies of simultaneous detection and recognition were performed to test alternative models of the detection process, signal detection theory and low-threshold theory. Sensitivity in a detection experiment was independent of whether the type of signal (red or green light flash) was known in advance, because only one type of signal was possible, or was unknown, because either stimulus could occur. When a recognition judgment was added to either a binary or rating-scale detection response, Ss were able to report the nature of the stimulus at better than chance levels even when they indicated that the stimulus was not detected. Since such performance occurred when Ss used detection responses likely to have been given only in the nondetect state, the data lead to the rejection of low-threshold theory. (Author)

**A72-42955 #** Dynamics of the electrical activity of various regions of the neocortex during the sleep-wakefulness cycle. (Dinamika elektricheskoi aktivnosti razlichnykh oblastei novoi kory pri tsikle bodrstvovanie-son). M. G. Kavkasidze and T. N. Oniani (Akademiia Nauk Gruzinskoi SSR, Institut Fiziologii, Tiflis, Georgian SSR). *Akademiia Nauk Gruzinskoi SSR, Soobshcheniia*, vol. 67, July 1972, p. 181-184. 10 refs. In Russian.

**A72-42960 #** The effect of electrical stimulation of the olfactory bulbs on the behaviour of cats and on the electrical activity of the neo- and archipaleocortex. (Vliianie elektricheskogo razdracheniia oboniatel'nykh lukovits na povedenie i elektricheskuiu aktivnost' neo- i arkhipaleokorteksa koshki). T. K. Kapanadze and E. O. Chidzhavadze (Akademiia Nauk Gruzinskoi SSR, Institut Fiziologii, Tiflis, Georgian SSR). *Akademiia Nauk Gruzinskoi SSR, Soobshcheniia*, vol. 67, Aug. 1972, p. 437-440. 8 refs. In Russian.

**A72-42976** International Interdisciplinary Cycle Research Symposium, 3rd, Noordwijk, Netherlands, August 22-28, 1971,

Proceedings. Symposium sponsored by the International Institute of Interdisciplinary Cycle Research and Foundation for the Study of Cycles. *Journal of Interdisciplinary Cycle Research*, vol. 3, Aug. 1972. 155 p.

Topics discussed deal with biological cycles in plants and animals at the cellular, organic, and population levels, as well as with entomological cycles and human physiological cycles. Human circadian rhythms and exogenous modifications of them are discussed, along with changes in internal phase relationships between different physiological functions possessing circadian rhythms.

A.B.K.

**A72-42977** Annual variations of diurnal rhythms in man. L. Klinker (Forschungsinstitut für Bioklimatologie, Heiligendamm, East Germany), S. Kunkel, and D. Weiss (Forschungsinstitut für Balneologie und Kurortwissenschaft, Bad Elster, Heiligendamm, East Germany). (*International Institute of Interdisciplinary Cycle Research, International Interdisciplinary Cycle Research Symposium, 3rd, Noordwijk, Netherlands, Aug. 22-28, 1971.*) *Journal of Interdisciplinary Cycle Research*, vol. 3, Aug. 1972, p. 225-232. 18 refs.

Results of time-series analyses of meteoropathological disturbances performed to verify that diurnal and annual rhythms are reflections of the same elementary mechanism. A single annual wave and a tenfold wave are found in a time series involving patients with endogenous eczema, disturbed sleep, and postoperative pains and in a time series concerning the acral rewarming time of spa patients. In studying the day-to-day variations in disturbed sleep, evidence of a possible antagonistic reaction of human regulation to external stimuli such as daylight is obtained. In a study of the mortality rate of cardiac patients seasonal variations of the diurnal rhythms are noted. Periodic modulations of diurnal rhythm are also noted in the study of acral rewarming times.

A.B.K.

**A72-42978** Exogenous modifications of circadian rhythms of adrenal hormones in man. J. Kriebel (Ulm, Universität, Schwendi, West Germany). (*International Institute of Interdisciplinary Cycle Research, International Interdisciplinary Cycle Research Symposium, 3rd, Noordwijk, Netherlands, Aug. 22-28, 1971.*) *Journal of Interdisciplinary Cycle Research*, vol. 3, Aug. 1972, p. 233-241. 16 refs.

Study of the circadian rhythms of activity, rest, body temperature, urine volume, urine excretion of adrenaline, noradrenaline, 17-hydroxycorticosteroids, and 17-ketosteroids in a subject before, during, and after isolation without time cues. The relatively late maxima of the catecholamines in synchronization, the increased amplitude during social activity, and the abrupt increase in the level of urinary catecholamine excretion at the conclusion of isolation lead to the suggestion that social stimuli are important factors determining the shape of circadian function curves.

A.B.K.

**A72-42979** Mutual relations between different physiological functions in circadian rhythms in man. R. Wever (Max-Planck-Institut für Verhaltensphysiologie, Erling-Andechs, West Germany). (*International Institute of Interdisciplinary Cycle Research, International Interdisciplinary Cycle Research Symposium, 3rd, Noordwijk, Netherlands, Aug. 22-28, 1971.*) *Journal of Interdisciplinary Cycle Research*, vol. 3, Aug. 1972, p. 253-265. 15 refs.

Analysis of internal desynchronization experiments on humans, showing a change in the internal phase relationship and a shift in the rhythms of different functions relative to each other. An attempt is made to determine whether the various functions examined are controlled by one master clock and several auxiliary clocks driven from the master clock or whether they are controlled by many self-sustained clocks running endogenously independently of each other. It is concluded that a multioscillator model is required which indispensably demands a number of separately self-sustained oscillators.

A.B.K.

**A72-42986 #** Specific ATP action on metabolism of isolated heart - Influence of pH, divalent cation concentration and stability of

complexes. A. Ziegelhöffner, M. Fedelesova, and S. Kostolansky (Slovak Academy of Sciences, Div. of Biochemistry, Bratislava, Czechoslovakia). *Acta Biologica et Medica Germanica*, vol. 28, no. 6, 1972, p. 893-900. 22 refs.

**A72-42987 #** The electrical activity of the isolated frog retina in buffered chloride-deficient Ringer's solution (Die elektrische Aktivität der isolierten Froschetina in gepufferter chloridarmer Ringer-Lösung). H. Berger (Jena, Universität, Jena, East Germany). *Acta Biologica et Medica Germanica*, vol. 28, no. 6, 1972, p. 999-1009. 60 refs. In German.

The electrical activity of an isolated frog retina as a function of the chloride-ion concentration of the cell environment had been investigated by Berger (1972). It had been found that the addition of phosphate ions to the solution produced pronounced changes in the electroretinogram. An investigation conducted to study the causes for these changes is discussed. The retinas were exposed alternatively to a current of Ringer's solution without a buffer and to Ringer's solution with a buffer. Various tests with solutions of differing chloride-ion concentrations were conducted. The characteristics of the electroretinograms obtained in the various cases considered are examined.

G.R.

**A72-43021 #** The influences of heart rate, age and sex on the movements on mitral valve. K. Buyukozturk, B. Kingsley, and B. L. Segal (Hahnemann Medical College and Hospital, Philadelphia, Pa.). *Acta Cardiologica*, vol. 27, no. 4, 1972, p. 427-444. 26 refs.

Study of the effects of heart rate, sex, and normal aging on the movement of the mitral valve leaflet in healthy subjects. On the basis of echocardiographic studies highly significant inverse correlations between heart rate and EF slope and between heart rate and total amplitude of the anterior mitral leaflet were obtained. The rates of mitral valve opening and closing movements and the QRS-C interval did not correlate with the heart rate. The total moving capacity of the anterior mitral leaflet, the maximum rate of mitral valve opening movement, and the rate of EF slope were found to be less in older subjects than in younger ones. The only difference between normal male and female groups was found in the total amplitude of mitral valve movement and in the maximum rate of mitral valve closing movement.

A.B.K.

**A72-43022 #** Cardiocirculatory adaptation to chronic hypoxia. II - Comparative study of myocardial metabolism of glucose, lactate, pyruvate and free fatty acids between sea level and high altitude residents. P. Moret, F. Duchosal (Genève, Université, Geneva, Switzerland), E. Covarrubias (Universidad Peruana, Lima, Peru), and J. Coudert (Instituto de Biología de la Altura; Instituto del Torax, La Paz, Bolivia). *Acta Cardiologica*, vol. 27, no. 4, 1972, p. 483-503. 31 refs. Research supported by the World Health Organization, Fondation S. I. Patino, Schweizerischer Nationalfonds zur Förderung der wissenschaftlichen Forschung, Swiss Cardiology Foundation, Hôpital Cantonal, and Université de Genève; Grant No. PHS-HE-06910-06.

**A72-43052 #** Control performance as a function of the transmission ratio and the Coulomb friction in the operational element (Steuerleistung in Abhängigkeit vom Übersetzungsverhältnis und von Coulombscher Reibung im Bedienungselement). F. Seibt. München, Technische Universität, Institut für Ergonomie, Dissertation, 1971. 143 p. 171 refs. In German.

The aimed manual movement is theoretically analyzed, giving attention to the movement as a control process, the optical motion control, the proprioceptive control of motion, reaction time, and aspects of adjustment. The influence of Coulomb friction in the operational element on the performance of a control movement is examined, taking into account improvements in the precision of the movement and negative effects on the control of muscular activity. An experimental investigation was also conducted. The tests involved



the correction of deviations of constant magnitude from a standard position. The corrective action was controlled by an operator with the aid of a control lever. The effect of various values of transmission ratio and Coulomb friction was explored in the tests. G.R.

**A72-43165 #** Electrophysiological investigation of the excitation and inhibition processes in the auditory cortex (Elektrofiziologichne doslidzhennia protsesiv zbudzhennia i gal'muvannia u slukhovii kori). P. M. Serkov (Akademiia Nauk Ukrain'skoi RSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal*, vol. 18, July-Aug. 1972, p. 452-462. 25 refs. In Ukrainian.

Study of the extra- and intracellular potentials arising in the auditory cortex neurons of a cat in response to a sound click and excitation of the inner geniculum and geniculocortical fibers. Under the action of the sound click, the auditory cortex is shown to receive a continuous succession of impulses involving several arrivals, rather than a volley of impulses arriving simultaneously. This impulse succession is formed as a result of a dispersion of the impulse volley on its way from the cochlea to the brain cortex. Upon arrival, the impulse succession induces in the auditory cortex a prolonged reaction made up of excitation and inhibition processes. Thus, the afferent impulses, upon reaching the auditory cortex, cause excitation in some neurons and inhibition in others. It is found that the number of inhibited neurons exceeds that of excited ones by a factor varying from two to three. M.V.E.

**A72-43166 #** Some neurophysiological aspects of the limbic system of the brain (Deiaki aspekti neirofiziologii limbichnoi sistemi mozku). F. P. Vediaev (Kharkiv'skii Medichnii Institut, Kharkov, Ukrainian SSR). *Fiziologichnii Zhurnal*, vol. 18, July-Aug. 1972, p. 463-468. 42 refs. In Ukrainian.

Discussion of the theoretical and practical trends characteristic of recent studies of the limbic system of the brain and of its functional significance. It is shown that local effects on specific limbic formations evoke emotional-type behavior responses accompanied by a wide spectrum of vegetative shifts. A presented version of a neurogenic stress model for animals is used as an example of an investigation basis for the study of limbico-neocortical, cardiovascular, and hormonal system shifts. M.V.E.

**A72-43167 #** Significance of venous vessel tonus for hemodynamic changes (Pro znachennia tonusu venoznikh sudin u zminakh gemodinamiki). V. V. Bratus' and M. I. Gurevich (Akademiia Nauk Ukrain'skoi RSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal*, vol. 18, July-Aug. 1972, p. 488-499. 106 refs. In Ukrainian.

Comparative evaluation of various approaches to the study of vein vessel tonus behavior. Published and unpublished results are presented of investigations of changes in the tonus of arterial and venous vessels induced by various kinds of action on the cardiovascular system. The investigation results clearly show the considerable responsiveness of the venous part of the cardiovascular system to central nervous and humoral influences. M.V.E.

**A72-43168 #** Hypothalamic control of the systemic and lung circulation and functional significance of this control (Gipotalamichna reguliatsiia sistemnogo i legenevogo krovoobigu ta ii funktsional'ne znachennia). V. O. Tsibenko (Kiiivs'kii Derzhavnii Universitet, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal*, vol. 18, July-Aug. 1972, p. 500-507. 77 refs. In Ukrainian.

In experiments on dogs under nembutal anesthesia, stimulation of the ventral hypothalamus was found to dilate the arterial and venous vessels of the thigh muscles. The oxygen tension (pO<sub>2</sub>) and O<sub>2</sub> content in the blood outflow increased during stimulation. The pO<sub>2</sub> in muscle tissues increased or decreased during hypothalamic stimulation in dependence on its initial level. These findings suggest that the increase of blood flow in skeletal muscles during hypo-

thalamic stimulation may be induced, not only by arterio-venous anastomosis, but also through augmented capillary flow. It is concluded that the hypothalamus participates in the control of oxygen distribution in an organism by influencing respiration and pulmonary circulation, as well as by systemic vasomotor reactions directed at optimizing the use of oxygen in the organism's tissues. M.V.E.

**A72-43169 #** Nervous mechanisms of the acoustic stress reaction (Nervovi mekhanizmi akustichnoi stres-reaktsii). I. I. Tokarenko (Zaporiz'kii Medichnii Institut, Zaporozhe, Ukrainian SSR). *Fiziologichnii Zhurnal*, vol. 18, July-Aug. 1972, p. 529-534. 40 refs. In Ukrainian.

The dynamics of kinetic defensive conditioned reflexes, together with their respiratory component, and the variations in the reactions of the unconditioned lung and heart activity and background or induced electric activity of the cerebral cortex and brain stem reticular formation, in response to a long and intense (94 dB) sound, have been investigated in experiments on dogs and cats. The cues are discussed that the obtained results provide on the mechanisms and brain locations of the physiological processes arising under the action of the adverse experimental factor the intense sound represents. The obtained data have theoretical and practical significance. M.V.E.

**A72-43170 #** Nervous-emotional stress as a problem of modern work physiology (Nervovo-emotsional'ne napruzhennia iak problema suchasnoi fiziologii pratsi). O. O. Navakatikian, Iu. I. Kundiev, G. G. Lisina, V. P. Buzunov, F. I. Grishko, V. S. Derkach, O. P. Kapshuk, A. E. Kirienko, A. N. Karakashian, and G. I. Koval'ova (Kiiivs'kii Institut Gigieni Pratsi ta Profzakhvoriuvan', Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal*, vol. 18, July-Aug. 1972, p. 535-546. 59 refs. In Ukrainian.

Consideration of some of the problems arising from the increasing nervous emotional tension characteristic of modern production work conditions. An analysis of the changes is presented that result from the work strains on the higher nervous activity, the cardiovascular system, and the adrenal gland system. It is shown that the work-induced tension is linked with the heavy demands upon the organs and systems whose contribution is essential to the professional work performance. This determines the specific character of the ensuing physiological shifts and pathological syndromes. An attempt is made to relate the nature of the physiological shifts with the pathology specific of the professional activity considered. The urgency of improving work and rest conditions is emphasized for providing protection against overexertion. M.V.E.

## STAR ENTRIES

**N72-30054\*** + National Aeronautics and Space Administration, Washington, D.C.

**AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 103, MAY 1972**

Jun. 1972 116 p refs  
(NASA-SP-7011(103)) Avail: NTIS HC \$3.00 CSCL 06E

This special bibliography lists 363 reports, articles, and other documents introduced into the NASA scientific and technical information system in May 1972. Author

**N72-30055\*** # Milan Univ. (Italy). Dept. of Human Physiology. **ORBITING FROG OTOLITH EXPERIMENT (OFO-A): DATA REDUCTION AND CONTROL EXPERIMENTATION Final Report**

Torquato Gualtierotti, Francesco Bracchi, and Emilio Rocca Jan. 1972 353 p refs

(Contract NASw-2211)  
(NASA-CR-62084) Avail: NTIS HC \$19.75 CSCL 06C

The OFO-A mission was prepared as a part of a special program of vestibular physiology with the purpose of studying in which way the lack of the gravity pull will affect the functioning of that part of the labyrinth which controls balance. The gravitational components corresponded to the different head positions, namely, the gravity sensitive or positioning receptors. It is evident that in weightlessness the gravity sensitive receptors are deprived of their primary input. Author

**N72-30056\*** # Mississippi Univ., Jackson. Dept. of Physiology and Biophysics.

**DIGITAL SIMULATION AND EXPERIMENTAL EVALUATION OF THE CO<sub>2</sub>-H(PLUS) CONTROL OF PULMONARY VENTILATION Final Technical Report**

Howard T. Milhorn, Jr. and W. J. Reynolds 28 Jun. 1972 13 p refs

(Grant NGR-25-002-015)  
(NASA-CR-127819) Avail: NTIS HC \$3.00 CSCL 06P

Previous models of the CO<sub>2</sub>-H(+) control of ventilation have been concerned either with the response to CO<sub>2</sub> inhalation, or the response to perfusion of the surface of the medulla with mock cerebrospinal fluid having a high P sub CO<sub>2</sub>. Simulation of both responses with the same model has not been attempted. The purpose of the present study was two fold: first to develop such a model and, second, to obtain experimental data from human subjects for both developing this model and for evaluating this and future models. Author

**N72-30057\*** # Scientific Translation Service, Santa Barbara, Calif.

**COMPARATIVE CHARACTERISTICS OF NUCLEOTIDE DNA BLOCKS IN RADIATION INJURY AND LEUKOSIS**

A. Oparin Washington NASA Aug. 1972 8 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 203, no. 1, Mar. - Apr. 1972 p 233-236

(Contract NASw-2035)  
(NASA-TT-F-14520) Avail: NTIS HC \$3.00 CSCL 06R

DNA block analysis shows changes in the hematopoietic system of animals in radiation which resemble those in leukosis. In both, a portion of nucleotide DNA blocks is damaged, while the relative amount of isolated thymidynucleotide residue is increased. It is assumed that the development of cancer-like tissue in irradiated organisms can lead to later cancer or leukosis. Author

**N72-30058\*** # Scientific Translation Service, Santa Barbara, Calif.

**MECHANISMS OF CHANGES IN ENZYME ACTIVITY IN THE SMALL INTESTINE AT HIGH TEMPERATURES**

A. Yu. Yunusov, K. Rakhimov, U. Z. Kadyrov, and N. A. Korotkina Washington NASA Aug. 1972 5 p refs Transl. into ENGLISH from Uzbeksk. Biol. Za. (Tashkent), no. 6, Nov. - Dec. 1971 p 21-23

(Contract NASw-2035)  
(NASA-TT-F-14521) Avail: NTIS HC \$3.00 CSCL 06P

Depletion of water in the organism changes enzyme activity in small rodents subjected to high temperatures and solar radiation. Under the effect of these stresses, amylolytic activity remained relatively stable, invertase activity decreased, and dipeptidase activity fluctuated. Alkaline phosphatase activity increased in all tests. Author

**N72-30059\*** # Scientific Translation Service, Santa Barbara, Calif.

**ROLE OF MITOCHONDRIAL BIOGENESIS IN ADAPTATION OF THE ORGANISM TO ALTITUDE HYPOXIA**

F. Meyerson, V. Pomoyntskiy, and B. Yampolskaya Washington NASA Aug. 1972 9 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), 1972 p 973-976

(Contract NASw-2035)  
(NASA-TT-F-14524) Avail: NTIS HC \$3.00 CSCL 06C

Studies of the dynamics of DNA, RNA and protein synthesis in mitochondria and nuclei of the heart muscles of rats during adaptation to the continuous effect of high altitude hypoxia are reported. A marked increase is indicated in mitochondrial DNA and RNA synthesis after 10 days of adaptation, which is maintained for the next 30 days. Simultaneous nuclear and mitochondrial activation results in the synthesis and mitochondrial protein and mitochondrial biogenesis. This activation is triggered by decreased macroerg concentration due to environmental stresses. Author

**N72-30060\*** # Civil Aeromedical Inst., Oklahoma City, Okla. **AVIATION MEDICINE TRANSLATIONS: ANNOTATED BIBLIOGRAPHY OF RECENTLY TRANSLATED MATERIAL, 7**

Karen N. Jones, D. R. Goulden, and E. Jean Grimm May 1972 8 p refs

(FAA-AM-72-16) Avail: NTIS HC \$3.00

An annotated bibliography of translations of foreign-language articles is presented. The 29 listed entries are concerned with studies of vestibular function, optokinetic nystagmus, positional nystagmus, alcohol, determination of specific gravity, noise, physiology, biochemical analysis, vision, cardiology, driving safety, anatomy, anti-smoke hoods, flight safety, and animal behavior. Procedures for obtaining copies of the translations are included. Author

**N72-30061\*** # Federal Aviation Administration, Oklahoma City, Okla. Flight Standards Technical Div.

**THE EFFECTS OF 2,2 DICHLOROVINYL DIMETHYL PHOSPHATE (DDVP) USED AS AN AIRCRAFT DIS-**

**INSECTANT Final Report**

James W. Ross, Jr. Dec. 1971 113 p refs Revised  
(FS-70-601-120A) Avail: NTIS HC \$7.75

A study to assess alleged hazards of exposing aircraft and passengers/crew to DDVP vapor for insecticidal purposes on international flights is reported. The study criteria focused on the effects of multiple exposure to the proposed disinsection environment under representative flight conditions. Particular relationships considered were: (1) human toxicology at cabin altitude; (2) flammability characteristics of cabin decorative materials; (3) performance of electronic/avionic equipment; and (4) corrosion of airframe components. Human subjects exposed to a conservative DDVP environment exhibited no characteristics of DDVP toxicity at ground level or at 8,000 ft. altitude. Cabin interior materials showed no measurable change in flammability characteristics after a DDVP treatment equivalent to 3 and 12 months operational exposure. Functional testing of representative avionics equipment produced no premature malfunction under conditions of cyclic altitude with concurrent DDVP exposure. It was concluded that the proposed DDVP disinsection environment would have no degrading effects on safety of flight. Author

**N72-30062\*#** Scientific Translation Service, Santa Barbara, Calif.

**FUNDAMENTALS OF AVIATION MEDICINE**

A. A. Lavnikov Washington NASA Jul. 1972 297 p refs Transl. into ENGLISH of the publ. "Osnovy Aviatsionnoy Meditsiny", Moscow, Military Press, 1971  
(Contract NASw-2035)

(NASA-TT-F-711) Avail: NTIS HC \$3.00 CSCL 06E

The historical development of aviation medicine in our country is reviewed. The structure of the earth's atmosphere, a survey of human anatomy and physiology, and the effect of various flight factors on man are also discussed. The physiological and hygienic requirements for cabins of modern aircraft and the oxygen-respiration apparatus are specified, along with particular aspects of flights under difficult meteorological conditions and at night affecting the pilot's body. The problems involved in feeding a flight crew are discussed. Author

**N72-30063#** Central Inst. for the Deaf, St. Louis, Mo. Central Inst. for the Deaf.

**EFFECTS OF NOISE ON PEOPLE**

31 Dec. 1971 165 p refs

(Contract EPA-68-01-0500P)

(NTID300.7) Avail: NTIS HC \$10.25

It is shown that noises can act as sources of psychological distress, either because of responses directly to the noise itself or because of responses to irrelevant messages carried by the sound. Psychological distress in turn contributes to the various unpleasant effects as hearing loss, speech interference, noisiness, anxiety, distress, etc. G.G.

**N72-30064\*#** Sandia Labs., Albuquerque, N.Mex. Planetary Quarantine Dept.

**PLANETARY QUARANTINE ACTIVITIES Final Report, Apr. 1965 - Jun. 1972**

Aug. 1972 101 p refs

(NASA Order W-12853)

(NASA-CR-127835; SC-RR-72-0516) Avail: NTIS HC \$7.25 CSCL 06M

The activities of the Planetary Quarantine Department at Sandia Laboratories during the period April 1965 through June 1972 are summarized. Included are the rationale, the methods, and the results of modeling and experimentation used in dry heat, radiation, thermoradiation, and chemical sterilization studies. Publications describing these activities and accounts of closely related research are also furnished. Author

**N72-30065\*#** Mississippi State Univ., State College. Dept. of Microbiology.

**MICROBIAL DEGRADATION OF PARATHION Ph.D. Thesis**

William Leonard Gibson Aug. 1972 125 p refs

(Grant NGL-25-001-040)

(NASA-CR-127913) Avail: NTIS HC \$8.25 CSCL 06M

An organism capable of utilizing parathion as the sole carbon and energy source was isolated by enrichment culture techniques. The bacterium was characterized and tentatively classified as *Pseudomonas aeruginosa*. A pH of 7.0 - 7.5 and temperature of 30 C were found to be optimum for the consumption of parathion. Virtually no oxygen utilization was observed with resting cell suspensions when nonsolubilized parathion was employed. The use of ethanol as solvent for parathion in resting cell studies or preincubation of cells in ethanol obviated this problem and rapid parathion oxidation was demonstrable. Approximately 80% of the parathion consumed by resting cells was present terminally as carbon dioxide. Permeability of the cell to parathion or its metabolites was contingent upon the use of ethanol as either solvent or denaturant. Metabolites were tentatively identified by thin layer chromatography. Author

**N72-30066#** Civil Aeromedical Inst., Oklahoma City, Okla.  
**THE USE OF SIMPLE INDICATORS FOR DETECTING POTENTIAL CORONARY HEART DISEASE SUSCEPTIBILITY IN THE AIR TRAFFIC CONTROLLER POPULATION**

Michael T. Lategoia. May 1972 8 p refs

(FAA-AM-72-20) Avail: NTIS HC \$3.00

An analysis was made of an eight-year interval change in several indicators of coronary heart disease (CHD) susceptibility as measured 23,826 male ATC personnel. The data were obtained from current aeromedical certification records in January 1971. The distributions of resting blood pressure (BP), resting heart rate (HR) and the 400 pathology code frequency were compiled in age versus Framingham relative weight index (FRWI) tables. Obesity was defined as a minimum FRWI of 120.0%. Substantiating earlier findings, all parameters generally increased with age and obesity. These findings are directly relevant to the mass aeromedical screening, early detection, susceptibility reversal and preventive aspects of CHD. Author

**N72-30067#** Civil Aeromedical Inst., Oklahoma City, Okla.  
**RESIDUAL PERFORMANCE EFFECTS OF SIMULATED SONIC BOOMS INTRODUCED DURING SLEEP**

W. Dean Chiles and Georgetta West May 1972 9 p refs

(FAA-AM-72-19) Avail: NTIS HC \$3.00

Twenty-four male subjects were tested on a complex performance device involving monitoring, mental arithmetic, and pattern discrimination. Three age-groups were used: 20 to 26, 40 to 45, and 60 to 72. Subjects were tested for 30 minutes each morning and each evening for a 21-day period. On the sixth through the 17th nights, subjects were exposed to eight simulated sonic booms with an outdoors overpressure level of 1.0 psf presented at 1-hour intervals during sleep. The results provided no evidence that exposure to simulated sonic booms during sleep produced measurable consequences with respect to complex performance. A significant age effect was found for five of the ten measures. Significant differences (apparently a learning effect) were found in performance across the three phases (pre-boom, boom, and post-boom). There was also a significant interaction between age and phase for five of the measures. Analysis of the simple effects indicated there were rather large differences among the three groups at the beginning of testing with the differences decreasing in the two latter phases. The time-of-day effect was significant for five of the measures. Author

**N72-30068\*#** Mississippi State Univ., State College. Dept. of Microbiology.

**ENHANCED DEGRADATION OF ALUMINUM METAL IN THE PRESENCE OF SELECTED MICROORGANISMS M.S. Thesis**

John Marion Tennyson Aug. 1972 61 p refs  
(Grant NGL-25-001-028)

(NASA-CR-127864) Avail: NTIS HC \$5.25 CSCL 06M

Experiments were conducted to determine the effects of microorganisms, substrates, pressures, humidities, and oxygen concentrations upon aluminum corrosion. In addition, the effects of microbes upon coated and treated aluminum were examined and an attempt to correlate aluminum in solution with degradation of the samples was undertaken. The organisms, humidities, oxygen levels, and substrates all played a major role in the corrosion of aluminum. Quantitation of aluminum losses indicated that the total metal losses from inoculated samples were significantly greater than those of the uninoculated samples.

Author

**N72-30069#** University of Southern Calif., Los Angeles. Electronic Sciences Lab.

**MATHEMATICS IN BIOLOGY AND MEDICINE** Technical Progress Report, 1 Jun. 1971 - 31 May 1972

Richard Bellman 31 May 1972 47 p refs

(Grant GM-16197-04)

(USCEE-418) Avail: NTIS HC \$4.50

Conceptual, analytic and computational methods of modern mathematics to treat biomedical problems are considered. Major efforts are devoted to chemotherapy and radiotherapy using the mathematical theory of control and decision processes, (dynamic programming), to utilize beneficial patient dosage treatment without harmful side-effects. Computerized drug regimen programs have been developed for digitoxin and kanamycin, and important savings have been made in the time required for tumor scanning using techniques of nuclear medicine. In the field of mental health, computerized simulation processes using graphics were obtained. Major mathematical breakthroughs have been made in the treatment of large scale systems, and in patient identification processes.

Author

**N72-30070#** George Washington Univ., Washington, D.C. Dept. of Medical and Public Affairs.

**INFORMATION SERVICES FOR COMPARATIVE ANALYSIS OF BIORHYTHM RESEARCH** Final Report

May 1972 210 p refs

(Contract NAS2-6216)

(NASA-CR-114487) Avail: NTIS HC \$12.50 CSCL 06P

References and full text documents are presented in support of continuing research and research planning for the NASA behavioral physiology program. Areas covered include: (1) desynchronization and performance; (2) effects of alcohol, common colds, drugs, and toxic hazards on performance; (3) effects of stress on rhythm of plasma steroids; (4) data processing of biological rhythms; (5) pharmacology and biological rhythms; (6) mechanisms of biological rhythms; and (7) development of biological rhythms.

A.L.

**N72-30071#** Sandia Labs., Albuquerque, N.Mex.

**PLANETARY QUARANTINE PROGRAM** Quarterly Report, period ending 31 Dec. 1971

Dec. 1971 61 p refs

(TID-25965; QR-23) Avail: NTIS

An irradiation facility was designed which approximates the irradiation conditions expected in space with regard to UV solar flux and vacuum. Survival data for *Bacillus subtilis* spores and for suspensions of microorganisms occurring naturally in Cape Kennedy soil irradiated in the facility are presented. The results indicate that the vacuum effect alone had a slight capacity to inactivate microorganisms. There was a dramatic difference in the response of spores of *B. subtilis* and Cape Kennedy soil microorganisms. Spores of *B. subtilis* were essentially completely inactivated after exposure of 24 hr to vacuum and uv radiation, while bacteria in the soil preparations survived for up to six days. Possible explanations for the difference in radiosensitivity are discussed.

NSA

**N72-30072#** Navy Experimental Diving Unit, Washington, D.C. **CALCULATION OF CUMULATIVE PULMONARY OXYGEN TOXICITY**

W. Brandon Wright 1972 44 p

(AD-742468; NEDU-RR-2-72) Avail: NTIS CSCL 06/20

The use of elevated oxygen pressures in diving, treatment of decompression sickness, and hyperbaric oxygen therapy exposes the subject to the risk of oxygen toxicity of the lungs. At present no adequate guidelines exist to assist the physician in planning an oxygen exposure which will be safe from this hazard. The development of a method of calculating an estimated rate of onset and severity of pulmonary oxygen toxicity in man for any oxygen exposure has been reported. This report explains that method and provides tables that may be used to rapidly estimate the severity of pulmonary toxicity which may be incurred by any oxygen exposure. Recommendations as to safe limits of oxygen exposures for various procedures are included.

Author (GRA)

**N72-30073#** School of Aerospace Medicine, Brooks AFB, Tex. **DETERMINATION OF REVISED AIR FORCE PERMISSIBLE EXPOSURE LEVELS FOR LASER RADIATION** Technical Report, Jan. - Sep. 1970

Irving L. Dunsky, William A. Fife, and Everett O. Richey Apr. 1972 16 p refs

(AF Proj. 6301)

(AD-742267; SAM-TR-72-11) Avail: NTIS CSCL 06/8

Air Force permissible exposure levels were revised using experimental data from rhesus macaque monkeys and the concept of a minimal retinal spot. The ED/50 levels were annotated from the major sources which met the above criteria. ED/50 levels were annotated from the major sources which met the above criteria. ED/50 values reported for extramacular/paramacular exposures were corrected to the macula by multiplying by an experimentally determined average factor of 0.5. In addition, ED/50 values for neodymium exposures were corrected for ocular chromatic aberration to insure application of the data to a minimum retinal spot size and worst case situation. Safety factor considerations and values were examined and discussed for both the visible and near infrared wavelengths, resulting in reduction of existing Air Force permissible exposure levels.

Author (GRA)

**N72-30074#** Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

**THE IMPLICATIONS OF A CEREBELLAR MODEL FOR THE MAMMALIAN RESPONSE TO MOVEMENT**

Thomas W. Calvert and Frank Meno Dec. 1971 13 p refs

Presented at the Symp. on Biodyn. Models and their appl., Dayton, 26-28 Oct. 1970; Sponsored in part by PHS

(AF Proj. 7231)

(AD-740457; AMRL-TR-71-29-Paper-20) Avail: NTIS CSCL 06/19

A model for the cerebellum has been developed which shows that the cortex can be regarded as a spatial filter with interesting temporal characteristics. When this model is applied to the vestibulo-cerebellar system it predicts that the signal to the brain which results from acceleration applied to the skull has a trade-off between precision and time response. It appears that slowly changing accelerations will result in high precision information for the brain while a rapidly changing acceleration will result in lower precision information being sent to the brain.

Author (GRA)

**N72-30075#** Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

**BIOMECHANICS IN MOTOR SKELETAL STRUCTURES**

Carl Hirsch (Karolinska Inst., Stockholm) Dec. 1971 8 p

Presented at Symp. on Biodyn. Models and their Appl., Dayton, Ohio, 26-28 Oct. 1970

(AF Proj. 7231)

(AD-740456; AMRL-TR-71-29-Paper-19) Avail: NTIS CSCL 06/19

Most lethal biomechanical conditions can be explained by the physical laws which govern inertia, acceleration - deceleration and dissipation or absorption of kinetic energy. These physical laws provide a framework for the quantitative description of the mechanical response of skeletal structures. The time during which decelerations and forces are generated are of such magnitude to cause sudden fatalities. Studies of autopsy materials indicate that just below the level which causes sudden death, there is a narrow margin which may produce serious injuries and yet permit survival. There is thus a maximum tolerance of the body to force. Above this level, death occurs from stresses which exceed the limits of the structures with vital functional capacity. Author (GRA)

**N72-30076#** Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

**A THEORETICAL ANALYSIS: THE MECHANICAL CHARACTERISTICS OF THE PATELLA**

Edward H. Miller (Cincinnati Univ.), Dane Miller (Cincinnati Univ.), and Robert Kroll (Cincinnati Univ.) Dec. 1971 18 p refs Presented at Symp. on Biodyn. Models and their Appl., Dayton, Ohio, 26-28 Oct. 1970 (AF Proj. 7231) (AD-740455; AMRL-TR-71-29-Paper-18) Avail: NTIS CSCL 06/16

The authors have performed a theoretical static moment analysis of the knee joint, the quadriceps mechanism, and the patella. They have demonstrated that, theoretically, it should be impossible to extend the knee towards 180 degrees (maximum extension) against gravity and a theoretical ten pounds active resistive weight at the ankle joint because of the mechanics of the knee joint. They demonstrated that as the quadriceps mechanism lies on the anterior femoral condyle it would seem that, as the knee approached full extension, the line of pull of the quadriceps mechanism would approach 90 degrees to the moment at the tibial tubercle. In this analysis, the authors demonstrated why the patellectomized patient can indeed obtain full extension against gravity in an active resistive weight.

Author (GRA)

**N72-30077#** Missouri Univ., Columbia. Space Sciences Research Center.

**MECHANISMS OF OXYGEN TOXICITY AT THE CELLULAR LEVEL** Annual Report, 1 Jan. - 31 Dec. 1971

Olen R. Brown Jan. 1972 36 p refs (Contract N00014-67-A-0287-0002; NR Proj. 136-756) (AD-742443; AR-3) Avail: NTIS CSCL 06/20

Over the preceding year, progress has been achieved in several related lines of research which contribute to the contract objective of delineating basic, cellular mechanisms of oxygen toxicity. Each of the following areas has been previously identified with proposals and reports and progress in each area will be reviewed separately. The areas are: (A) techniques of measuring the toxicity of gaseous environments for cells, (B) quantification of the oxygen sensitivities of species and strains; (C) oxygen sensitivity of fatty acid synthetase and its components, and the effects of hyperoxia on: (D) pyridine nucleotide coenzymes, (E) oxidative phosphorylation, (F) cellular permeability, (G) respiration, and (H) cellular sulfhydryl. Author (GRA)

**N72-30078#** Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.

**BRAIN FUNCTION AND ADAPTIVE SYSTEMS: A HETEROSTATIC THEORY**

A. Harry Klopff 3 Mar. 1972 79 p refs (AF Proj. 5632)

(AD-742259; AFCRL-SR-133; AFCRL-72-0164) Avail: NTIS CSCL 06/4

A new theory of intelligent adaptive systems is proposed. The theory provides a single unifying framework within which the neurophysiological, psychological, and sociological properties

of living adaptive systems can be understood. Furthermore, the theory offers a new basis for the synthesis of machines possessing adaptive intelligence. The proposed theory is of a heterostatic type. That is to say, it is a theory which assumes that living adaptive systems seek, as their primary goal, a maximal condition (heterostasis), rather than assuming that the primary goal is a steady state condition (homeostasis). It is further assumed that the heterostatic nature of animals, including man, derives from the heterostatic nature of neurons. The postulate that the neuron is a heterostat (that is, a maximizer) is a generalization of a more specific postulate, namely, that the neuron is a hedonist. This latter postulate is interpreted strictly in terms of physical variables, yielding the heterostatic neuronal model that is the basis for the detailed development of the theory. Author (GRA)

**N72-30079#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**INVESTIGATING THE DOSE FIELD OF AN ELECTRON BEAM**

I. F. Moiseev, B. Ya. Narkevich, and V. N. Chernyavskii 11 Dec. 1971 10 p refs Transl. into ENGLISH from Vop. Dozim. Zashch. Izluch. (USSR), no. 9, 1969 p 77-81 (AD-739207; FTD-HT-23-1101-71) Avail: NTIS CSCL 06/18

A procedure is presented for calculating absorbed doses from electron sources (monoenergetic as well as those showing different spectral distribution in the energy interval 25 KeV-10 MeV) in tissue equivalent medium. A conversion from one source to another is accomplished in 3 stages which are explained. Results are compared with an experiment performed on a magnetic E monochromator (E energy of 1000 plus or minus 80 KeV, beam diam. 10 mm). The dose distribution was studied by using disk scintillators. Results differed by smaller than plus or minus 30 percent. Author

**N72-30080#** California Univ., Davis. Dept. of Human Physiology. **INVESTIGATION OF FACTORS AFFECTING HUMAN PERFORMANCE** Final Report

Richard F. Walters 25 Feb. 1972 7 p (Grant AF-AFOSR-1659-69; AF Proj. 9777) (AD-740665; AFOSR-72-0741TR) Avail: NTIS CSCL 06/19

A predictive model of human performance has been under fairly constant revision as new experimental and other information becomes available and is incorporated into the model's design. The model illustrates techniques of interactive simulation, including tutorial assistance for the researcher unfamiliar with its operation, interruptible execution for adjustment of workload or environmental characteristics, and the ability to interrogate the status of any changing variable in the model. Models of acceleration and of the effects of long term exposure to extremely low humidity are in early phases of analyses. GRA

**N72-30081#** Missouri Univ., St. Louis. Inst. of Psychiatry. **AEROSPACE STRESS AND HUMAN RELIABILITY** Final Report

Amedeo S. Marrazzi 6 Apr. 1972 22 p refs (Grant AF-AFOSR-1821-69; AF Proj. 9777) (AD-740666; AFOSR-72-0848TR) Avail: NTIS CSCL 05/10

Interaction with the external and internal environments is dependent on the information retrieval process. The interneuronal communication process essential to information retrieval and to cerebral integration generally has been the object of extensive study utilizing evoked field, focal, and extra- and intra-cellular unitary potentials as measures of synaptic output. In the process the investigators have worked out a means of checking adequacy of retrieval from association areas, which has enabled them to convert experimental findings into clinical test procedures able to assess breakdown point in subjects without actually breaking them down. This could be modified so as to behaviorally detect drug abusers and, with modification, detect drug abuse and its lasting consequences. Author (GRA)

**N72-30082#** Air Force Academy, Colo. Frank J. Seiler  
Research Lab.

**POST-AWAKENING VISUALIZATION PERFORMANCE AS  
A FUNCTION OF ANXIETY LEVEL, REM OR NREM SLEEP,  
AND TIME OF NIGHT**

Robert B. Tebbs Feb. 1972 79 p refs  
(AF Proj. 7903)

(AD-738630; SRL-TR-72-0005) Avail: NTIS CSCL 05/10

On the basis of their Q4 scores (calm-tense) on the 16 PF, 16 calm and 16 moderately tense young adult male subjects were aroused twice each night on two non-consecutive nights in the laboratory and tested with two visualization tests in a 3- to 15-minute period after arousal. The REM and NREM awakenings were counterbalanced for early (about 1:00 A.M.) and late (about 3:00 A.M.) positions across nights and subjects. No REM-NREM effects were found on PAP. The TON effects were not interpreted, since awakenings could not be positioned according to the pre-experimental plan. No significant PAP differences were found between calm and tense subjects. One significant difference was found between PAP of night subjects and the performance of comparable day subjects. No difference was found between calm day and night subjects. The results strongly suggest that the most important determinant of PAP is the anxiety level of the subjects. Author

**N72-30083#** Army Medical Research Lab., Fort Knox, Ky.  
**THE MACH-DVORAK PHENOMENON AND BINOCULAR  
FUSION OF MOVING STIMULI** Interim Report

George S. Harker 30 Nov. 1971 42 p refs  
(DA Proj. 3A0-61102-B-71-P)

(AD-740656; USAMRL-951) Avail: NTIS CSCL 05/10

Depth judgments of the Mach-Dvorak phenomenon induced by cyclic, intermittent stimulation were used to assess eye coordination in binocular vision. The response to the experimental manipulations of the simultaneous and alternate neutral points, the points of zero and maximum disparity, was suggestive of the function of multiple neural processes. The data were strongly supportive of an interaction between direction of stimulus motion and interocular sequencing. Reduced illumination of one eye affected the time of occurrence of the simultaneous and alternate neutral points oppositely, dependent upon exposure conditions. The data for equal duration exposure condition were suggestive of the known nasal-temporal conductive latency difference. Author (GRA)

**N72-30084#** Aerospace Medical Research Labs., Wright-  
Patterson AFB, Ohio.

**A MODEL TO SIMULATE THORACIC RESPONSES TO AIR  
BLAST AND TO IMPACT**

E. R. Fletcher (Lovelace Found for Med. Educ. and Res., N. Mex)  
Dec. 1971 45 p refs Presented at the Symp. on Biodyn.  
Models and their Appl., Dayton, Ohio, 26-28 Oct. 1970  
(AF Proj. 7231)

(AD-740438; AMRL-TR-71-29-Paper-1) Avail: NTIS CSCL  
06/19

A fluid-mechanical model of the thorax is described which has been useful in explaining biophysical mechanisms and scaling procedures applicable in assessing responses of the thorax energized by air-blast overpressures or by nonpenetrating missiles. Methods of parameter estimation are discussed. Comparisons are made between measured and computed intrathoracic pressures and chest-wall motions. The tested mammalian species are shown to divide into two approximately similar groups and the implications of this are discussed. Suggestions are made concerning possible future areas of research. Author (GRA)

**N72-30085#** Aerospace Medical Research Labs., Wright-  
Patterson AFB, Ohio.

**AN ANALYSIS OF THE PRESSURE WAVE GENERATED**

**IN SEATED SPINAL IMPACT**

Peter J. Torvik (AF Inst. of Tech.) Dec. 1971 27 p refs  
Presented at the Symp. on Biodyn. Models and their Appl.,  
Dayton, Ohio, 26-28 Oct. 1970  
(AF Proj. 7231)

(AD-740460; AMRL-TR-71-29-Paper-23) Avail: NTIS CSCL  
06/9

Experiments performed on seated pentobarbital anesthetized Macaca mulatta in order to study the response of the vertebral column and internal organs to spinal impact have revealed a spatio-temporal wave phenomenon along the torso during impact. Associated with this wave is a visible temporary abdominal distension. A mathematical model for such a mode of propagation is developed in this paper which enables the prediction of the parameters of a pressure wave in terms of certain physical properties of the subject. From the (closed form) results of the analysis, pressure, propagation speed, and skin stretch can be computed in terms of the speed at which the impact occurs. Although the model is necessarily simplified from the actual complex structure, the predicted relationships between the parameters show encouraging agreement with available experimental results. Author (GRA)

**N72-30086#** Aerospace Medical Research Labs., Wright-  
Patterson AFB, Ohio.

**SOME CURRENT BIOMECHANICAL RESEARCH IN THE  
UNITED KINGDOM, AS RELATED TO THE EFFECTS OF  
IMPACT AND VIBRATION ON MAN**

J. Sandover (Loughborough Univ. of Tech.) Dec. 1971 19 p  
refs Presented at Symp. on Biodyn. Model and their Appl.,  
Dayton, Ohio, 26-28 Oct. 1970  
(AF Proj. 7321)

(AD-740440; AMRL-TR-71-29-Paper-3) Avail: NTIS CSCL  
06/19

Although current research into models is not widely dispersed in the United Kingdom, models are used extensively as an aid to discussion. Current research includes the dynamics of wrist movements, the use of a model for tractor seat testing, and the properties of body tissue. Work at the author's establishment is directed towards providing a range of information on the human dynamic response to impact and vibration. Studies range from transient and steady-state impedance experiments, to internal and external transmissibility measurements. It is suggested that a wider understanding of variations and non-linearities is required before useful analytic, and synthetic models can be evolved. Author (GRA)

**N72-30087#** Aerospace Medical Research Labs., Wright-  
Patterson AFB, Ohio.

**USE OF A MATHEMATICAL MODEL FOR THE EVALUA-  
TION OF HEAD INJURY CRITERIA**

James V. Benedict Dec. 1971 18 p refs Presented at Symp.  
on Biodyn. Models and their Appl., Dayton, Ohio, 26-28 Oct.  
1970  
(AF Proj. 7231)

(AD-740441; AMRL-TR-71-29-Paper-4) Avail: NTIS CSCL  
06/19

The present study concerns the use of an analytic model for closed brain injury to evaluate General Motors' Severity Index for head injury. This index, which considers the relative importance of the duration and intensity of the pulse by means of an impulse-integration procedure, has been demonstrated empirically to be an excellent means of comparing the severity of pulses of varying shapes. Four pulses (square, half-sine, skewed and triangular), each having the same Severity Index but different magnitudes, were employed as inputs to the model. The model response to each of the four impacts was determined. Graphs of the time variation of stresses in the shell and pressures in the fluid at both the impact pole and at the counter pole demonstrate excellent correlation between model response and Severity Index, independent of the shape and magnitude of the impact force. Author (GRA)

**N72-30088#** Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

**MECHANICAL AND PHYSIOLOGICAL RESPONSE TO THE HUMAN CERVICAL VERTEBRAL COLUMN TO SEVERE IMPACTS APPLIED TO THE TORSO**

Wolfgang Lange Dec. 1971 28 p refs Presented at Symp. on Biodyn. Models and their Appl., Dayton, Ohio, 26-28 Oct. 1970 (AF Proj. 7231)

(AD-740442; AMRL-TR-71-29-Paper-5) Avail: NTIS CSCL 06/19

In experiments with human cadavers, severe frontal and rear-end automobile collisions were simulated on an acceleration sled. A wide range of angles of rotation between head and torso resulted from the impacts. The magnitude of the torque exerted at the cervical spine was estimated using the mass moments and lever arms. Autopsies after the experiments indicated certain types of injuries to the intervertebral disks and the ligaments caused by torque, axial forces and shear forces. Obviously, preexperimental damages to the column by spondylitis and/or atrophy deformans are important parameters for the impact trauma. Author (GRA)

**N72-30089#** Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

**BIODYNAMIC MODELING AND SCALING: ANTHROPO-MORPHIC DUMMIES, ANIMALS AND MAN**

M. Kornhauser Dec. 1971 23 p refs Presented at Symp. on Biodyn. Models and their Appl., Dayton, Ohio, 26-28 Oct. 1970 (AF Proj. 7231)

(AD-740443; AMRL-TR-71-29-Paper-6) Avail: NTIS CSCL 06/19

After a brief outline of the applications and methods of biomechanics and the major sources of biodynamics data, the paper reviews the status of mathematical modeling, physical modeling (dummies) and scaling of models and damage levels. Biomechanics data required for preparing mathematical models, as well as for adjusting and validating the computer programs, are found to be insufficient for computational applications. Because of this paucity of supporting data, computer models are in general oversimplified and rudimentary, despite the availability of adequate computational techniques used in the aerospace industry. Physical models and the requirements for dynamic similarity are discussed. Although quantitative simulation is warranted under some circumstances, anthropomorphic dummies are expected to be of most value as visual aids and for purposes of demonstrating kinematic relationships between man and vehicle. Scaling from dummies to man and from animals to man is difficult to justify theoretically because of differences in structure, size and modes of failure. However, damage scaling in terms of the inputs (G and delta-V) required for failure, is shown to be accurate enough for purposes of rough approximation. Author (GRA)

**N72-30090#** Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

**MULTIDEGREE, NONLINEAR MATHEMATICAL MODELS OF THE HUMAN BODY AND RESTRAINT SYSTEMS: APPLICATIONS IN THE ENGINEERING DESIGN OF PROTECTIVE SYSTEMS**

Raymond R. McHenry Dec. 1971 18 p refs Presented at Symp. on Biodyn. Models and their Appl., Dayton, Ohio, 26-28 Oct. 1970

(AF Proj. 7231) (AD-740444; AMRL-TR-71-29-Paper-7) Avail: NTIS CSCL 06/19

The role of mathematical models of whole-body kinetics in the engineering design of protective systems for acceleration exposures of humans is discussed. A number of specific models of this type and corresponding engineering applications are described. Present limitations of the research technique and probable future developments are discussed. Author (GRA)

**N72-30091#** Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

**BONE ATROPHY BY INACTIVITY**

Joachim H. Eichler Dec. 1971 22 p refs Presented at Symp. on Biodyn. Models and their Appl., Dayton, Ohio, 26-28 Oct. 1970

(AF Proj. 7231) (AD-740448; AMRL-TR-71-29-Paper-11) Avail: NTIS CSCL 06/19

The development of bone atrophy caused by inactivity was investigated in experiments with Guinea pigs. 300 animals of an inbred strain were fixed by a pelvic plaster for different times. The breaking strength of femora was measured and the reduction of spongy bone determined by uncalcified bone sections. Moreover, bone remodelling, dry mass of bone, and mineral balance were tested in our experiments. Bone atrophy is developing rapidly depending upon time of immobilization, age, and sex. The calcium balance is negative from the first day of immobilization. Osteoporotic changes produced by inactivity are compared with results obtained after space flights. Author (GRA)

**N72-30092#** Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

**THE MECHANICAL CHARACTERISTICS OF SKIN AND OTHER SOFT TISSUE AND THEIR MODELLING**

R. M. Kenedi (Strathclyde Univ., Glasgow) Dec. 1971 21 p refs Presented at Symp. on Biodyn. Models and their Appl., Dayton, Ohio, 26-28 Oct. 1971

(AF Proj. 7231) (AD-740449; AMRL-TR-71-29-Paper-12) Avail: NTIS CSCL 06/5

A brief survey of attempts at mechanical characterization of human tissue as components of the body have been presented. It is concluded that human tissue from a mechanical point of view is a multi-component material, nonhomogeneous, anisotropic and clearly non linearly visco-elastic. As regards effective modelling it is suggested that both material simulation and rheologic modelling are likely to prove abortive and that the most promising attempts to date are based on simplified models of actual physical structure. It is patently obvious that much more factual data is needed over the whole spectrum not the least in respect of limit load carrying capacity of the body and its components. It is further suggested that such limit capacity should preferably be related to the onset of physiological impairment than to palpable tissue damage. Author (GRA)

**N72-30093#** Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

**ON SOME GEOMETRIC PROPERTIES OF HUMAN RIBS. 1**

Sanford B. Roberts (Calif. Univ., Los Angeles) and Ping Heng Chen (Calif. Univ., Los Angeles) Dec. 1971 26 p refs Presented at Symp. on Biodyn. Models and their Appl., Dayton, Ohio, 26-28 Oct. 1970

(AD-740450; AMRL-TR-71-29-Paper-13) Avail: NTIS CSCL 06/19

The cross-sectional geometric properties of ribs 1 through 8 of a medium-framed female cadaver specimen were studied. Specifically, each rib was cut into 10 sections, the exposed cross-sections photographed, a finite element grid superimposed, and with the aid of a digital computer, the geometric properties (total area, compact bone area, centroid, principal axes, principal moments of inertia and torsional constant) of the compact bone region were determined. Although most of these quantities exhibit wide variations some trends do emerge. Of particular significance is a simple geometric construction for the location of the centroid and principal axes and the general result that a thin-walled ellipse is a reasonably accurate model from which the approximate cross-sectional properties may be calculated. Author (GRA)

**N72-30094#** Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

**THE INTERACTION OF THE COMPONENTS OF THE HUMAN BACK**

Gerner A. Olsen (City Coll. of New York) Dec. 1971 30 p refs Presented at Symp. on Biodyn. Models and their Appl., Dayton, Ohio, 26-28 Oct. 1970 (AF Proj. 7231)

(AD-740451; AMRL-TR-71-29-Paper-14) Avail: NTIS CSCL 06/5

Much of the difficulty retarding progress in treating malfunctions of the human back stems from a lack of understanding of the interaction of its various components. This paper would attempt to clarify such interaction and present clinical and experimental evidence supporting its concepts. The actions of the thoracic and lumbar portions of the back are discussed separately. In the thoracic portion lateral stability is shown to be largely dependent on the truss mechanisms resulting from the ribs and attached musculature. The lumbar portion is shown to derive its stability from its inherent spinal components as well as its strong muscular bracing. The result of malfunctions in each of these regions is also emphasized.

Author (GRA)

**N72-30095#** Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

**THE ULTIMATE STRENGTH AND FAILURE MECHANISM OF ANTHROPOID KNEE JOINTS**

John O. Outwater (Vermont Univ., Burlington), Carl H. Jacobs (Vermont Univ., Burlington), and Robert W. Castle (Vermont Univ., Burlington) Dec. 1971 17 p refs Presented at Symp. on Biodyn. Models and their Appl., Dayton, Ohio, 26-28 Oct. 1970

(AF Proj. 7231)

(AD-740452; AMRL-TR-71-29-Paper-15) Avail: NTIS CSCL 06/19

Testing of the anthropoid knee in three point loading indicates a progressive failure mechanism in an anterior loading situation. This phenomenon is investigated and is shown to be due to the failure of the connective tissue of the knee region as loading progresses. The first response is the patella settling into the intercondyle space of the tibia and contacting the tuberosity. This contact causes the posterior surface of the patella to be bruised. The second response is that of the posterior cruciate ligament failing at its point of insertion into the medial condyle. The ultimate and final failure of the joint occurs when the posterior cruciate ligament completely ruptures and causes the ligament of Wrisberg to tear its lateral condyle insertion allowing the complete collapse of the joint. The relationships between the angular displacement of the knee joint and the applied bending moment are shown for different size joints. The failure conditions are related also to the joint sizes. The effects of freezing on the angular modulus of the joint and on its ultimate strength is shown to reduce the strength and modulus about 50%.

Author (GRA)

**N72-30096#** Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

**THE EFFECTS OF HYPOGRAVIC AND HYPODYNAMIC ENVIRONMENTS ON THE SKELETAL SYSTEM AND ACCELERATION TOLERANCE**

L. E. Kazarian and H. E. VonGierke Dec. 1971 26 p refs Presented at Symp. on Biodyn. Models and their Appl., Dayton, Ohio, 26-28 Oct. 1970

(AF Proj. 7231)

(AD-740453; AMRL-TR-71-29-Paper-16) Avail: NTIS CSCL 06/19

The purpose of this study was to determine the effects of disuse atrophy of bone on spinal impact tolerance for the Rhesus monkey. This study clearly demonstrates that disuse and inactivity has profound structural and functional effects on the weight bearing spine, in terms of decreased spinal impact tolerance. The presently used biodynamic injury criteria for

impact is based on laboratory experiments and field data, with adult human and animal subjects whose skeletal systems are assumed to be normal and healthy. Disuse atrophy decreases the overall mechanical strength of the skeletal system to such a degree that injury levels for acceleration exposure are significantly altered, for the immobilized Rhesus monkey. There are indications that a similar analogy may hold true for man in space for extended periods of time. If this is true, new acceleration stress indices predictive of physiological conditions for the astronaut may become necessary.

Author (GRA)

**N72-30097#** Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

**TESTING DYNAMIC MATERIAL PROPERTIES OF BRAIN ARTERIES**

G. H. Daly (Washington Univ., Seattle), J. D. Chalupnik (Washington Univ., Seattle), and J. D. Danberg (Washington Univ., Seattle) Dec. 1971 15 p refs Presented at Symp. on Biodyn. Models and their Appl., Dayton, Ohio, 26-28 Oct. 1970 Sponsored in part by NIH Head Injury Program

(AF Proj. 1231)

(AD-740454; AMRL-TR-71-29-Paper-17) Avail: NTIS CSCL 06/19

Freshly excised arteries of the brain obtained from human autopsy have been tested under dynamic loading conditions for the purpose of determining a suitable dynamic constitutive relation for the material. The results of these tests are to be used in the construction of improved mathematical and physical biodynamic models of the head for use in the Head Injury Program. Preliminary results show that the arteries display a nonlinear elastic behavior with no frequency dependent viscoelastic effects over the range of frequencies tested or under static loading.

Author (GRA)

**N72-30098#** Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

**MODELING THE CIRCULATORY SYSTEM UNDER BIODYNAMIC LOADS**

Julia T. Apter (Ill. Univ., Chicago) Dec. 1971 22 p refs Presented at Symp. on Biodyn. Models and their Appl., Dayton, Ohio, 26-28 Oct. 1970

(AF Proj. 7231)

(AD-740459; AMRL-TR-71-29-Paper-22) Avail: NTIS CSCL 06/19

The model developed here was based on the dynamic viscoelastic properties of the components of the cardiovascular system. The model parameters are functions of time and are valid for a wide range of strains. From some limited kinds of behavior numerical values for model parameters can be obtained from data on intact portions of a human cardiovascular system. Almost all behavior can be clarified with this model which, therefore, serves as a valuable teaching aid and as a basis for evaluating the qualitative results to be expected from management of changes induced by large dynamic loads, like impact.

Author (GRA)

**N72-30099#** Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

**THE TRANSVERSE RESPONSE OF THE LUMBAR SPINE UNDER LONGITUDINAL LOADS**

H. E. Krause (Dayton Univ. Res. Inst.) and M. Shirazi (Dayton Univ. Res. Inst.) Dec. 1971 29 p refs Presented at the Symp. on Biodyn. Models and their Appl., Dayton, Ohio, 26-28 Oct. 1970 Sponsored in part by Dayton Univ. Res. Inst. (Contract F33615-69-C-1681; AF Proj. 7231)

(AD-740461; AMRL-TR-71-29-Paper-24) Avail: NTIS CSCL 06/19

A novel continuous model of the spine is presented. The transverse motion in the sagittal plane of the spine of sitting human subjects exposed to vertical vibrations revealed considerable bending along the lumbar spine and negligible bending along the thoracic spine. Therefore, the model consists



of a curved rod, representing the lumbar spine, longitudinally loaded by a mass, representing the thorax. The differential equation of the transverse motion was derived and solved by making a product assumption. No transverse displacements and no bending moment was assumed at the pelvic end. At the thoracic end, a shear force and a bending moment are applied, representing translatory and rotatory inertia of the attached rib cage. Eigenfunctions and eigenvalues depend on longitudinal loading. The eigenfunctions correlate well with data obtained over a large range of experimental conditions. The solution for the time distribution contains various distinct harmonic components if an external force, alternating sinusoidally at only one discrete frequency, is applied. This effect is due to a periodic parameter in the differential equation. Author (GRA)

**N72-30100#** Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

**NONLINEAR LUMPED PARAMETER MATHEMATICAL MODEL OF DYNAMIC RESPONSE OF THE HUMAN BODY**

Gordon R. Hopkins (West Virginia Univ.) Dec. 1971 22 p refs Presented at Symp. on Biodyn. Models and their Appl., Dayton, Ohio, 26-28 Oct. 1970

(AF Proj. 7231)

(AD-740462; AMRL-TR-71-29-Paper-25) Avail: NTIS CSCI 06/19

Two nonlinear models of man's dynamic response to low frequency vibration are discussed. The first model uses linear spring and damper elements but accounts for the nonlinear geometry of visceral mass motion. This model adequately reproduces both the input mechanical impedance and vibration transmission characteristics for a seated human subject. The second model includes the nonlinear effects of the lungs. The influence of this nonlinearity on the dynamic response is discussed and compared to experimental results from tests on animals. Author (GRA)

**N72-30101#** Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

**CONTROL OF THE HUMAN FOREARM DURING ABRUPT ACCELERATION**

P. A. Stewart (Brown Univ.), J. Duffy (Brown Univ.), J. Soechting (Brown Univ.), H. Litchman (Brown Univ.), and P. R. Paslay (Brown Univ.) Dec. 1971 22 p refs Presented at Symp. on Biodyn. Models and their Appl., Dayton, Ohio 26-28 Oct. 1970

(AF Proj. 7231)

(AD-740463; AMRL-TR-71-29-Paper-26) Avail: NTIS CSCI 06/19

The paper describes research aimed toward the development of a useful mathematical model of the human forearm including the musculature and its neural control. The goals are to provide quantitative bases for both diagnosis and monitoring of therapy in a variety of neuromuscular disease states, and also to improve current understanding of the basic physiological systems involved. Three types of experiments designed to evaluate the parameters in the model have been performed on human subjects. The first, a series of static tests, demonstrates on the basis of the principles of structural mechanics that averaged electromyogram amplitude is directly related to muscle contractile force. The second experiment, a set of constant velocity tests, independently evaluates these same parameters, as well as a damping coefficient. The results show that damping is small. The third, a series of quick release tests, evaluates the control parameters in the model. Results indicate that velocity control is much less important for present experimental conditions than direct proportional control. Author (GRA)

**N72-30102#** Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

**AN APPROACH TO HEAD IMPACT ANALYSIS**

Gordon Moskowitz (Drexel Univ.), Joseph Rose (Drexel Univ.),

and Stephen Gordon (Drexel Univ.) Dec. 1971 8 p Presented at Symp. on Biodyn. Models and their Appl., Dayton, Ohio, 26-28 Oct. 1970.

(AF Proj. 7231)

(AD-740464; AMRL-TR-71-29-Paper-27) Avail: NTIS CSCI 06/19

Presently, many mathematical models of response to head impact are based on a thin elastic shell filled with an inviscid fluid. While these models serve as starting points, anatomic and physiologic considerations indicate that many areas for improvement exist. Research has been recently initiated to determine the behavior of the multi-layered viscoelastic and elastic-plastic brain protection system in response to impact loading. Geometrically simplified layered mathematical models are proposed to evaluate the importance of viscous, plastic, and layering effects within the model. Dynamic material testing has been performed on photoelastic models to demonstrate stress wave propagation through the cavities within the diploe region. Author (GRA)

**N72-30103#** Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

**THE BIOMECHANICS OF SPINAL AND HEAD IMPACT: PROBLEMS OF MATHEMATICAL SIMULATION**

Y. King Liu (Tulane Univ.) Dec. 1971 37 p refs Presented at Symp. on Biodyn. Models and their Appl., Dayton, Ohio, 26-28 Oct. 1970

(AF Proj. 7231)

(AD-740465; AMRL-TR-71-29-Paper-28) Avail: NTIS CSCI 06/19

The paper examines the various mathematical models proposed in impact studies in general and those in connection with spinal and head injuries in particular. First, the concept of injury tolerance surface is introduced. When a complete mapping of this surface is in hand, then the probability of injury due to any acceleration vector can be evaluated. After reviewing a typical single-degree-of-freedom model, a quadrature scheme, based on classical Fourier transform technique, is proposed for obtaining the pulse response from the experimentally determined mechanical impedance. The second part of the paper begins with a review and critique of a promising one-dimensional continuum model of head injury by Hayashi. Exact wave-propagation solutions were obtained for the intracranial pressure and container acceleration. The survey of two- or three-dimensional models is divided into axisymmetric, rotational and nonaxisymmetric versions of fluid-filled spherical shells. A brief summary of the implications of the idealizations discussed above to other critical organs of the human body concludes the paper. Author (GRA)

**N72-30104#** Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

**THE EFFECT OF VIBRATION ON BLOOD FLOW AND PRESSURE IN THE MAJOR ARTERIES OF DOGS**

Richard G. Edwards (Kentucky Univ.), Charles F. Knapp (Kentucky Univ.), Ernest P. McCutcheon (Kentucky Univ.), Karl O. Lange (Kentucky Univ.), and Ward O. Griffen (Kentucky Univ.) Dec. 1971 30 p refs Presented at Symp. on Biodynamics Models and their Appl., Dayton, Ohio, 26-28 Oct. 1970

(AF Proj. 7231)

(AD-740466; AMRL-TR-71-29-Paper-29) Avail: NTIS CSCI 06/19

The response of various systems in the human body to forces transmitted from vehicles and machinery has been the object of much research in recent years, but there have been few direct experimental measurements of cardiovascular function in a dynamic environment. This report describes both in vitro and in vivo approaches to analyzing the cardiovascular effects of vibration. First, a simplified mechanical model of the circulatory system was constructed and exposed to sinusoidal vibration. Next, electromagnetic flow transducers were chronically implanted around the aorta and the pulmonary and carotid arteries of a dog. After recovery the animal was anesthetized, placed in an upright position (spine vertical), and vibrated at 2 to 12 Hz and

at 1 to 3G acceleration amplitude in the direction of the gravity vector. Variables measured were blood flow rate, arterial pressure, and force transmitted between animal and vibration exciter. The purpose was to determine the maximum and minimum peak flow rates, pressures, and transmitted force during vibration compared to normal levels. Author (GRA)

**N72-30105#** Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

**ANALYSIS OF GAIT USING A MINIMUM ENERGY APPROACH**

R. E. Beckett and K. C. Pan (US Army Weapons Command) Dec. 1971 20 p refs Presented at Symp. on Biodynamics Models and their Appl., Dayton, Ohio, 26-28 Oct. 1970 (AD-740470; AMRL-TR-71-29-Paper-33) Avail: NTIS CSCL 06/19

The paper presents an analysis of the motion of the legs and the center of gravity of the torso in walking. The analysis is based on the hypothesis that the behavior will be such as to minimize the amount of muscle effort and be consistent with constraints imposed by muscle behavior and geometry. The equations of motion are solved by a shooting technique which is made to satisfy conditions imposed at the beginning and end of a step cycle by an interval halving method. Results give the time-phased position of the legs and the torso center of gravity and the moment inputs at the pelvis and the knee. Comparisons of results are made with available experiments and analysis. Results and comparisons are displayed in graphical form.

Author (GRA)

**N72-30106#** Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

**RESPONSE OF THE SPINE IN BIODYNAMIC ENVIRONMENTS**

Mehdi Shirazi (Dayton Univ. Res. Inst.) Dec. 1971 8 p ref Presented at the Symp. on Biodyn. Models and their Appl., Dayton, Ohio, 26-28 Oct. 1970 Sponsored in part by Dayton Univ. Res. Inst. (AF Proj. 7231) (AD-740471; AMRL-TR-71-29-Paper-34) Avail: NTIS CSCL 06/19

The report discusses the propagation of longitudinal elastic waves along the spine considered as a thin uniform rod with nonlinear elastic parameters. The response of the spine in terms of the dynamic longitudinal deformation of the spine cross section is determined and its variation with respect to axial distance and the applied frequency is noted. Author (GRA)

**N72-30107#** Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

**A DYNAMIC MODEL OF THE SPINE USING A POROUS ELASTIC MATERIAL**

Edmund F. Rybick (Battelle Mem. Inst.) Dec. 1971 26 p refs Presented at the Symp. on Biodyn. Models and their Appl., Dayton, Ohio, 26-28 Oct. 1970 (AF Proj. 7231) (AD-740472; AMRL-TR-71-29-Paper-35) Avail: NTIS CSCL 06/19

A preliminary investigation of a two-phase solid-fluid continuum model to represent the spinal column subjected to dynamic loadings is presented. The two-fold purpose of this investigation is: (1) to examine a simple dynamic model that has a continuum representation and offers a capability to include the inertia and pressure effects of a fluid and (2) to use this model to study what effect the presence of a fluid has on the stresses in the solid material. The model consists of a uniform straight porous elastic column containing a viscoelastic fluid and supporting a mass to represent the head. Loading consists of a constant acceleration at the base of the column. Two types of boundary conditions for the fluid at the upper end of the column are

considered. The problem is formulated in terms of two coupled partial differential equations with the displacements of the fluid and the solid material treated as unknowns. Author (GRA)

**N72-30108#** Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

**A MATHEMATICAL MODEL FOR THE BEHAVIOR OF THE BRAIN WHEN THE HUMAN HEAD IS SUBJECTED TO IMPULSIVE LOADS**

Ali E. Engin (Mich. Univ.) and Verne L. Roberts (Mich. Univ.) Dec. 1971 28 p refs Presented at the Symp. on Biodyn. Models and their Appl., Dayton Ohio, 26-28 Oct. 1970 (Contract PH-43-67-1136; AF Proj. 7231) (AD-740473; AMRL-TR-71-29-Paper-36) Avail: NTIS CSCL 06/19

The subject matter of this paper is concerned with the theoretical determination of the behavior of the brain when the human head is subjected to external impulsive loads. The mathematical analysis is made for the axisymmetric response of an inviscid compressible fluid loaded impulsively by its elastic spherical shell container. In the analysis, first the solution for an initial value problem is obtained. Later the transient response of the fluid for an arbitrary velocity input of the shell is constructed by means of convolution integral. For the numerical results, a characteristic time is defined and the excess pressure distribution in the fluid is evaluated for various deceleration times comparable with this characteristic time. Author (GRA)

**N72-30109#** Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

**A MECHANICAL IMPEDANCE MODEL FOR HEAD INJURY DUE TO LINEAR IMPACTS**

Richard L. Stalnaker (Michigan Univ.), James H. McElhane (Michigan Univ.), and Verne L. Roberts (Michigan Univ.) Dec. 1971 28 p refs Presented at Symp. on Biodyn. Models and their Appl., Dayton, Ohio, 26-28 Oct. 1970 (AF Proj. 7231; Contracts DOT-FM-11-7288; PH-43-67-1136) (AD-740474; AMRL-TR-71-29-Paper-37) Avail: NTIS CSCL 06/19

The mechanical impedance of the human and various other primate species heads was determined over the frequency 30-5000 hertz. A simple model was developed that closely follows the observed impedance characteristics. Spring and damping constants were evaluated and comparisons between species obtained. An impact tolerance curve was computed based on the model predictions with a maximum strain criteria. Various input pulse shapes were analyzed and the effect of pulse shape and duration studied for the different species. Published values of tolerable impulses were examined and compared with the model predictions. Author (GRA)

**N72-30110#** Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

**THE BIOLOGICAL RESPONSE OF THE SPINAL CANAL AND ITS CONTENTS TO SURGICAL TRAUMA OF THE AXIAL SKELETON; COMMENTS ON INFRAHUMAN EXPERIMENTATION AND BIOSTATISTICS IN CLINICAL ORTHOPEDICS**

John Hartley Moore (Yale Univ.) Dec. 1971 42 p refs Presented at Symp. on Biodynamics Models and their Appl., Dayton, Ohio, 26-28 Oct. 1970 (AD-740475; AMRL-TR-71-29-Paper-38) Avail: NTIS CSCL 06/5

The presentation deals with the occurring loads or forces (surgical trauma) applied to the canine intervertebral space and its surrounding structures when a surgeon performs a laminectomy with exploration of an interspace. This may also occur when the human disc space is entered, either purposely for diagnosis, such as discography, or accidentally during the course of spinal anesthesia (rare). GRA

**N72-30111#** Naval Medical Research Inst., Bethesda, Md.  
**BIOCHEMICAL STUDIES DURING SATURATION DIVING:  
 A COMPARISON OF A SATURATION DIVE WITH  
 SATURATION-EXCURSION DIVES** Medical Research  
 Interim Report

David E. Uddin, Richard E. Danziger, Terry L. Sallee, John M. Alexander, and Edward T. Flynn 12 Oct. 1971 47 p refs (MF12524014)

(AD-740508; NAVMED-2) Avail: NTIS CSCL 06/19

A number of serum constituents were measured before, during and after one saturation-excursion dive to 300 feet of sea water (FSW), two saturation-excursion dives to 600 FSW, and one saturation dive to 1000 FSW. Significant increases in creatine phosphokinase (CPK) and lactate dehydrogenase (LDH) activity were noted on both saturation-excursion profiles. However, there were essentially no changes in serum enzyme activity during the saturation dive to 1000 FSW. On all 3 profiles, serum lactic acid was elevated with the largest increase occurring on the 1000 FSW dive. No changes were noted in the serum lipid constituents on any of these dives. These changes in serum biochemistries are discussed in relation to the differences in environmental conditions. Author (GRA)

**N72-30112\*#** Stanford Research Inst., Menlo Park, Calif.  
**SIMULATED INDOOR SONIC BOOMS JUDGED RELATIVE  
 TO NOISE FROM SUBSONIC AIRCRAFT**

Karl D. Kryter and Jerome S. Lukas Washington NASA Aug. 1972 20 p refs

(Contract NAS1-10017)

(NASA-CR-2106)\* Avail: NTIS HC \$3.00. CSCL 05E

Judgment tests were conducted in which subjects equated the subjective unwantedness or noisiness of simulated indoor sonic booms with the flyover noise of a subsonic jet aircraft as heard indoors. It was found that the spectral content of the booms, as affected by changes in the rise time of the booms, influenced the relative subjective noisiness of the booms in a way predictable from certain physical measures of Max and EPNL. However, a correction factor is required for predicting from physical measures the subjective noisiness of sonic booms when compared to nonimpulsive subsonic aircraft flyover noise measured in the same physical units. It appears that a somewhat different correction value is required for booms heard outdoors than when heard indoors. Author

**N72-30113\*#** Research Triangle Inst., Durham, N.C.  
**PRELIMINARY DESIGN STUDY OF A REGENERATIVE  
 LIFE SUPPORT SYSTEM INFORMATION MANAGEMENT  
 AND DISPLAY SYSTEM** Final Report

C. D. Parker and J. B. Tommerdahl Apr. 1972 51 p ref

(Contract NAS1-11077)

(NASA-CR-112105) Avail: NTIS HC \$4.75 CSCL 06K

The instrumentation requirements for a regenerative life support systems were studied to provide the earliest possible indication of a malfunction that will permit degradation of the environment. Four categories of parameters were investigated: environmental parameters that directly and immediately influence the health and safety of the cabin crew; subsystems' inputs to the cabin that directly maintain the cabin environmental parameters; indications for maintenance or repair; and parameters useful as diagnostic indicators. A data averager concept is introduced which provides a moving average of parameter values that is not influenced by spurious changes, and is convenient for detecting parameter rates of change. A system is included to provide alarms at preselected parameter levels. F.O.S.

**N72-30114\*#** Vought Missiles and Space Co., Dallas, Tex.  
**ADVANCED EXTRAVEHICULAR PROTECTIVE SYSTEMS  
 (AEPS) STUDY** Interim Report, Jul. 1970 - May 1971

James L. Williams, Robert J. Copeland, and Bruce W. Webbon May 1971 77 p refs

(Contract NAS2-6022)

(NASA-CR-114321) Avail: NTIS HC \$6.00 CSCL 06K

A description is given of life support subsystem concepts for advanced extravehicular protective systems (AEPS) intended for use on future orbital, lunar surface, and Mars surface missions in the late 1970's and 1980's. Primary interest was centered around the thermal control and carbon dioxide control subsystems because they offer the greatest potential for total weight savings. Emphasis was placed on the generation of regenerable subsystem concepts; however, partially regenerable and expendable concepts were also considered. Previously conceived and developed subsystem concepts were included in the study. Concepts were evaluated on the basis of subsystem weight and volume, and subsystem contribution to parent vehicle weight and volume, which included spares, regeneration equipment, expendables, expandables storage penalty, power penalty, and process heating or cooling penalty. Results are presented showing total weight and volume penalty as a function of total mission extravehicular activity (EVA) hours, and showing EVA weight and volume as a function of EVA duration. Subsystem concepts are recommended for each life support function, and secondary concepts which should be developed are also identified. Author

**N72-30115\*#** Indiana Univ., Bloomington. Div. of Optometry  
 and Program in Physiological Optics.

**THE VISUAL STANDARDS FOR THE SELECTION AND  
 RETENTION OF ASTRONAUTS, PART 2**

Merrill J. Allen, John R. Levene, and Gordon G. Heath May 1972 29 p refs

(Contract NAS9-9665)

(NASA-CR-115763) Avail: NTIS HC \$3.50 CSCL 06N

In preparation for the various studies planned for assessing visual capabilities and tasks in order to set vision standards for astronauts, the following pieces of equipment have been assembled and tested: a spectacle obstruction measuring device, a biometric glare susceptibility tester, a variable vergence amplitude testing device, an eye movement recorder, a lunar illumination simulation chamber, a night myopia testing apparatus, and retinal adaption measuring devices. G.G.

**N72-30116\*#** National Aeronautics and Space Administration,  
 Washington, D.C.

**LASER MICROSPECTRAL ANALYSIS OF BIOLOGICAL  
 OBJECTS**

G. Dimitrov et al Aug. 1972 13 p refs Transl. into ENGLISH from Godishnik Sofiakiya Univ., Fiz. Fak. (Bulgaria), v. 63, 1968-1969 (published in 1971) p 123-135

(NASA-TT-F-14353) Avail: NTIS HC \$3.00 CSCL 20E

The use of the laser microspectral analyzer to study various biological phenomena is discussed. Specific studies include: (1) investigations of links between pigmentation and the presence of metallic components, and their role in the coloration of butterflies; (2) investigations of the distribution of certain inorganic components in the internal and external organs of the common house fly; and (3) investigations of the presence and distribution of metallic components in human hair and teeth. E.H.W.

**N72-30117#** Civil Aeromedical Inst., Oklahoma City, Okla.  
**A STUDY OF THE STATE-TRAIT ANXIETY INVENTORY  
 AND THE ASSESSMENT OF STRESS UNDER SIMULATED  
 CONDITIONS**

Roger C. Smith May 1972 6 p refs

(FAA-AM-72-23) Avail: NTIS HC \$3.00

One approach to the measurement of stress in ATC and other aviation personnel is through assessment of anxiety. One means of accomplishing this is to use the state-trait anxiety inventory (STAI), a 40-item self-report technique. However, the STAI may be susceptible to effects of biasing response sets. In order to determine if stress can be simulated on the STAI, the responses of 283 subjects obtained under normal instructions were compared to their responses obtained when asked to make

it appear as if they were experiencing a high degree of stress. It was found that while both the A-State (current anxiety level) and A-Trait (anxiety proneness) scales were influenced by this response set, the effect was greater for the A-State scale. Using the A-State raw score alone as an index of bias resulted in 95.7% accuracy in protocol classification. A two-step procedure, using eight items and the A-State raw score, was subsequently devised which reduced false-positive classifications of legitimate psychiatric patient profiles from 49% to 38% with no reduction in discriminatory power for normal records. The application of the index to clinical and research settings in aviation was discussed. Author

**N72-30118#** Toronto Univ. (Ontario). Inst. for Aerospace Studies.

**THE EFFECT OF SECONDARY TASKS ON PILOT DESCRIBING FUNCTIONS IN A COMPENSATORY TRACKING TASK**

B. L. Watson Jun. 1972 48 p refs  
(UTIAS-178) Avail: NTIS HC \$4.50

The effect certain secondary tasks have on human pilot describing functions is examined. The describing functions are generated from a compensatory tracking task with rate-control dynamics. The experiment involved six well trained subjects in a multitask situation where the primary control task was tracking. The results are presented as amplitude and phase plots of measured describing functions, which are fitted by an eight-parameter theoretical pilot model. The effects are described in terms of both raw data and model parameters. Author

**N72-30119#** Joint Publications Research Service, Arlington, Va. **MILITARY HUMAN FACTORS ENGINEERING**

G. N. Ageyev 1 Aug. 1972 440 p refs Transl. into ENGLISH of the book "Voyennaya Inzhenernaya Psikhologiya" Moscow, USSR Ministry of Defense Publishing House, 1970 400 p. (JPRS-56653) Avail: NTIS HC \$22.00

Soviet research in the basic science of the interaction of man and machine in modern complex military systems is reported. Problems considered in the military human factors engineering include: psychological structure of military operator activities; modeling psychophysiological functions of man for personnel selection, and designing trainers; and special directions which reflect the interests of different types of armed forces and branches of arms. F.O.S.

**N72-30120#** Air Force Human Resources Lab., Wright-Patterson AFB, Ohio. Advanced Systems Div.

**DESIGN OPTION DECISION TREES. A METHOD FOR RELATING HUMAN RESOURCES DATA TO DESIGN ALTERNATIVES** Technical Report, Jan. - Oct. 1971

William B. Askren and Kenneth D. Korkan (System Research Labs., Inc.) Dec. 1971 34 p refs  
(AF Proj. 1124)

(AD-741768; AFHRL-TR-71-52) Avail: NTIS CSCL 05/5

The feasibility of predetermining the design options available to the engineer during system design and placing the results in a decision tree format was investigated. Design option decision trees for propulsion and flight control subsystems were developed. The decision trees were evaluated by eight engineers experienced in designing these specialized areas of aerospace systems. It is concluded that the decision format is a feasible and valid method for describing system design options. It is hypothesized that design option decision trees may provide a means for relating human resources data to specific design characteristics. However, a number of additional investigations are needed to develop and validate a workable technique for using DODT's as a method for including human resources data in design decisions. Author (GRA)

**N72-30121#** Denver Univ., Colo. Dept. of Mechanical Sciences and Environmental Engineering.

**ANALYTICAL AND EXPERIMENTAL EVALUATION OF A PILOT CHIN-AIRBAG SYSTEM**

Arthur A. Ezra Apr. 1972 84 p refs  
(Contract N00014-67-A-0394-003)  
(AD-742449) Avail: NTIS CSCL 06/17

The research reported has been directed toward the development of an inflatable collar for pilots. The collar is designed to protect the head against violent rotation and against loss of consciousness during survivable crashes of aircraft. Analytical studies were conducted to determine the range of effectiveness of an airbag for use as a collar in reducing the peak deceleration of the head in a crash. The goal is to arrive at the best possible design and performance criteria for such an airbag. Author (GRA)

**N72-30122#** Webb Associates, Yellow Springs, Ohio.

**HUMAN FORCE EXERTIONS IN AIRCRAFT CONTROL LOCATIONS**

Marvin L. Thordsen, K. H. Eberhard Kroemer (AMRL), and Lloyd L. Laubach Wright-Patterson AFB, Ohio AMRL Feb. 1972 84 p refs

(Contract F33615-71-C-1087; AF Proj. 7184)  
(AD-740930; AMRL-TR-71-119) Avail: NTIS CSCL 01/3

Experiments were conducted to measure the maximum isometric forces male subjects could exert at six locations of hand-operated aircraft controls. Forces were measured in two vertical and four to eight horizontal directions. The subject (n=51) sat in a simulated aircraft seat and exerted forces on a cylindrical handle. Selected anthropometric dimensions were obtained on the subjects and compared with those from the 1967 USAF anthropometric survey of flying personnel. Summary statistics, including the mean, standard error of the mean, standard deviation, standard error of the standard deviation, coefficient of variation, symmetry, kurtosis, and selected percentiles, are presented for each of the 44 force exertion measures. Author (GRA)

**N72-31094\*#** George Washington Univ., Washington, D.C. Biological Sciences Communication Project.

**APPLICATIONS OF AEROSPACE TECHNOLOGY IN THE PUBLIC SECTOR** Semiannual Review of the Biomedical and Public Sector Technology Application Team Program, 1 Jun. - 30 Nov. 1971

Todd Anuskiewicz, John Johnston, and Robert Zimmerman 30 Nov. 1971 129 p refs  
(Contract NASw-2055)  
(NASA-CR-128116; GW-BSCP-72-02R) Avail: NTIS HC \$8.50  
CSCL 06B

Current activities of the program to accelerate specific applications of space related technology in major public sector problem areas are summarized for the period 1 June 1971 through 30 November 1971. An overview of NASA technology, technology applications, and supporting activities are presented. Specific technology applications in biomedicine are reported including cancer detection, treatment and research; cardiovascular diseases, diagnosis, and treatment; medical instrumentation; kidney function disorders, treatment, and research; and rehabilitation medicine. F.O.S.

**N72-31095#** RAND Corp., Santa Monica, Calif.

**THE SENSITIVITY OF PORTIONS OF THE HUMAN CENTRAL NERVOUS SYSTEM TO SAFE LEVELS OF MICROWAVE RADIATION**

Robert M. Lebovitz Mar. 1972 34 p refs  
(R-983-RC) Avail: NTIS HC \$3.75

The possible biological effects of low level microwave (MW) radiation on the human organism are examined. A cursory examination of the direct effects of MW radiation reveals no

mechanism by which low level exposure can produce significant changes. Heat effects exist which can be verified by careful measurement, but at neither the gross-tissue level nor the cellular level does 10 mW/sq cm of radiation appear to produce a significant thermal stress on the human. It was proposed that the human vestibular apparatus (the inner ear) may be responsive to low level MW radiation via indirect, caloric stimulation. To examine this possibility, a simplified mathematical model of induced temperature gradients in the vestibular apparatus was constructed. It appears that convective forces within the semicircular canals may generate sensible neural signals in response to MW irradiation at intensities as low as 10 mW/sq cm. Further experimentation using behavioral and direct neurophysiological techniques is now required to determine whether the predictions of this model have some validity.

Author

**N72-31096#** Public Health Service, Washington, D.C. Injury Control Research Lab.

**THE INFLUENCE OF SENSORY PATTERN AND ALCOHOL ON VEHICULAR VELOCITY SENSING**

Santo Salvatore 1972 45 p refs

(ICRL-RR-70-8; DHEW(HSM)-72-10003) Avail: SOD

An investigation comparing the ability of subjects to judge travelled vehicular velocity with and without alcohol is described. Auditory and visual cues to travelled velocity were presented alone and in combination. The time that these cues were operative was varied from 1/4 to 1 second. The velocity factor was highly significant. Velocity estimates were compressed by velocity sequence. Judgments following low speeds tended to overestimation, and those following high speeds tended to underestimation. Auditory stimulation yielded the most accurate velocity judgments, and visual stimulation the least accurate. Reduced observation time accentuates the overestimation of low velocities and the underestimation of high velocities. This effect of time on velocity is potentiated by alcohol. Both reduced observation time and alcohol lessen the correlation between the judgment and its physical counterpart or both alcohol and reduced observation time increase the guessing that takes place. Under the influence of alcohol, when bisensory information is presented, a definite trend appears to evaluate only the auditory input. This selection of the auditory input for evaluation is interpreted as a primitivization of the sensory attention mechanism rather than the employment of a strategy. Author

**N72-31097#** Institut Franco-Allemand de Recherches, St. Louis (France).

**AUDITORY LOSS AND RECUPERATION OF GUINEA PIGS AFTER EXPOSURE TO A SONIC BOOM. SONIC BOOM PRODUCED BY THE ISL GENERATOR. [PERTE AUDITIVE ET RECUPERATION CHEZ LE COBAYE APRES EXPOSITION A UN BANG SONIQUE. BANG PRODUIT PAR LE GENERATEUR DE L'ISL]**

R. Franke, C. Lursat, and G. Evrard 26 Oct. 1971 25 p In FRENCH

(Contract DRME-71.34.445)

(ISL-35/71) Avail: NTIS HC \$3.25

The auditory loss threshold provoked by the TSS Concorde sonic boom N-type shock wave is evaluated from guinea pig auditory reflexes. An audiometric method based on the Preyer reflex threshold measurement was used. The experimental results show that a slight and temporary effect is noticeable for a 40 m/bar pressure wave (40 times more intense than the sonic boom). ESRO

**N72-31098#** Institut Franco-Allemand de Recherches, St. Louis (France).

**AUDITORY LOSS AND RECUPERATION OF GUINEA PIGS AFTER EXPOSURE TO SHOCK WAVES WITH RECTANGULAR PROFILE [PERTE AUDITIVE ET RECUPERATION**

**CHEZ LE COBAYE APRES EXPOSITION A DES ONDES DE CHOC A PROFIL RECTANGULAIRE]**

R. Franke, C. Lursat, G. Evrard, and F. Devriere [1972] 25 p refs In FRENCH

(Contract DRME-70.197)

(ISL-3/72) Avail: NTIS HC \$3.25

Guinea pigs were subjected to rectangular shock waves of constant duration (12 m sec) generated by a shock tube to study the active role of different parameters which characterize the shock wave (gun noise, etc.). The time evolution of guinea pig auditory loss was followed using an audiometric method based on the Preyer reflex threshold measurement. It is shown that for an over pressure of 50 m bar, slight and temporary auditory loss was noticeable. However, for a double over pressure, the loss was of 16 db for the 16 kHz frequency and the recuperation after four weeks was only partial. ESRO

**N72-31099#** Newark Coll. of Engineering, N.J. Dept. of Mechanical Engineering.

**APPARENT VISCOSITIES OF WHOLE BLOOD SYSTEMS AT MODERATE PRESSURE** Final Report

A. L. Copley, R. M. Jacobs, and J. L. Martin Apr. 1972 18 p

(Contract N00014-71-A-0124)

(AD-740853) Avail: NTIS CSCL 06/16

Experiments are summarized which present evidence that the apparent viscosity of blood is unlikely to vary significantly with hydrostatic pressures to pressures of 775 psi (fifty atmospheres). GRA

**N72-31100#** Navy Medical Neuropsychiatric Research Unit, San Diego, Calif.

**RECENT TECHNICAL REPORTS AND PUBLICATIONS**

1 May 1972 14 p refs

(AD-741951) Avail: NTIS CSCL 06/5

A bibliography of reports in psychiatry, psychology and related subjects is presented. GFA

**N72-31101#** Naval Aerospace Medical Research Lab., Pensacola, Fla.

**FOREHEAD SWEATING DURING MOTION SICKNESS**

Joseph A. McClure and Alfred R. Fregly 7 Feb. 1972 12 p refs

(AD-743075; NAMRL-1157) Avail: NTIS CSCL 06/19

Forehead sweating was monitored on fifteen subjects during the elicitation of motion sickness by vestibular stimulation. An Electrochemical sweat sensor and a skin-resistance technique were used simultaneously to detect the sweat responses. None of the subjects showed any arousal type sweat responses, at the time of onset of the vestibular stimulation. Two of the subjects showed no evidence of any forehead sweating despite an advanced degree of nausea. For the remaining thirteen subjects, a forehead sweat response was obtained after a latent period that ranged anywhere from 5 seconds to 4 minutes. Once initiated, the response tended to increase in magnitude as long as the stimulus was continued. This pattern of response is characteristic of most motion-sickness symptomatology. For certain subjects the forehead sweat response was compared with their dorsal-hand response obtained from a previous run carried out under the same standard conditions. These comparisons suggest that the forehead is a less active sweat area than the dorsal hand during motion sickness. Author (GRA)

**N72-31102#** Naval Aerospace Medical Research Lab., Pensacola, Fla.

**EFFECT OF ENVIRONMENTAL TEMPERATURE ON SWEAT ONSET DURING MOTION SICKNESS**

Joseph A. McClure and Alfred R. Fregly 6 Feb. 1971 20 p refs

(AD-740801; NAMRL-1153) Avail: NTIS CSCL 06/19

Since the sweat response is observed as part of some motion-sickness-rating procedures, it is useful to know if other variables such as environmental temperature can affect the response during vestibular stimulation on several occasions. On each occasion the run was carried out with a different environmental temperature. At a relatively high temperature the thermal stress caused a sweat response, and no vestibular stimulation was required. With lower environmental temperatures, a longer period of vestibular stimulation was required to evoke the sweat response. At a relatively low temperature no sweating was observed despite continuous vestibular stimulation and the development of severe nausea. The results indicate that environmental temperature can affect the sweat response during motion sickness and suggest the possible hazard of excessive fluid and electrolyte loss when both vestibular and thermal stress are present. By proper selection of environmental temperature, sweating can be induced before the onset of nausea. In this situation the sweat response could serve as a useful predictor of motion-sickness onset in the administration of adaption schedules and in monitoring persons in the space-flight environment.

Author (GRA)

**N72-31103#** Naval Aerospace Medical Research Lab., Pensacola, Fla.

**REVISED NORMATIVE STANDARDS OF PERFORMANCE OF MEN ON A QUANTITATIVE ATAXIA TEST BATTERY**

Alfred R. Fregly, Margaret J. Smith, and Ashton Graybiel  
15 Mar. 1972 19 p refs

(AD-743074; NAMRL-1160) Avail: NTIS CSCL 06/16

Revised normative standards of performance of men, ages 16-60 years, on a quantitative ataxia test battery in terms of new chronological age groupings based on a sample of 1055 normal men are presented. Five age groups--16-30, 31-40, 41-45, 46-50, and 51-60 years--were found to be required to reduce the correlation with age to a nonsignificant level. All subtests of the battery, except Walk On Floor Eyes Closed (WOFEC), were very nearly similar in sensitivity to aging influences, implying a reliably unitary sensitivity of the battery to aging influences on the complex postural equilibrium functions sampled by it. Present findings tentatively suggest that the negative aging influences become apparent several years earlier than reported previously (within the age range of 31-40 years rather than 43-50 years). The progressive nature of this aging influence along the life span sampled is similar to that previously reported on women. The new normative standards should allow more precise laboratory and clinical applications of the test battery which has proved to be useful particularly in the vestibular physiological and neuro-otological assessment of postural equilibrium-disequilibrium, including spontaneous and induced vestibular ataxia. The test battery has other clinical and/or research applications.

Author (GRA)

**N72-31104#** Navy Medical Neuropsychiatric Research Unit, San Diego, Calif.

**MOTIVATION, COGNITION, AND SLEEP WORK FACTORS; CENTRAL AND AUTONOMIC NERVOUS SYSTEM INDICES**

Laverne C. Johnson, H. L. Williams, and J. A. Stern 1972 15 p refs Repr. from "Human Factors in Long Duration Space Flight" Washington, Natl. Acad. of Sci., 1972 p 108-130

(AD-741939; NMRU-72-13) Avail: NTIS CSCL 06/16

Possible problems for human performance in relation to three factors, motivation, cognition, and sleep, are discussed. Of particular concern in the discussion are possible alterations in cycles of sleeping and waking, and in physiological patterns of sleep and the potential effects of such changes on vigilance, memory, problem solving, and motivation. An attempt is also made to anticipate the effects of prolonged spaceflights on the central and autonomic nervous systems.

Author

**N72-31105#** School of Aerospace Medicine, Brooks AFB, Tex.  
**DEVELOPMENT OF REALISTIC A WEIGHTED AUDITORY**

**RISK CRITERIA FOR AEROSPACE OPERATIONS Progress Report, Nov. 1970 - Aug. 1971**

Donald C. Gasaway and Harrell C. Sutherland, Jr. Dec. 1971 22 p refs

(AF Proj. 7755)

(AD-743298; SAM-TR-71-47) Avail: NTIS CSCL 06/19

The authors have previously proposed adoption of the CHABA Working Group 46 criterion for steady-state noises to assess degrees of auditory risk associated with aerospace operations. In this report, the salient features of various damage risk criteria are reviewed and primary and secondary compromises are discussed. A simple criterion using A-weighted sound levels is proposed for broad-band and narrow-band steady-state and intermittent noise and for impact noises. The criteria contained in this report provide guidance needed to identify potentially hazardous exposures encountered in aerospace operations.

Author (GRA)

**N72-31106#** Naval Medical Research Inst., Bethesda, Md.

**DIFFERENTIAL BEHAVIORAL EFFECTS OF BREATHING AIR AND HELIUM-OXYGEN AT THREE TO TEN ATMOSPHERES Medical Research Progress Report**

John R. Thomas and Arthur J. Bachrach 30 Dec. 1971 22 p refs

(MF12524004)

(AD-741691; NAVMED-MF12.524.004-7007D-2) Avail: NTIS CSCL 06/19

A multiple schedule of reinforcement, consisting of a fixed-ratio (FR) schedule and a fixed-interval (FI) schedule, was used as an ongoing behavioral baseline to measure differential gas and depth effects on pigeons. Measurements were taken at depths of 66, 99, 200, and 300 feet. An 80% helium-20% oxygen mixture was found to have less disruptive effects than air on pigeons responding on the two different schedules particularly at 200- and 300-foot depths. Repeated exposure to pressure, independent of gas mixture or depth, resulted in a gradual behavioral adaptation measured by a reduction in the disruption of behavior.

Author (GRA)

**N72-31107#** Naval Training Device Center, Orlando, Fla.

**VISION TESTS USING LASER SPECKLE**

Windell N. Mohon and Alfred M. Rodemann 11 Apr. 1972 16 p refs

(AD-742792; NAVTRADEVCCEN-TN-34) Avail: NTIS CSCL 06/5

A method is described for testing myopic, hyperopic, emmetropic, and astigmatic vision using the speckle patterns of a laser. The tests significantly reduce the subjective judgments required of a patient. The subject does not need to know how to read; hence, young children and possibly laboratory animals could be tested. Results of laboratory tests are discussed. A physical system to implement the testing method is described. This testing method is extended to include measurements of required corrective power and the accommodative response at wavelengths throughout the visible spectrum.

Author (GRA)

**N72-31108#** Navy Medical Neuropsychiatric Research Unit, San Diego, Calif.

**A GENERALIZATION OF HARMONIC ANALYSIS FOR DETECTION OF LONG-PERIOD BIORHYTHMICITIES FROM SHORT RECORDS**

Cyril Nute and Paul Naitoh 1971 24 p refs

(MF12524004)

(AD-741211; NMNRU-71-55) Avail: NTIS CSCL 06/16

Successive ordinates of the line spectrum as computed by means of the discrete Fourier transform indicate how the variance of a given time series is apportioned among the members of a set of orthogonal, i.e. harmonic, frequencies. The continuous Fourier transform provides a means of interpolation between these frequencies. However, when the original data include a long-period sinusoid whose frequency is below the fundamental, then neither the discrete nor the continuous Fourier

transform gives a good indication of the presence of long-period wave function. The detection and estimation of such a function can be accomplished by a generalization of harmonic analysis along the framework of regression analysis. The procedure computes a squared multiple correlation coefficient corresponding to any frequency, by regressing sine and cosine weights on the observed data. The method and its applications are illustrated by simple numerical examples. Author (GRA)

**N72-31109#** Environmental Protection Agency, Rockville, Md. Twinbrook Research Lab.

**MICROWAVE ENERGY ABSORPTION IN TISSUE**

Richard A. Tell Feb. 1972 62 p refs  
(PB-208233) Avail: NTIS HC \$3.00 CSCL 06R

A guide to several dosimetric techniques used to study energy absorption in biological tissues is presented. A detailed account is given of the calculational concepts, gathered from the literature, which are used to determine the degree of power absorption within such tissue systems as well as the spatial distribution of this absorbed dose as heat and consequently, the tissue temperature elevations which may be experienced in the model. Both a graphic-analytic technique using the Smith chart and a mathematical derivation of the appropriate computing formulas are given. Adequate derivation of the appropriate computing formulas are given. Author (GRA)

**N72-31110#** Texas Technological Univ., Lubbock.  
**VALIDATION OF A QUICK, SUBMAXIMAL TEST OF MAXIMAL OXYGEN INTAKE** Research Quarterly Report

Alfred Eugene Coleman Apr. 1972 18 p refs  
(Contract DAAD05-69-C-0102)

(AD-743103) Avail: NTIS CSCL 06/16

The purpose of this study was to validate a submaximal treadmill test for prediction of maximal oxygen consumption in fifteen male college students. This objective was accomplished by comparing maximal oxygen intake values recorded during a maximal treadmill test with those predicted from the submaximal test. Comparisons were also made among the between the true and predicted values and those estimated from the Astrand-Rhyming nomogram. Application of the analysis of variance techniques indicated that no significant difference existed between the criterion and the two predictors. The average error of prediction; however, was 8 percent for the submaximal test and 15 percent for the nomogram. The results of the study indicated that the submaximal test yielded a valid estimate of maximal oxygen intake and is more accurate than several of the commonly used submaximal tests. Author (GRA)

**N72-31111#** Army Behavior and Systems Research Lab., Arlington, Va.

**A COMPARISON OF TWO METHODS OF GISTING**

Joyce L. House Nov. 1971 29 p refs  
(AD-743185; BESRL-TRN-236) Avail: NTIS CSCL 05/10

An important segment of army research is concerned with human factors studies in communication analysis processing. The report is on two experimental methods of gisting - reporting in brief form the essential information in a communication - in comparison with baseline performance in simulated on-line gisting. Twenty-four communications processors were each tested using two methods of gisting. In one method (free repeat), the processor listened once to the complete message with no option to stop or replay, preparing as complete a gist as possible, and was then free to replay the tape as he judged necessary to complete the gist. In the second method (forced repeat), the processor listened to the complete message five additional times with no option to stop or replay. The resulting gists were evaluated in terms of key items of information correctly reported, quality of gist as rated by four judges, and in the case of the free repeat method the number of times the tape was stopped and replayed in the gisting process. Author (GRA)

**N72-31112#** Army Edgewood Arsenal, Md.  
**THE MEASUREMENT OF ENZYME KINETIC PARAMETERS OF POORLY SOLUBLE SUBSTRATES** Technical Report, Nov. 1969 - Oct. 1971

George M. Steinburg, Norman C. Thomas, and Larrel W. Harris Apr. 1972 39 p refs

(AD-743176; EA-TR-4632) Avail: NTIS CSCL 06/1

A method is presented for determining enzyme kinetic constants using the full progress curve of conversion of substrate to products. Use is made of the integrated form of the Michaelis-Menten equation with correction for product inhibition. Satisfactory results were obtained with phenyl acetate (using the enzyme acetylcholinesterase). Two computer programs are appended. One is for the calculation of enzyme kinetic constants using the integrated form of the rate equation. The second program is for calculation of the kinetic constants from initial rate data using the Wilkinson weighted regression method. A convenient procedure is suggested for the preparation of selected alcohols and thiols of limited stability, as, for example, phenol and thiocholine. Author (GRA)

**N72-31113#** Human Engineering Labs., Aberdeen Proving Ground, Md.

**DARK-ADAPTATION RECOVERY AFTER PULSED LIGHT**

David J. Florip and Robert W. Bauer Apr. 1972 12 p refs  
(AD-743164; HEL-TN-3-72) Avail: NTIS CSCL 06/16

Recovery of complete dark adaptation was observed after exposure to single pulses of light. Illuminances were measured at the subject's face, and durations ranged from 0.01 to 1.0 second. Subjects recorded their own recovery by adjusting an adaptometer to the lowest luminance detectable. Recovery times were sensitive to both duration and illuminance but varied most predictably with total light flux as measured in lumen-seconds. Author (GRA)

**N72-31114#** Texas Christian Univ., Fort Worth. Inst. for the Study of Cognitive Systems.

**PARAMETERS OF HUMAN PATTERN PERCEPTION**

Semiannual Progress Report, 18 Sep. 1971 - 18 Mar. 1972  
Selby H. Evans 18 Apr. 1972 27 p

(Contract DAAD05-68-C-0176; DA Proj. 1T0-61102-B-81A)  
(AD-741396; SAPR-9) Avail: NTIS CSCL 05/10

Theoretical and methodological development were concentrated on the development of a model for human pattern perception and include: (1) the development of prototype and generation of sets of deviant examples of line drawings (insects) to be used with the model; (2) the operation of the model in a supervised learning mode to validate its pattern analytic routines and to obtain distributional statistics on the sets of examples; and (3) planning for the unsupervised learning mode in which the model will learn to recognize a new pattern on the basis of examples in which the classes are not identified for the model by the experimenter. Author (GRA)

**N72-31115#** Army Foreign Science and Technology Center, Charlottesville, Va.

**STUDY OF THE DYNAMIC ACUITY OF VISION**

M. G. Kozrkova 26 Jan. 1972 9 p refs Transl. into ENGLISH from Probl. Fiziol. Opt. (USSR), v. 15, 1969 p 138-141,  
(AD-741528; FSTC-HT-23-313-72) Avail: NTIS CSCL 06/16

Dynamic visual acuity is a complex form of interaction of the visual analyzer relative to the perception of moving objects. It is determined by the static visual acuity and the condition of the oculomotor apparatus. It depends on the rate of motion and tracking time of an object. Individual differences in dynamic visual acuity with the same static acuity indicate the desirability of using this test for selection of persons whose activity requires the perception of moving objects. Author (GRA)

**N72-31116\*#** National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.  
**ULTRASONIC BIOMEDICAL MEASURING AND RECORDING APPARATUS** Patent Application  
 Robert D. Lee, inventor (to NASA). Filed 18 Aug. 1972 23 p (NASA-Case-ARC-10597-1; US-Patent-Appl-SN-281876) Avail: NTIS HC \$3.25 CSCL 06B

An improved ultrasonic biomedical measuring and recording apparatus particularly useful for measuring and recording movements of organs such as heart walls or valves is described. The system includes an ultrasonic transducer for transmitting a probing beam of ultrasonic wave energy into the organ to be observed. Echoes from the organ are picked up by a transducer, amplified in a receiver and detected in an ultrasonic measuring circuit to derive an output proportional to the distance from the transducer to the organ under observation. This distance signal varies with movement of the organ and is recorded on a chart recorder as a function of time. The measuring and recording circuit includes an electronically-controlled gate (window), the time delay of the gate relative to the transmitter pulse being selected for observing desired echo signals. An automatic gate control circuit integrates the squared and gated echo signal over succeeding halves of the gate interval and subtracts one integral from the other to derive an error signal for centering the gate interval on the desired echo. NASA

**N72-31117\*#** National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.  
**SHOULDER HARNESS AND LAP BELT RESTRAINT SYSTEM** Patent Application  
 Albert P. Garavaglia and Dennis S. Matsuhiro, inventors (to NASA). Filed 22 Aug. 1972 9 p (NASA-Case-ARC-10519-1; US-Patent-Appl-SN-282738) Avail: NTIS HC \$3.00 CSCL 06K

A description is given of a combination shoulder harness and lap belt restraint system. The lap belt is combined with the shoulder harness in such a manner that a single fastening mechanism suffices to fasten both the harness and belt around the body of the wearer. The restraint system is suitable for use in automobiles, aircraft, or other vehicles. NASA

**N72-31118\*#** Clemson Univ., S.C. Dept. of Mechanical Engineering.  
**FEASIBILITY DEMONSTRATION OF A HYPERFILTRATION TECHNIQUE TO RECLAIM SHOWER WASTEWATER AT ELEVATED TEMPERATURES**  
 J. C. Hester and C. A. Brandon, Sep. 1972 24 p refs (Contract NAS1-11297) (NASA-CR-112127) Avail: NTIS; Office of Technical Services, Dept. of Commerce, Washington, D. C. 20230 \$0.75 CSCL 06I

A feasibility demonstration of a hyperfiltration technique to determine its capability to reclaim shower wastewater at elevated temperature was conducted. Approximately twenty (20) gallons of typical shower water were processed through a dynamically formed membrane at a temperature of 167 F. Chemical and bacterial analyses of the product water are presented which show compliance with all potable water requirements established for extended manned space missions. In addition, subsystem characteristics and capabilities are discussed. Author

**N72-31119#** Public Health Service, Washington, D.C. Injury Control Research Lab.  
**THE PERCEPTION OF REAL MOTION: A LITERATURE REVIEW**  
 Santo Salvatore 1972 62 p refs (ICRL-RR-70-7; DHEW(HSM)-72-10002) Avail: SOD \$0.35

A survey of literature, both governmental and psychological publications, on real motion perception is presented. Data cover two aspects: (1) angular orientation of the moving object in relation to the observer's line of sight, and (2) eye movement

activity the observer uses to evaluate the object motion. Also covered are presence or absence of reference points in the visual field, direct inferential dichotomy, and sensitivity of various portions of the visual field. E.H.W.

**N72-31120#** Toronto Univ. (Ontario). Inst. for Aerospace Studies.  
**THE EFFECT OF PREVIEW ON PILOT DESCRIBING FUNCTIONS IN A SIMPLE TRACKING TASK**  
 N. H. Drewell May 1972 40 p refs (UTIAS-TN-176) Avail: NTIS HC \$4.00

A preliminary analysis is presented of the pilot describing functions of six volunteer subjects found by using the new preview display at UTIAS. The tasks were pure pursuit tracking with rate control dynamics; the pilot being given a preview of the input signal. The amount of preview was varied between zero and 0.8 seconds and where possible, an 8-parameter theoretical pilot model was fitted to the describing function data in order to enhance the quantitative description of these functions. Author

**N72-31121\*#** National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.  
**EXPERIMENTAL INVESTIGATION OF THE VISUAL FIELD DEPENDENCY IN THE ERECT AND SUPINE POSITIONS**  
 Jacob H. Lichtenstein and Rayford T. Saucer Washington Sep. 1972 75 p refs (NASA-TN-D-6883; L-8315) Avail: NTIS HC \$3.00 CSCL 05E

The increasing utilization of simulators in many fields, in addition to aeronautics and space, requires the efficient use of these devices. It seemed that personnel highly influenced by the visual scene would make desirable subjects, particularly for those simulators without sufficient motion cues. In order to evaluate this concept, some measure of the degree of influence of the visual field on the subject is necessary. As part of this undertaking, 37 male and female subjects, including eight test pilots, were tested for their visual field dependency or independency. A version of Witkin's rod and frame apparatus was used for the tests. The results showed that nearly all the test subjects exhibited some degree of field dependency, the degree varying from very high field dependency to nearly zero field dependency in a normal distribution. The results for the test pilots were scattered throughout a range similar to the results for the bulk of male subjects. The few female subjects exhibited a higher field dependency than the male subjects. The male subjects exhibited a greater field dependency in the supine position than in the erect position, whereas the field dependency of the female subjects changed only slightly. Author

**N72-31122#** Forschungsinstitut fuer Anthropotechnik, Meckenheim (West Germany).  
**A NONLINEAR MULTIPARAMETRIC HUMAN CONTROL-LER MODEL**  
 Gunnar Johannsen Jul. 1971. 188 p refs In GERMAN (FB-5) Avail: NTIS HC \$11.50

A process is proposed which presents a systematic approach to the contradictions between the mathematical model representing man as part of a control system and the physiological aspects included in the model by developing and optimizing several models. Performance of this process is proved by developing a multiparameter nonlinear model and comparing this model with the well-known quasi-linear transfer function. Parametric optimization of the model depends on a random process and minimization of the difference between the input values given by the operator and the ones given by the model. Optimization in open and closed control systems is discussed. A nonlinear model is designed which represents the operator and takes into account not only visual but also proprioceptive information. A threshold device and a decision making algorithm is included in the program. Four different display configurations are discussed. A hybrid computer was used. ESRO



**N72-31123#** Forschungsinstitut fuer Anthropotechnik, Meckenheim (West Germany).

**SIMULATORS FOR MAN-VEHICLE SYSTEMS [SIMULATOREN FUER MENSCH-FAHRZEUG-SYSTEME]**

K.-P. Gaertner and J. Wernicke Oct. 1971 96 p refs In GERMAN; ENGLISH summary (FB-7) Avail: NTIS HC \$7.00

The applications and technical development of simulators of man-vehicle systems are surveyed. The basic technical principles of the simulation of man-vehicle systems are outlined and discussed. Training, development, and research simulators are distinguished. The mode of operation and the realism of simulators are considered. Concepts of visual simulation are mentioned. Author (ESRO)

**N72-31124#** Istituto di Fisica Dell Atmosfera, Rome (Italy). **RANGE OF VISIBILITY OF AN OBJECT IN THE ATMOSPHERE [PORTATA VISUALE DI UN OGGETTO ATTRAVERSO L'ATMOSFERA]**

M. Gazzi and V. Vicentini Apr. 1972 38 p refs In ITALIAN (IFA-SR-36) Avail: NTIS HC \$4.00

The visual field of an object in the earth atmosphere is presented, based on the elementary theory of optics and the attenuation of light transmission in the air, and the contrast threshold of the human eye. Finally the visual field is computed using the Koschmieden and Allard equations. ESRO

**N72-31125#** Istituto di Fisica Dell Atmosfera, Rome (Italy). **BIBLIOGRAPHY ON VISIBILITY (1958 - 1970) [BIBLIOGRAFIA "VISIBILITA" (1958 - 1970)]**

M. Gazzi, G. Simonini, and V. Vicentini Jan. 1972 59 p refs In ITALIAN Prepared jointly with Aeron. Mil. Ital. (IFA-STR-17) Avail: NTIS HC \$5.00

A bibliography from 1958 up to 1970 is presented on visibility problems relating to air navigation, runway visual fields, and visual field of objects in the atmosphere. Problems such as psychophysical effects of luminous intensity and color on the human eye and effect of low visibility conditions on the pilot's landing maneuver are also included. ESRO

**N72-31126#** Electronic Systems Div., Bedford, Mass. **MINUTEMAN PERSONNEL SELECTION STUDY**

William H. Hendrix Mar. 1972 21 p refs (AD-740841; ESD-TR-72-140) Avail: NTIS CSCL 05/9

The report deals with the selection of personnel for assignment as Minuteman Missile Combat Crew Members. The data evaluated consists of biographical data, Officer Efficiency Reports, and Air Training Command Standard Scores obtained on individuals during individual missile training. Two predictors of performance were isolated using a multiple regression technique, which incorporated the use of dummy variables. The importance of this study, however, is not limited only to those variable found to be significant. In fact, an example cited in the study indicates that certain variables which are not predictive of success could have an equally important managerial implication. It is recommended that future research be undertaken to evaluate ORT scores, AFQOT scores, and other pre-service variables such as Grade Point Average as possible predictors. Author (GRA)

**N72-31127#** Emory Univ., Atlanta, Ga. Regional Rehabilitation Research and Training Center.

**RESEARCH ON ACQUISITION OF SKILLS WITH SINGLE MOTOR UNIT TRAINING AND EEG Annual Report**

John V. Basmajian and William D. McLeod 31 Mar. 1972 10 p

(Contract DADA17-70-C-0105) (AD-740824; AR-2) Avail: NTIS CSCL 05/10

An experiment based on several pilot studies was defined to investigate the sensory input, motor output correlation within a single motor unit control task using EEG as the indicator of both sensory and motor response. Author (GRA)

**N72-31128#** School of Aerospace Medicine, Brooks AFB, Tex. **PULSE COUNT AUDIOMETRIC EQUIPMENT: NEW ELECTROMECHANICAL AND DIGITAL ELECTRONIC APPROACHES Final Report, Nov: 1967 - Jan. 1971**

Francis A. Brogan Apr. 1972 15 p refs (AD-742973; SAM-TR-72-9) Avail: NTIS CSCL 06/12

Two types of devices which may be used in producing pulse trains for pulse count audiometry are described. The electromechanical model, while simple to understand, has disadvantages such as adjustment problems and it produces acoustic and electrical noise. The digital electronic model eliminates these problems and costs less to construct. The digital approach using integrated circuits offers unusual flexibility for interfacing audiometers with computing equipment. Author (GRA)

**N72-31129#** Naval Submarine Medical Center, Groton, Conn. **SUBMARINE CREW EFFECTIVENESS DURING SUBMERGED MISSIONS OF SIXTY OR MORE DAYS DURATION Interim Report**

Benjamin B. Weybrew 28 Oct. 1971 29 p refs (AD-740796; NSMRL-686) Avail: NTIS CSCL 05/10

The primary objective of the study was to integrate that segment of the literature of submarine psychology which focusses upon the major factors affecting submarine crew-member effectiveness during prolonged submergence. First, the most significant submarine stressors were delineated together with the specific adaptive processes correlated with them. These were found to be: confinement, revitalized air, flattening of circadian rhythms, threat of hyperbaric exposure and sleep deprivation. Performance decrements, incidence of debilitating morbidity (including psychopathology), and decompensatory trends in crew morale appeared to be minimal during long cruises. In general, the impressions from this integrative review of this rather specialized literature is that the habitability situation in the submarine service continues to be optimal, in part because of the effective psychiatric screening procedures in force, but also as a result of the quality of leadership demonstrated by the officers and petty officers making up the crews of the submarines in the fleet. Author (GRA)

**N72-31130#** Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

**AN ANNOTATED BIBLIOGRAPHY OF UNITED STATES AIR FORCE APPLIED PHYSICAL ANTHROPOLOGY Bibliography, Jan. 1946 - Mar. 1972**

Rena Kimbrough, comp. Mar. 1972 61 p refs. (AF Proj. 7284)

(AD-743029; AMRL-TR-71-15) Avail: NTIS CSCL 05/5

The report contains the titles, authors, publication/source information, and the abstracts of 122 technical reports and articles published by Anthropology Branch of the Aerospace Medical Research Laboratory between January 1946 and March 1972. It is a detailed document of the scope of the effort of the Air Force in the field of applied physical anthropology to provide the information on human body size and biomechanical characteristics of Air Force personnel required for the development and evaluation of Air Force systems, personal-protective equipment and clothing. Author (GRA)

**N72-31131#** Army, Aeromedical Research Lab., Fort Rucker, Ala.

**VIETNAM RETURNEE SURVEY**

Kurt E. Lidke, Mark A. Hofmann, and Andrew S. Martin Mar.

1972 24 p refs

(AD-742665; USAARL-72-12) Avail: NTIS CSCL 05/9

The paper presents some results of a questionnaire given to 300 Army aviators who served in the Republic of Vietnam. The questions analyzed were primarily those concerned with work patterns, physical conditions, medical care, groundings and accidents. GRA

N72-31132# Human Resources Research Organization, Alexandria, Va.

**TRANSFER OF INSTRUMENT TRAINING AND THE SYNTHETIC FLIGHT TRAINING SYSTEM**

Paul W. Caro Mar. 1972 12 p refs Presented at the Naval Training Device Center and Ind. 5th Conf., Orlando, Fla., Feb. 1972

(Contract DAHC19-70-C-0012)

(AD-743155; HUMRRO-PP-7-72) Avail: NTIS CSCL 05/9

One phase of an innovative flight training program, its development, and initial administration is described in this paper. The operational suitability test activities related to a determination of the transfer of instrument training value of the Army's Synthetic Flight Training System (SFTS) Device 2B24. Sixteen active Army members of an Officer Rotary Wing Aviator Course who had completed primary training and 9 Instructor Pilots participated in the study. Instrument training was conducted in the SFTS on a proficiency basis. Aircraft checkrides were administered by independent evaluator personnel. Checkride times and grades showed that much of the training now conducted in aircraft could be conducted more efficiently on the ground. Author (GRA)

N72-31133# Army Foreign Science and Technology Center, Charlottesville, Va.

**PARACHUTE OXYGEN APPARATUS**

7 Apr. 1972 6 p Transl. into ENGLISH from Krylya Rodiny, (Moscow), no. 4, 1969 p 28

(AD-743039; FSTC-HT-23-603-72) Avail: NTIS CSCL 06/11

The KP23 is designed to supply oxygen during jumps of no higher than 14,000 meters. It can also be used as a reserve until descent to a safe altitude (4,000 m) in the event the flight oxygen apparatus fails. The parachutist is automatically disconnected from the flight oxygen system and switched to the individual apparatus. The KP23 can be used with any type of parachute having special packs for the apparatus. Preflight checkout instructions are given. Author (GRA)

N72-31134# Naval Submarine Medical Center, Groton, Conn.  
**MOTION PARALLAX AND ABSOLUTE DISTANCE** Interim Report

Steven H. Ferris 22 Jul. 1971 15 p refs

(AD-742078; NSMRL-673) Avail: NTIS CSCL 05/10

The accuracy of absolute distance estimation based on monocular motion parallax was determined both before and after specific training. With the usual distance information eliminated, subjects either held their heads stationary or rhythmically rotated their heads from side to side while judging the distance of stimuli placed 4-15 ft. away. Before training, head movement produced more accurate judgments than head fixed. After only 10 training trials, accurate judgments based on motion parallax were obtained. Results with a textured background were better than results with a white background only when the subjects were not given any direct information about motion parallax. Good results were also obtained for motion parallax relative to a near reference object (2.5 ft. away). The results indicate that motion parallax can be useful for absolute distance estimation, and they suggest that motion parallax would be useful in the underwater environment, where the usual sources of distance information are absent or distorted. Author (GRA)

N72-31135# National Society of Professional Engineers, Washington, D.C.

**SKILLS CONVERSION PROJECT. CHAPTER 10: OCEAN ENGINEERING AND OCEANOGRAPHY Final Report**

Mar. 1972 83 p refs

(Contract DL-11-1-0534-000)

(PB-209281-10; DLMA-EST-11-1-0534-000-10) Avail: NTIS CSCL 051

A study of ocean-oriented industry in Florida and Southern California was conducted. The purpose was to determine the potential utilization of aerospace/defense technical professional manpower by those industries. Author (GRA)

N72-31136# Human Resources Research Organization, Alexandria, Va.

**PERFORMANCE MEASUREMENT IN HELICOPTER TRAINING AND OPERATIONS**

Wallace W. Prophet Apr. 1972 17 p refs Presented at the Am. Psychol. Assoc. 79th ann. meeting, Washington, D. C., Sep. 1971

(Contract DAHC19-70-C-0012)

(AD-743157; HUMRRO-PP-10-72) Avail: NTIS CSCL 05/9

For almost 15 years an active research program was conducted on techniques for measuring the flight performance of helicopter trainees and pilots. This program addressed both the elemental aspects of flying (i.e., maneuvers) and the mission- or goal-oriented aspects. A variety of approaches was investigated, with the stress on nonautomated techniques feasible for operational use. The paper describes the work and illustrates its application to and implications for training management, quality control, manpower resources management, and operational capability. Automated human performance monitoring in flight simulators and its implications for automated training is also described. Author (GRA)

N72-31137# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

**A METHOD FOR MONITORING SYSTOLIC AND DIASTOLIC BLOOD PRESSURES ON A BEAT BY BEAT BASIS** Final Report

Michael L. Rubinstein and Adolf F. Marko Mar. 1972 27 p

(AD-744003; AMRL-TR-70-47) Avail: NTIS CSCL 14/2

A system for measuring systolic and diastolic blood pressures on a beat by beat basis is described. The system input consists of only the amplified output of a pressure transducer. It operates over a range of 0-250 mm Hg, will satisfactorily trigger on pulse pressures from 5 mm Hg to 100 mm Hg, and is insensitive to wave shape or baseline changes. The theory of beat by beat measurement is discussed, several current methods are explained, and a new method is described in detail. A practical circuit is given along with the results of the operation of a prototype. Author (GRA)

N72-31138# Naval Coastal Systems Lab., Panama City, Fla.

**A STUDY OF SEVERAL APPROACHES FOR SUPPLYING A DIVER WITH WARM BREATHING GAS**

R. L. Bentz Apr. 1972 60 p refs

(AD-742080; NCSL-105-72) Avail: NTIS CSCL 06/11

Recent investigations have shown that a diver working in cold water below 500 feet for extended periods of time must be provided with a warm breathing gas. Several practical approaches for supplying the diver with a warm breathing gas were investigated. The approaches investigated were influenced by their applicability to the U. S. Navy scuba Mark-11. This system uses warm water to heat the diver, and, therefore, is the only heat source considered. A thermal analysis of the Mark-11 yields theoretical temperatures throughout the system for helium-oxygen gas mixture at 1000 feet and for air at surface pressure. The same analysis is made considering insulated system components. The other approaches investigated were a

heat exchanger, heated breathing hose, and a heated back pack. The advantages and disadvantages of each approach are discussed. Author (GRA)

**N72-31139#** Systems Technology, Inc., Inglewood, Calif.  
**THE VOCAL ADAPTIVE CONTROLLER-HUMAN PILOT DYNAMICS AND OPINION**

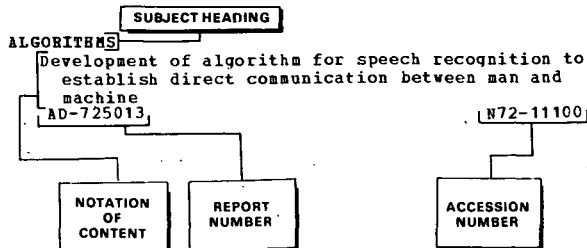
I. L. Ashkenas and D. T. McRuer 1972 8 p refs  
(Contract AF 33(616)-5661)  
(AD-742442) Avail: NTIS CSCL 05/10

The paper undertakes to examine the roots of pilot opinion from the standpoint of the dynamical system involved. By considering data which contain both pilot opinion and pilot performance in the dynamic output/input (transfer function) sense, it is shown that opinion is closely correlated with; the low frequency performance of the complete system including the pilot; and the quantitative manner in which the pilot must 'adapt' to the vehicle. The first of the above factors is related to the accuracy with which the pilot can control the vehicle; the second relates to the magnitudes of the gains, leads, and lags that the pilot generates. Author (GRA)

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1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that proper record-keeping is essential for transparency and accountability, particularly in financial matters. The text notes that without clear documentation, it becomes difficult to track expenses and revenues, which can lead to misunderstandings and disputes.

2. The second section focuses on the role of technology in modern record-keeping. It highlights how digital tools and software solutions have revolutionized the way data is stored and accessed. These technologies not only streamline the process but also reduce the risk of human error and data loss. The document suggests that organizations should invest in reliable digital systems to ensure their records are secure and easily retrievable.

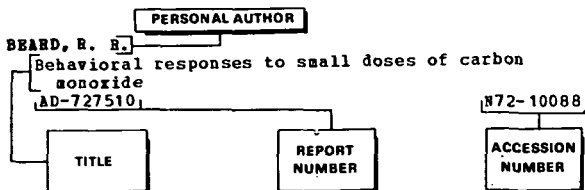
3. The third part of the document addresses the legal and regulatory requirements surrounding record-keeping. It outlines the various laws and standards that govern the retention and disposal of records. Compliance with these regulations is crucial to avoid legal penalties and ensure that all records are maintained for the required duration. The text provides a summary of key regulatory frameworks and offers guidance on how to stay up-to-date with changing requirements.

4. The final section discusses the importance of regular audits and reviews of records. It explains that periodic audits help identify any discrepancies or areas where records may be incomplete or inaccurate. This process is vital for maintaining the integrity of the data and ensuring that all records are consistent and reliable. The document recommends implementing a structured audit schedule and involving relevant stakeholders in the process.

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1. Report No. NASA SP-7011 (109)	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle AEROSPACE MEDICINE AND BIOLOGY A Continuing Bibliography (Supplement 109)		5. Report Date December 1972	6. Performing Organization Code
		8. Performing Organization Report No.	
7. Author(s)		10. Work Unit No.	
9. Performing Organization Name and Address National Aeronautics and Space Administration Washington, D.C. 20546		11. Contract or Grant No.	
		13. Type of Report and Period Covered	
12. Sponsoring Agency Name and Address		14. Sponsoring Agency Code	
		15. Supplementary Notes	
16. Abstract  This special bibliography lists 430 reports, articles, and other documents introduced into the NASA scientific and technical information system in November 1972.			
17. Key Words (Suggested by Author(s)) Aerospace Medicine Bibliographies Biblogical Effects		18. Distribution Statement  Unclassified - Unlimited	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 126	22. Price* \$3.00 HC

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