AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY

WITH INDEXES

(Supplement 100)

MARCH 1972
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AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 100)

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 February 1972 in

- *Scientific and technical Aerospace Reports (STAR)*
- *International Aerospace Abstracts (IAA)*
NASA SP-7011 and its supplements are available from the National Technical Information Service (NTIS). Questions on the availability of the predecessor publications, Aerospace Medicine and Biology (Volumes 1 - XI) should be directed to NTIS.

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INTRODUCTION

This Supplement to Aerospace Medicine and Biology (NASA SP-7011) lists 317 reports, articles, and other documents announced during February 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, irregular supplements have been issued.

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

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

Two indexes—subject and personal author—are included.

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1972 Supplements.
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IAA ENTRIES (A72-10000 Series)

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This publication is available on subscription from the National Technical Information Service (NTIS). The annual subscription rate for the monthly supplements, excluding the annual cumulative index, is $10.00. All questions relating to the subscriptions should be referred to the NTIS.
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TYPICAL CITATION AND ABSTRACT FROM STAR

NASA SPONSORED DOCUMENT .............................................. AVAILABLE ON MICROFICHE

NASA SPONSORSHIP ...................................................... NASA SPONSORSHIP

TITLE .............................................................................. N72-10072\#

AUTHOR ................................................................. E. J. Schneider, A. Graffi, H. Bielka, and L. Venker

CONTRACT OR GRANT .................................................. (Contract NASw-2035)

REPORT NUMBER ......................................................... NASA-TT-F-14034

TYPICAL CITATION AND ABSTRACT FROM IAA

NASA SPONSORSHIP ...................................................... NASA SPONSORSHIP


TITLED OF PERIODICAL .................................................. A72-10818
IAA ENTRIES


Examination of some of the most important aspects of the biological effects of heavy primary cosmic nuclei. The composition of primary cosmic rays and the types of interaction with the elements composing tissues is described. Attention is given to the biological effects of the 'enders,' and the nuclear reactions inducing radioactivity in an astronaut's body. Data from current experiments concerning the nuclear fragmentation of light elements are given, as well as some characteristics of the highly ionizing particles emitted during high-energy proton interactions.

F.R.L.


The arterial blood pressure and the rate of volume pulsations were measured experimentally as functions of time for a segment of the human arm. Using these curves and a type of identification program, common in control engineering, a mathematical model was calculated for the arterial tree included in the segment. This mathematical model led to the construction of an electrical analogue circuit for simulating the time-dependence of the rate of volume pulsations on the arterial pressure. In both cases the results show a close agreement between the simulated curves and the physiological curves determined experimentally. The inertia of blood and vessels is shown to be negligible, while nonlinear compliances must be included when dealing with wide pressure ranges.

A72-12952 * An experimental stress analysis of the neck of the femur. J. F. Williams (Melbourne, University, Melbourne, Australia) and N. L. Svensson (New South Wales, University, Sydney, Australia). Medical and Biological Engineering, vol. 9, Sept. 1971, p. 479-493. 17 refs.

The paper is concerned with the experimental analysis of the distribution of stress across the neck of the femur (thigh bone). The case considered was that of a man supported on one leg, a position which imposes maximum static load on the femur. The frozen stress method of three dimensional photoelasticity was adopted as the means of solution. A procedure was devised for correcting the results obtained from a homogeneous photoelastic model to apply to the case of bone which was considered to be composed of two main regions, a hard shell and a softer core. The bending and axial stress components so determined show a distribution which can be predicted by an engineering analysis but the shear stress distribution is not so satisfactory. Furthermore, additional weight has been added to the theory that bone growth occurs in response to applied stress.

(Author)


The resistive and capacitive properties of stainless-steel electrodes in contact with saline solutions of various concentrations were investigated over a frequency range extending from 20 to 10 kHz by using a variable-length conductivity cell. With a low current density, the series-equivalent resistance and capacitance of a single electrode-electrolyte interface were found to vary almost inversely as the square root of frequency. In the frequency range studied, it was found that the reactance was very nearly equal to the resistance and both varied almost inversely as the square root of the frequency, verifying Warburg's postulate. When current density was increased, resistance decreased and capacitance increased at all frequencies studied; the change in each was most apparent in the low frequency region. As a consequence, it can be stated that the impedance of an electrode-electrolyte interface decreases with increasing current density.

(Author)


The effect of gibberellic acid on exponential growth rate of four strains of Chlorella was investigated under variety of experimental conditions. In concentrations from 10 ppm to 100 ppm, gibberellic acid was shown to have no effect on Chlorella growth. In concentration of 200 ppm, gibberellic acid exerted some unfavorable effect on algal growth.

(Author)

The book, intended to be both theoretical and practical, attempts to describe what the human factors specialist actually does during system development, what he should be doing, and what the factors underlying and impacting on his discipline are. Following an exploration of the various ways in which human factors can be defined, the significance of the error concept to human factors theory and practice is pointed out. A step-by-step description is given of how the human factors specialist analyzes system requirements and identifies the interface equipment needed to implement man-machine interaction. The human factors research required to supply the data for the analyses is outlined. Attention is given to human factors in predesign and detail design, the role of the engineer, the procurement of human factors research, H group organization, and the status of H theory, practice, and research. F.R.L.


The immunological response in man and nonhuman primates is treated, together with topics involving experimental transplantation in primate animals, comparative biology, genetics and phylogenetics, the nervous system of man and nonhuman primates, perinatal biology and development, behavioral physiology, virology, infectious diseases, and reports from major primate laboratories and current programs.

M.M.


Comparison of the anatomical-physiological, optical and behavioral-visual characteristics of nonhuman and human primates. It is pointed out that all the characteristics found in the human eye are found in the primate animals from the macaques upward, even to the presence of Bowman’s membrane, which is found only in primates.

M.M.


Study of the thermoregulatory activity of neuroendocrine, cardiovascular, and neuromuscular systems, and investigation of behavioral thermoregulatory response to central cooling and warming. The results obtained underscore the thermosensitivity of the POA/H preoptic/anterior hypothalamic region and suggest that stimulation of central thermoreceptors by potentially harmful levels of warmth causes suppression of the thermogenic drive from cutaneous cold receptors. Such predominance of hypothalamic warm receptors may play a crucial role in emergency situations, such as heat exhaustion, by limiting muscular activity and reducing metabolic rate. Similarly, the importance of anesthetic depression of the central thermoregulatory apparatus prior to general hypothermia for surgery is obvious because extreme cold stress mobilizes thermogenic mechanisms maximally and leads rapidly to exhaustion.

M.M.


Study of the interaction between the two independent desynchronizers of normal endogenous rhythms in monkeys represented by time zone shift and p-chlorophenylalanine (PCPA). The primary objective of the study was to determine if 5-HT depletion (PCPA administration) could enhance physiological and behavioral adjustment to a 6-hr phase shift. The results presented are of a preliminary nature and form part of a larger study investigating the interaction of environmental parameters, work/rest cycles and sleep patterns.

M.M.


Description of experiments furnishing evidence for the existence of more than one thermoregulatory site which provides signals for the behavioral regulation of body temperature. One of these sites is located in the hypothalamus, and at least one other is located elsewhere in the body. The experiments also demonstrate that when the hypothalamic temperature is artificially manipulated, signals from the other site (or sites) may affect the behavioral response or not, depending upon the duration and level of the manipulation of the hypothalamic temperature.

M.M.


Description of a technique for measuring eye orientation in monkeys. Some of the results obtained during performance of brightness discrimination tasks are presented. The apparatus is a modification of Mackworth’s head-mounted eye-marker’s apparatus for humans (Mackworth and Thomas, 1962). The basic components of Mackworth’s system are mounted on a helmet, so that the subject’s head is free to move. These components are: (1) a camera objective lens (the scene lens), which forms an image of the visual field; (2) a light source, which produces a corneal reflection; and (3) a second lens (the eye lens), which is focused on the corneal reflection. A method of on-line computer recording and analysis of the location of the eye spot has been developed.

M.M.

A72-13142 Ballistocardiographic and angiographic correla-
tive study in idiopathic hypertrophic subaortic stenosis. D. H.
Jackson, E. E. Edelman, Jr., W. H. Bancroft, Jr., and R. H. Swatzell,
Jr. (U.S. Veterans Administration Hospital; Alabama University,
Birmingham, Ala.). In: Ballistocardiography and clinical studies;
Ballistocardiograph Research Society, Annual Meeting, 14th,
HE-11310; No. HE-05737.
Demonstration that relating BCG (ballistocardiogram) variables
to dynamic variables may be useful in considering abnormality of
ventricular function. It is suggested that it may be an important value
inherent in ballistocardiography. It is pointed out that, although
many of the (BCG) abnormalities noted in the study are difficult to
explain, the changes do appear to indicate a greater contractile force
in idiopathic subaortic hypertrophic stenosis and a more rapid
acceleration of early ventricular emptying. M.M.

A72-13143 The effect of bundle branch block on cardiac
dynamics as recorded with the high frequency /acceleration/ direct
body ballistocardiograph. N. J. Winer (Lenox Hill Hospital, New
York, N.Y.). In: Ballistocardiography and clinical studies; Ballis-
tocardiograph Research Society, Annual Meeting, 14th, Atlantic City,
Basel, S. Karger AG, 1971, p. 25-35. 5 refs. Research supported by the Florence G.
Heller Foundation.
Demonstration that bundle branch block in regular sinus rhythm
may have a definitive effect on the nature of the cardiac dynamic
response. It is pointed out that left bundle branch block has a
notable effect on BCG (ballistocardiogram) dynamics as character-
ized by: (1) prolongation of the systolic interval, primarily, due to
prolongation of the isometric period; and (2) diminution of early
systolic forces as correspondingly reflected in the BCG, CP2 and PCG
(phonocardiogram).
M.M.

A72-13144 Etiological factors associated with the diminu-
tion of ballistocardiographic amplitudes occurring with advancing
age. R. Proper and F. Wall (Loveland Foundation for Medical
Education and Research, Albuquerque, N. Mex.). In: Ballistocar-
diography and clinical studies; Ballistocardiograph Research
Society, Annual Meeting, 14th, Atlantic City, N.J., May 2, 1970,
Proceedings.
Basel, S. Karger AG, 1971, p. 40-43. 10 refs. NIH Grant No. 5-R01-HD-00518.
Ballistocardiograms were examined to determine the age-related
variances in electrical and ballistic amplitudes that could be
attributed to anthropometric increases in chest circumference,
abdominal circumference and percent body fat noted in older subjects.
The results indicate that the effect of increasing body fat and
abnormalities of the chest and abdomen are relatively
insignificant and the relationship between these anthropometric
parameters and age is essentially the same. It is concluded that
age-related diminutions in ballistocardiographic and electro-
cardiographic amplitudes appear to be related primarily to diminishing
heart size, and to some lateralization in the position of the heart.
M.M.

A72-13145 Measurements of cranial blood flow using
ballistocardiography. W. K. Harrison (Johns Hopkins University,
Baltimore, Md.). In: Ballistocardiography and clinical studies; Bal-
istocardiograph Research Society, Annual Meeting, 14th, Atlantic
A quantitative, noninvasive method (ballistoecephalography)
for measuring human cerebral circulation is described. A simple
formula is derived for calculating the net cranial blood inflow during
cardiac ejection. Calculations of net cranial inflow in 8 normal
subjects are presented and compared with estimates of this quantity
based on general physiological knowledge. Ballistoecephalography is
potentially valuable for diagnosis of cerebral circulatory deficit if its
precise physiological basis can be fully elucidated.
M.M.

A72-13146 A simplified technique for obtaining the high
frequency ballistocardiogram in the erect postion. E. W. Bixby, Jr.,
In: Ballistocardiography and clinical studies; Ballistocardiograph
Research Society, Annual Meeting, 14th, Atlantic City, N.J., May 2,
Brief description of preliminary results achieved in the search of
a simple method for obtaining an erect ballistocardiogram (BCG)
that could be incorporated into the erect chest X-ray film taken for
the public on routine health surveys in a fixed or mobile situation. It
is pointed out that experience using the Starr hf table in the
near-vertical position, with the addition of special techniques for
fixation, damping, counterbalancing and calibration, has given
remarkably good tracings in preliminary testing.
M.M.

A72-13161 Systems, Man and Cybernetics Group, Annual
Symposium, Anaheim, Calif., October 25-27, 1971, Record. Sympo-
sium sponsored by the Institute of Electrical and Electronics
Engineers. New York, Institute of Electrical and Electronics Engi-
Papers in civil, social, urban, and health-care systems are devoted to
interdisciplinary advances in these major system areas. Topics
include digital simulation, systems analysis, pattern classification,
decision-directed learning, information systems and displays, systems
applications of availability analysis, and the system scientist in the
changing job market. Computer algorithms and numerical models of
specific systems are outlined.
M.M.

A72-13162 Modeling man-machine control systems in
biodynamic environments. H. R. Jex (Systems Technology, Inc.,
Hawthorne, Calif.). In: Systems, Man and Cybernetics Group,
Annual Symposium, Anaheim, Calif., October 25-27, 1971, Record.
New York, Institute of Electrical and Electronics Engineers, Inc., 1971, p. 91-96. 21 refs.
Review of the current status of developments in modeling
man-machine control behavior in biodynamic environments. The models which are appropriate for manual control performance are
reviewed, together with the added elements necessary to deal with
biodynamic interfaces. Some simplified relationships relating the
parameters of the models to the man-machine control performance
are surveyed, together with some biodynamic interface pilot/vehicle
problems which have occurred, have been solved, or need to be
solved.
M.M.

A72-13163 * A dynamic model of the human postural
control system. J. C. Hilt (Oakland University, Rochester, Mich.). In:
Systems, Man and Cybernetics Group, Annual Symposium, Anaheim,
Calif., October 25-27, 1971, Record.
New York,

Description of a digital simulation of the pitch axis dynamics of a stick man. The difficulties encountered in linearizing the equations of motion are discussed: the conclusion reached is that a complete linear simulation is of such restricted validity that only a nonlinear simulation is of any practical use. Typical simulation results obtained from the full nonlinear model are illustrated.

A72-13176 Coronary heart disease; Proceedings of the International Symposium, Frankfurt am Main, West Germany, January 22-24, 1970. Edited by M. Kaltenbach (Universitäts-Kliniken, Frankfurt am Main, West Germany) and P. Lichtlen (Kantonsspital, Zurich, Switzerland). Stuttgart, Georg Thieme Verlag, 1971. 279 p. $11.30.

This volume contains the proceedings of a European symposium on selective coronary and left ventricular angiography. Problems of technique, anatomy, and nomenclature are discussed together with details regarding the impaired myocardial functions in coronary disease, questions arising from exercise electrocardiography, and different means of assessing coronary blood flow in man. Concerning medical treatment of coronary heart disease, special attention is given to the concept of Beta-blockade. In surgical therapy, the discussion is focused on revascularization by mammary artery implantation and especially by aorto-coronary venous bypass.

A72-13177 History and clinical findings related to selective coronary angiography. H.-J. Becker, M. Kaltenbach, G. Kober, J. Kolthoff, P. Spitz (Universitäts-Kliniken, Frankfurt am Main, West Germany), P. Lichtlen, P. C. Baumann, B. Preter (Kantonsspital, Zurich, Switzerland), and H. Albert (Spital Limmattal, Zurich, Switzerland). In: Coronary heart disease; Proceedings of the International Symposium, Frankfurt am Main, West Germany, January 22-24, 1970. Stuttgart, Georg Thieme Verlag, 1971, p. 56-60.

All patients were examined in the same way. They received either 10 mg Valium or no medication. The injection of contrast medium was repeated in different positions. A film of the coronary arteries was usually made in left and right anterior oblique position. Pathological findings were divided into four groups including minimal obstructions, partial obstructions, subtotal stenosis, and total obstruction. Risk factors, relations between angina pectoris and angiogram, and the correlation between myocardial infarction in the history and the angiogram are discussed.


In 51 patients with selective cinecoronary arteriography and ventriculography, the morphological patterns were compared with the exercise ECG. From 33 patients with abnormal exercise tests, 29 revealed severe stenosis or occlusion of one or more large branches of coronary arteries. Five patients had normal coronary arteries or only little changes. From 18 patients with normal exercise tests, 16 had no pathological patterns or insignificant stenosis. The two patients with normal exercise tests had a remote anterior myocardial infarct, and did show significant stenosis in the anterior interventricular branch of left coronary artery but no severe stenosis or occlusion in other branches of the coronary arteries.


The measurement of myocardial blood flow as an adjunct in the assessment of ischemic heart disease is discussed. The major techniques and their modifications for this type of measurement are listed. Since ischemic heart disease is often regional in its distribution, the inability of these techniques to detect regional ischemia is a severe disadvantage. It is possible that imaging devices may help provide a solution to this problem, but only work of a very preliminary nature has been done in this field to date. A method involving the injection of xenon-133 directly into the coronary arteries is discussed. The radioactivity is detected in this case with the aid of precordial scintillation during the washout of the radioactivity. Other approaches involve the use of dinitrogen oxide.


Coronary blood flow is measured by the clearance method using xenon-133. The indicator is injected in aorta ascendens or in the left atrium. The coronary sinus blood is continuously withdrawn from a catheter in coronary sinus through a glass spiral placed in a well-shaped scintillation detector. This method of coronary flow could be used for repeated measurements of coronary blood flow both at rest and during work. It seems suitable for coronary flow measurements in coronary healthy patients but it gives only a value of the dominating coronary flow. For this reason it has a limited value in patients with coronary disease.

A72-13181 Appraisal of the xenon clearance method for recording myocardial blood flow - Determinations under different hemodynamic conditions. P. Lichtlen (Kantonsspital, Zurich, Switzerland), H. Albert (Spital Limmattal, Zurich, Switzerland), and T. Moccetti (Universitats-Klinik, Zurich, Switzerland). In: Coronary heart disease; Proceedings of the International Symposium, Frankfurt am Main, West Germany, January 22-24, 1970. Stuttgart, Georg Thieme Verlag, 1971, p. 106-120. 14 refs.

The accuracy and reliability of the xenon clearance method in determining high and low left coronary artery (LCA) blood flow were assessed under different pharmaceutically induced hemodynamic conditions. LCA flow was increased by administration of either Angiotensin or Isoproterenol. A decrease of LCA flow was obtained via beta-blockade. In all cases the myocardial clearance of selectively injected xenon-133 was determined by the precordial disappearance of radioactivity.

A72-13182 Regional myocardial blood flow evaluated with xenon-133. G. Kober and M. Kaltenbach (Universitäts-Kliniken, Frankfurt am Main, West Germany). In: Coronary heart disease; Proceedings of the International Symposium, Frankfurt am Main, West Germany, January 22-24, 1970. Stuttgart, Georg Thieme Verlag, 1971, p. 120-129. 18 refs.

Discussion of blood flow measurements by the Xe-133 clearance method after direct application of the isotope into the subendocardial and subepicardial layers of the left ventricle. In seven normotensive dogs the blood supply to the inner layer of the
ventricular wall was found to be smaller by 8.7% than the blood supply to the outer parts. In eight chronic hypertensive animals this difference in favor of the outer layer was as high as 27%. The significance of these findings is discussed.

G.R.

A72-13183

Coronary blood flow, oxygen consumption, and coronary vascular resistance were determined at rest and after maximum coronary dilation by intravenous administration of dipyridamole in 14 patients with aortic stenosis (AS), nine patients with aortic insufficiency (AI), and nine patients with mitral valvular disease (MV). The coronary vascular resistance was calculated. The coronary blood flow was determined by means of the argon inert gas method.

G.R.

A72-12324

In the altitude region beyond 60,000 ft two basically different types of radiation exposure have to be examined including the normal radiation level due to galactic radiation and short-term increases of the normal level due to solar particle beams. It is emphasized, however, that flares which would create greatly elevated radiation levels as far down in the air ocean as 60,000 ft are rare events. Instantaneous radiation levels at different altitudes and latitudes are analyzed together with accumulated radiation exposures to crew members and passengers as well as the resulting radiation burden to the entire population.

G.R.

A72-13621

By recording antidromic field potentials and unit responses generated in the retina by stimulation of the optic tract and optic disk, evidence was obtained which suggests that velocity is related to the retinal origin of the axons. It is shown that it may be meaningful to distinguish four conduction velocity groups, two arising from peripheral retina, and two from the area centralis.

A72-13622

An anatomical basis is presented for the classification of conduction velocity groups of the cat's optic nerve as suggested by Stone and Freeman (1971) - i.e., a classification distinguishing four groups, two arising from peripheral retina, and two from the area centralis. It is demonstrated that axons arising from the area centralis are, on the average, markedly smaller than axons arising peripherally.

O.H.

A72-13623

Research supported by the Institut National de la Santé et de la Recherche Medecale; Direction des Recherches et Moyens d'Essai Grant No. 70-038; Contract No. F61053-70-C-0034.

The activity of 83 single lateral geniculate body neurons was recorded in encephale isolé cats during saccadic eye movements induced as an aftereffect of electrical stimulation of the lateral vestibular nucleus. Phasic changes in firing, time-locked with the eye movements, were found in 66 per cent of the neurons, by a method using the saccades to trigger a 'postsaccadic'-time histogram of the 'corresponding neuronal discharge. The onset of the postsaccadic change showed an average latency of about 100 msec from the onset of the movement. The change could be either an increase, or a decrease in firing in both light and dark, or a change evident in one condition only, or even a reversal of the pattern of the change by shifting from one condition to the other. The results are discussed in connection with theories on visuo-motor mechanisms that counteract illusory shifts of visual field during active eye movements.

O.H.

A72-13624

Psychophysical experiments on contrast vision were made using a modified Hermann grid which was graded in two directions. This pattern was composed of intersecting (IG) and intersected stripes (ID) representing 15 shades of a gray scale, and was viewed against five uniform backgrounds (BGD) ranging from white to black. Illusory light and dark patches at intersections were essentially limited to IGs that ranged in reflectance between BGD and ID. 'Brighter' responses were evoked by a white BGD and 'darker' responses by a black BGD; gray BGDs elicited both kinds of responses. The contrast effects were more pronounced for vertical and horizontal than for diagonal grid orientation. An optimum grid was devised that shows maximum brightness changes at almost every intersection. The observations are interpreted in terms of Baumgartner's receptive field hypothesis.

O.H.

A72-13676

During negative work (bicycling downhill on a motordriven treadmill), it was found in three young, male subjects that the oxygen consumption continued to increase over a 25-50 min exercise period. The increase from the 10-th to the last minute of exercise was more than 25%. After 3-5 weeks of training with negative work of higher numerical work intensity, a marked decrease in oxygen consumption was seen, and the continuous increase in oxygen consumption during the exercise period was reduced to a minimum, when the subjects worked at the same work intensity as before the training period. The direct employment of energy received by the muscles during negative work in the contraction process is discussed as a possible explanation for the reduced aerobic metabolism. Strengthening of the connective tissue during training and changes in muscle viscosity due to changes in muscle temperature are suggested as other possible factors involved in the decrease in oxygen consumption.

(Author)
A72-13677 # The effect of acute and chronic hypercapnia upon the lactate, pyruvate, alpha-ketoglutarate, glutamate and phosphocreatine contents of the rat brain. K. Messeter (University Hospital, Lund, Sweden) and B. K. Siesjö (Lund, University, Lund, Sweden). Acta Physiologica Scandinavica, vol. 83, Nov. 1971, p. 344-351. 18 refs. Research supported by the Swedish Medical Research Council, the Swedish Bank Tercentenary Fund, and the C.-B. Nathorst’s Vetenskapliga Stiftelse; NIH Grant No. 5-RO1-NS-07838-02.

Acute hypercapnia was associated with highly significant decreases in the lactate, pyruvate, alpha-ketoglutarate, glutamate and phosphocreatine contents. In sustained hypercapnia, the lactate, pyruvate and alpha-ketoglutarate contents were partially restored but phosphocreatine and glutamate remained decreased. The results suggest that the intracellular lactate/pyruvate ratio is affected both by changes in the intracellular pH and by changes in the cytoplasmatic NADH/NAD(+) ratio.

M.M.


The relationship between the subjective rating of perceived exertion (RPE) and different physiological variables during work were investigated in 19 healthy subjects under the following conditions: (1) after heart rate (HR) has been experimentally changed during work by the use of autonomic nervous system blocking agents; (2) during different types of physical work; and (3) before and after an 8 week period of physical training, respectively. In most work situations, HR mirrors the physical strain subjectively experienced. However, this correlation between HR and RPE was altered during the experiments with blocking agents. Therefore, a tachycardia as such is not the primary factor in the setting of HR during exercise - RPE was higher for a given level of oxygen uptake during arm work than during leg work, as well as during bicycling compared to running or swimming. A better correlation was found in these experiments between RPE and blood lactate concentration. After training, and in parallel to the decrease in HR at submaximal work loads, RPE was lower for a given level of oxygen uptake, but was the same when related to the ‘relative’ (per cent of maximum) oxygen uptake.

(Author)


Studies of the depth-ionization properties and the biological effects of heavy ion beams produced at the bevatron have extended work previously done with less energetic beams from other sources. Results indicate that heavy ion beams are suitable for tumor therapy, studies relating to space biology, and fundamental radiobiology.

(Author)


Demonstration of the dangers inherent in two commonly used flight instruments - namely, the altimeter and the artificial horizon. In tests of both experienced pilots and completely inexperienced subjects a large number of errors in reading these instruments were detected. The existence of alternative, more easily readable instruments is noted, and it is recommended that these modified instruments be used instead of the standard instruments.

A.B.K.


Heat is transferred through fabrics by convection, conduction, and radiation, and, under certain circumstances, by vaporization. Each mode is subject to different physical principles, but the effect of the total heat absorbed by underlying skin is the same. If the resultant skin temperature rise is sufficiently high and maintained sufficiently long, injury results. The extent of injury is predicted under certain controlled conditions, and these conditions may be used to disclose protection principles appropriate to each mode of transfer.

(Author)


The existence of a relation between the functional state and the brain performance of a human organism is discussed in the light of available studies. Experiments are reviewed and statistical data are quoted to demonstrate that evidence for such a relation frequently fails to come up. It is also contended that functional tests frequently fail to give the general picture of the functional state of an organism as a whole. Direct mental performance tests are suggested as a more reliable approach to the assessment of mental working capacity.

V.Z.


The causes of fainting are discussed. Constitutional susceptibilities, minor health irregularities, temporal weakness due to alcohol, heavy smoking, lack of sleep, and emotions are noted as the contributing factors. Checking of health background and medical and personnel histories for proneness to fainting is recommended for prevention of fainting cases among flying personnel.

V.Z.


Airmen with performance error histories were subjected to psychological tests to group them according to the fitness of their psychic characteristics for the profession. Two particular cases of pilots with error records are discussed in detail to demonstrate how a careful consideration of individual psychic characteristics can be helpful in keeping pilots in the profession by adjustment to limited assignments.

V.Z.

Description of portable and miniature devices for eye movement control in electronystagmography. Essential in these devices are sets of flashlights bulbs enclosed in panels with holes which facilitate the measurement of eye motion angles from 2.5 to 60 deg during nystagmus tests. Line drawings and the basic circuit of the devices are given.

V.Z.


Description of a method for scoring the degree of obstruction of all three coronary arteries as revealed by coronary arteriography so that the disease process as a whole can be assessed. This score has been correlated with the clinical details of 107 patients having ischaemic heart disease, rheumatic heart disease, or both. It was not possible to find a close relation between the particular artery diseased and the area of myocardial damage as predicted from the EKG either at rest or on exercise. Either the EKG nor clinical diagnosis of myocardial infarction, alone or together, correlated with complete obstruction on the arteriogram. This method of scoring coronary arterial disease is believed to be a practical objective means of assessing the clinical significance of the coronary arteriogram.

M.M.


Cytochemical, cytophysiological, and electron-microscopic research data are given for the development of the structural, cytochemical, and functional organization of the gravitation receptor in invertebrates (statocyst) and vertebrates (vestibular apparatus). The material presented is used to interpret the operational mechanisms of the gravitation receptor at the cellular, subcellular, and molecular levels. The corresponding organs in various animals are illustrated, and their functional features are described together with observed developmental processes.

T.M.


A stabilized human plasma protein solution has been prepared by heating citrated plasma for one hour at 70 C in the presence of 0.04 N sodium caprylate at pH 7.0. Immunological analyses show that this plasma protein solution contains albumin which gives a reaction of complete identity with human serum albumin, and one precipitin line similar in shape and position to that of human serum albumin. Chemical analyses of this plasma protein solution show that the recovery of albumin is more than 93% of the original plasma albumin. There is a significant rise in nonprotein nitrogen and polypeptide index of the plasma after heart treatment. Only 40% of total cholesterol and no lipase activity can be directed after heating. The concentrations of calcium, total, lipid and inorganic phosphorus become also less in this plasma protein solution.

(Author)


Zero-gravity adaptive responses of man are discussed on the basis of biomedical data for 54 American astronauts, covering performance, locomotion, orientation, sleep and physiological and functional characteristics. Figures and diagrams are given for cardiovascular adaptation, weight loss, endocrine and electrolyte responses, fluid balance, skeletal responses, muscular and neuromuscular changes, exercise response tests and work capacity indicators. A review is given of current hypotheses concerning the processes involved in human adaptation to zero gravity. It is concluded that the immediate response of the body to weightlessness is a redistribution of the total circulating blood volume, leading to a loss of water, sodium and potassium through the kidneys and, thus, to a loss in total body weight.

V.Z.


The Ss viewed their own localizing movements through a laterally displacing prism as they pointed at a visible target. In the Concurrent Exposure condition, the pointing arm was visible throughout its excursion from resting place to target, while in the Terminal Display condition it could be seen only at the termination of a pointing movement. L. K. Canon's model of the process of adaptation holds that compensatory shifts in localizations manifest themselves primarily in the modality not attended to or employed as a source of information for localizing responses. With terminal display conditions during exposure to the intermodality in-consistency, where Ss were likely to attend to proprioceptive cues in making their localizations, subsequent shifts in the position selected as the visually straight ahead were found. With concurrent display conditions, where exposure period localizations would be expected to be based on visual cues, shifts in the arm position felt to be straight ahead occurred. The relevance of these findings to prior research on interlimb transfer of adaptation was discussed. (Author)
The relation between QRS amplitude, QRS axis deviation and heart position was studied in 360 subjects, using the 12-lead EKG. The height of the V sub 6 R wave was used as the measure of QRS amplitude. The distance from the left lateral border of the heart was used to indicate heart position. The frontal and horizontal QRS axes were determined by noting the isoelectric limb and precordial leads, measured according to Schmitt's values. M.M.

**A72-13884**


*Description of a psychological measuring device, called the universal perception meter, which is an important testing instrument in work psychology laboratories. The characteristics of the instrument are presented, and the operation of the automatic stimulator unit and the analyzer unit is discussed. The automatic stimulator transmits test signals (visual or auditory stimuli) to the subject, while the analyzer evaluates the subject’s response. A digital recorder can be connected to the device to confirm the measured values. A.B.K.*

**A72-13935**


*Using an optical bench, interference filters, and a Bachstein flicker photometer, spectral curves of luminous efficiency relative to that of a 552 nm radiation have been determined at retinal illumination levels of 55 and 415 trolands for several protanope, protanomalous, deuteranope, and deuteranomalous subjects, as well as for several typical achromats and for one atypical 'blue monocone monochromate'. Twenty-five normal subjects of the same age have been used for reference. Results are discussed and analyzed. O.H.*

**A72-13936**


*The influence of spatial interactions on the rapid changes in the rod threshold which occur in early light and dark adaptation (masking) is examined. Early light and dark adaptation curves were traced with a 5 min test spot centered upon adapting disks of light of various diameters, from 12 min to 3 deg of arc. Standard early light and dark adaptation curves were found on the larger sizes of the disks, with a clear maximum in the threshold occurring near or slightly after the instant of onset of the disk, and a secondary maximum at or near the instant of offset of the disk. For the smaller range of disks, however, both the rise and the fall of the threshold were monotonic, with no maxima near disk onset or offset. These data suggest that the threshold maximum of early light adaptation results from the interaction of center and surround processes of neural units. O.H.*

**A72-13937**


*The problem of whether simultaneous brightness contrast also occurs under scotopic conditions is investigated. In addition, the possibility is explored that the rod and cone systems interact within the framework of brightness contrast. As a result, simultaneous brightness contrast was found to occur below cone threshold. The rod action spectrum of the phenomenon, and its lack of a Stiles-Crawford effect, argue that it is mediated by the scotopic system. In additional experiments, a parafoveal scotopic annulus was found not to darken a foveal test spot; but a 7-deg-peripheral test spot, designed to stimulate predominantly cones, was darkened by a scotopic annulus. This last experiment suggests that the rod and cone systems may sometimes interact within the framework of brightness contrast. O.H.*

**A72-13938**


*A stimulus consisting of a bright line with a small gap in the center was observed as the after-image of a bright flash. The proportions of time for which fragmentation of the stimulus and closure of the gap occurred were recorded in two conditions: with the whole stimulus seen with one eye, and with the two halves of the line seen with different eyes. In the after-image there was more fragmentation and less closure when the two halves of the line were presented to different eyes. A possible explanation is suggested in terms of adaptation of 'line detector' units in the visual cortex. O.H.*

**A72-13939**


*Readings of Ishihara charts in artificial daylight by normal and color defective subjects were tested. It is shown that single exposures of somewhat longer duration (1 or 5 sec) in the light of 3200 deg K and 1.2 ft-cd produces normal readings in color normal people but has a number of novel effects on the readings of color defectives, probably by constraining some searching mechanisms involving nervous feedback. O.H.*

**A72-13989**


*Temporal response characteristics of fast and slow muscle fibers stimulated by single electrical pulses were measured in eight human muscles. Tension-time records revealed single- and multiple peaks of muscle hardness variation. Fibers with different contraction rates were identified by the time required to reach the peak from the onset of contraction. Both fast and slow fibers in different muscles of the same subject and fibers in the same muscles of different subjects are shown to differ from each other by temporal characteristics of the contractile properties. Groups of fast and slow fibers represent characteristic families of fibers with similar contractile properties. T.M.*
which differs in magnitude and character. Natural body postures are characterized by a low voltage of the action potentials and by the presence of a phase component and gain periodicity in the asynchronous muscular activity. During uncustomed postures, the tension of the most active muscles is in most cases characterized by asynchronous activity of substantial amplitude. Synchronized high-amplitude action potentials occur together with asynchronous activity during difficult postures, and the phase component of muscular activity disappears. T.M.


The free oxygen content and the oxygen diffusion coefficient were measured in vivo in the muscles of adrenalectomized and intact rats during recovery after physical strain. Short-term physical exercise (swimming) is shown to be a stress factor which gives rise to deep and prolonged hypoxic effects and which hinders oxygen diffusion in the skeletal muscles of adrenalectomized rats. These animals show inefficient utilization of oxygen during recovery from physical strain. T.M.


The potential for interference in devices including medical devices and instrumentation exposed to leakage or stray fields of microwave sources is explored. A study of semiconductor devices in arbitrary circuitry suggests a maximum potential interference in microwave fields. Experimental data on interference of demand pacemakers in microwave fields is reviewed in the context of electromagnetic compatibility. Potential interference levels are far below biological exposure hazard levels. Effective methods of reducing susceptibility of devices to microwave radiation are shown to include shielding and filtering techniques. (Author)


The role of astronauts in the man-spacecraft system is examined from the viewpoints of crew teamwork requirements in a multiple-member mission and psychological training measures for human operators. Variations in living conditions during space flight are described together with corresponding changes in the psychophysiological mechanisms of space and time perception. The effects of weightlessness, prolonged isolation in restricted confinement, emotional stress, and other flight factors on the perception of time by man are explained, and the motor activity of an astronaut in a state of weightlessness is analyzed. Astronaut training to maintain orientation in prolonged flights, the organization of rest and work cycles in prolonged interplanetary missions, and the development of improved man-machine interface facilities are also examined. T.M.


Patients with idiopathic hypertrophic subaortic stenosis were studied by ballistocardiographic and angiographic techniques. A number of statistically significant differences were found between those with hypertrophic subaortic stenosis and normal subjects of similar age range. This ballistocardiographic study confirms findings of previous studies showing a greater early systolic contractile force in these patients with hypertrophic subaortic stenosis and more rapid acceleration of emptying. Correlation studies indicate that certain ballistocardiographic variables may quantitatively reflect ventricular function. Therefore, we have shown that relating ballistocardiographic measurements to dynamic variables may be useful in considering ventricular abnormality. It is strongly suggested that the relation of the ballistocardiogram to ventricular function is the major value inherent in the wave forms. Previous rejection of the ballistocardiogram as a useful clinical device or as an investigative technique appears to have been premature. (Author)


Findings in eleven families with cardiomyopathy, collected during a period of approximately a decade, are reviewed. Of 98 persons examined, 47 were affected. The clinical findings included palpitations, arrhythmias, syncope, and sudden death; some patients had intractable congestive heart failure and Stokes-Adams attacks. Rhythm disturbances, left ventricular hypertrophy, intraventricular conduction defects, and abnormal Q waves were frequent. The prognosis is uncertain. The electrocardiogram proved to be the best single tool for detection of cardiomyopathy. Of special interest were the dynamic changes in the electrocardiogram with the disappearance of the abnormal Q waves and infarction-like patterns with advancing age, as well as appearance of left bundle branch block. Serum enzyme disturbances were detected in some families, and their possible significance is discussed. O.H.


Compensatory tracking performance was shown to be substantially degraded by oscillation of the visual display at both 1.0 and 2.0 Hz. The severity of this decrement was altered significantly by changes in both the color and the intensity of the display illumination. Performance was significantly better with red light illuminating the display at 0.05 mL than with blue light at the equivalent luminance. This improvement in performance was similar in magnitude to that found for an increase in broad-band illumina- tion of the display where luminance was increased from 1/2 log unit below to 1/2 log unit above 0.05 mL. Visual mechanisms that may have been responsible for these findings are suggested. (Author)

A72-14474 Effects of alcohol ingestion on tracking per- formance during angular acceleration. W. E. Collins, D. J. Schroeder (FAA, Civil Aeromedical Institute, Oklahoma City, Okla.), R. D. Gilson, and F. E. Guedry, Jr. (U.S. Navy, Aerospace Medical Research Laboratory, Pensacola, Fla.). Journal of Applied Psycholo-

Results of simulated climbs to high altitudes, using a decompression chamber to demonstrate to pupil pilots the effects of anoxia caused by failure of the oxygen supply. It was found that most of the subjects put into sudden anoxia at different altitudes seemed to resist the effects of low partial oxygen much longer than classical data would predict. The new data discussed were obtained by electroencephalograms and recordings of the cardiac rhythm. F.R.L.


Consideration of medicopsychological problems, with attention to psychological stress in ground school; minor ailments, some of which may be psychosomatic; and air sickness in the early stages of the course, which may also be of psychological origin. Account must be taken of human factors as well as of the pressing need to meet the requirements for personnel and to develop the planning of the school. An overall and dynamic perspective of psychology puts the accent on concepts of maturity where the time factor appears to be very important. F.R.L.


Three primary concerns are dealt with: what system safety engineering is, what it can do for project and product management, and how it can be implemented. The general topic of safety within product development is considered first. This is followed by a discussion detailing the chronological sequence of events from which system engineering evolved. By presenting this history, a foundation is established on which the strong and weak points of the practical application of system safety engineering can be discussed. Subsequent chapters are devoted to product management, analysis techniques, the system safety engineering data bank, product assurance, industry safety, and product liability. Three appendices present a typical system safety program plan, typical safety design criteria, and a military standard of requirements for a system safety program for systems, associated subsystems, and equipment. O.H.
The activities of glycolytic ferments G-6-PDG and 6-PGDH of the leucocytes of irradiated and unirradiated rabbits as well as therapeutically irradiated patients were measured. Granulocyte and lymphocyte size was determined. The investigations revealed an increase in ferment activities and granulocyte size with increasing leukopenia. The results are considered a sign of a compensatory increase in ferment activities and granulocyte size with increasing leucopenia. M.M.


The effects of the unfocused laser radiation in the culture of a thymine requiring E. coli strain have been examined. Cell multiplication has been shown to be progressively retarded by exposure to laser radiation. While oxygen consumption is usually little altered by laser treatment, there are drastic derangements in the synthetic metabolism of the cell, DNA is easily inhibited, and RNA synthesis is less sensitive. Numerous studies indicate that low-intensity laser radiation produces stimulation of certain biological activities. The rate of DNA and RNA synthesis increases depending on the dose applied. M.M.


Topics discussed concern the integrative action of the nervous system, muscular coordination, the motor learning process, the kinetics of human motion, human motion in sports, and research in rehabilitation. The contents show an increasing knowledge of muscle coordination by analysis and synthesis of (1) the muscle properties and characteristics, and (2) the innervation pattern and function of the nervous system. This makes it possible to design functional models of which some examples are shown and which may be important in constructing and programming artificial limbs. Some interesting contributions regarding the motor learning process stress the complexity of the nervous system. A.B.K.


Results of experiments in evoking spinal reflexes through stimulation of the gastrocnemius and soleus muscles in both legs. In an experiment in which Hoffmann reflexes and Achilles tendon reflexes were evoked simultaneously an increase in the amplitudes of the tendon reflexes was noted without clear changes in the Hoffmann reflexes. These increased amplitudes are attributed to a hyperactivation of the gamma motoneurons. In studying the recovery cycle of the Hoffmann and tendon reflexes in a hemiparetic patient, it is found that a higher facilitation level is reached in the hemiparetic limb with respect to both Hoffmann and tendon reflexes. A.B.K.


Consideration of the organizing principle or optimizing strategy involved in neuromuscular coordination. An attempt is made to show how the overall coordinating operation may be programmed temporally, both as to the initial learning and to on-line adaptation. Evolutionary criteria governing the selection mechanisms operating in neuromuscular coordination are reviewed, as well as neuromuscular control structure and strategies. A neuromuscular control actuating mechanism proposed by Aizerman and Andreeva (1968) is discussed, as well as some work by Griffith (1963) on the learning of spinal reflexes. The possibility of preprogrammed control, where specific movements are controlled on an open-loop basis, and feedback loops operate in a monitoring role, is considered, and an experimental program on neuromuscular control mechanisms is described. A.B.K.


Operant conditioning, or behavior modification, represents a technology that is receiving much emphasis in the field of psychology. The operant technologist would, basically, maintain that the frequency of a behavior can be modified in accordance with the kind of reinforcement that follows the behavior. While operant technology has been widely used as a research technique by clinical and developmental psychologists, little attention has been paid to its possible value as a tool for producing, and modifying, gross motor responses. It would seem, however, to have potential for application in the areas of physical medicine and rehabilitation, particularly with mentally retarded patients. (Author)


In this investigation a series of simple movements are graphically presented as a means of formulating basic kinetic rules of movement. These rules with certain modifications should also apply to more complex movements. (Author)


Description of a technique for calculating the compliance of a muscle group in the course of movements performed at variable velocities. In the proposed technique a compliance value is calculated from the inverse of the slope of the tension-length curve. It is found that compliance increases when tension decreases. The curve obtained for compliance variation as a function of tension is interpreted in terms of Hill's (1938) two-component system. A.B.K.

Consideration of the ability of both animals and humans to perform well-controlled self-rotation maneuvers while falling freely for short periods of time in the neighborhood of the earth's surface. Specifically, an analytical theory dealing with the righting movements of falling cats is constructed, and the validity of this theory is tested by reference to photographs. Pitch, yaw, and roll motions generated by arm and leg motions of humans are studied analytically and, in the case of yaw motions, experimentally.

A.B.K.


Extension of a previously proposed method of recording human body motions by employing photogrammetric stereo cameras together with highly stabilized signal pulse transmitters. It is shown that by using pulsed-light kinograms to obtain three-dimensional measurements of human body motions, by employing differential calculus to determine kinematic parameters, and by approximating possible to create mathematical models of these locomotions. A.B.K.


The camera makes it possible to produce very good slit lamp pictures for the medical diagnosis of the eye. The device consists of a stereomicroscope and the photographic camera with a photocassette for 35 mm film. A xenon high-pressure flash light and a projection lamp are provided as light source. The principles of operation of the instrument are discussed, and a number of recommendations for its suitable use are made, giving attention to general-survey exposures, slit exposures, goniphotography, photography of the rear section of the eye, photography with horizontal slit, capillary and vascular photography, IR photography, fluorescence photography, and the photographic measuring of the anterior chamber depth.

G.R.


The present state of investigations on the origin of life is surveyed together with the current state of molecular paleontology. General and theoretical subjects discussed include an energetic approach to prebiological chemistry, the recognition of description and function in chemical reaction networks, and the origin and development of optical activity of bio-organic compounds on the primordial earth. Other fields considered are the syntheses of small molecules, oligomers and polymers; photochemical processes; the origin of biological structures; primitive biochemical and biological; and exobiology.

G.R.


Experiments in several branches of science point in general outline to a number of stages in the evolution of carbon compounds, underlying the pathway to the origin of living things on the earth. The first stage includes an appearance of hydrocarbons, cyanides, and their close derivatives in space. In the second stage, abiogenetic synthesis of more and more complicated organic substances has proceeded in interplanetary space, and on the surface of the planets the so-called 'primeval broth' has been formed. The third stage involves the formation of the 'protobionts.' Further evolution of the 'protobionts' occurs in the fourth stage.

G.R.


Florkin et al. (1961) demonstrated the preservation of shell proteins in fossils including a case involving a fossil of the Eocene with an age of 60 m.y. The persistence of the polypeptide structures during periods of up to 500 m.y. was also shown. Analyses on three different samples of fossils belonging to the order of graptolidea were conducted by Foucart et al. (1965). Collagen has been extensively studied in fossil bones. Chitin is found in insect fossils of the Middle Eocene. Precambrian rocks dating from over 3000 m.y. have been found to contain hydrocarbons such as pristane and phytane, which are considered to be of biological origin.

G.R.


The major problem in connection with investigations on the origin of life is to define first how syntheses of biologically interesting compounds have come into existence, taking into consideration syntheses which on the basis of the principles of present-day biological syntheses are feasible with the only reagents available in primeval environment. A search is, therefore, conducted for the most evident conditions which govern the occurrence of syntheses as closely akin to present-day biosyntheses as possible. The discussion is entirely developed on energetical bases. The energy balances of elementary actions occurring on simplified templates of present-day biosyntheses are analyzed, giving attention to very widely represented bioreactions involving endergonic condensations in aqueous media.

G.R.


Hypotheses about the possible origin of the dissymmetry of life are proposed. Their advantage lies in the fact that they do not suppose the preexistence of any dissymetric factor such as optically active quartz. It is shown that life itself is accountable for
the dissymmetry of living matter. The hypotheses make it possible to consider that D-amino acids, which only occur in some bacteria, should be a vestige of the early evolutionary stages of life. It is thought that chance is accountable only for the choice of the preferential configuration of the first germ.

G.R.

**A72-14767**  

Demonstration that alpha-hydroxy acids may have participated in the formation of prebiological polymers in a manner similar to the participation of alpha-amino acids. Experiments are described which indicate that the system for forming peptide bonds in present-day biological organisms is equally competent in forming ester and polyester bonds. In particular, the experiments described are directed toward answering questions regarding the action of peptidyl transferase in ester formation. Also, an attempt is made to determine whether a complete protein synthetic system can operate with transfer RNA molecules which have alpha-hydroxy acids attached to them instead of alpha-amino acids, using both synthetic and natural mRNA. The ability of ribosomal peptidyl transferase to catalyze the formation of an ester bond as well as its normal product, the peptide bond, is demonstrated.

A.B.K.

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**A72-14768**  

Description of a set of experimental data related to transdehydration reactions of biological importance leading in particular to protein-like macromolecules, but proceeding in simple aqueous media from reagents and under conditions compatible with primeval terrestrial environment. A theoretical analysis of energy transfer processes reveals that the neutralization energies involved in transdehydration reactions play a role of paramount importance in the free enthalpy balances. This conclusion is supported by the experimental fact that simple esters and thiolesters, relatively energy-poor as regards their simple hydrolysis in acidic media, behave as relatively energy-rich donors in alkaline solutions.

M.M.

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**A72-14772**  

Discussion of mechanistic studies which suggest a pathway of prebiotic formation of polypeptides beginning with the dimerization of hydrogen cyanide to a reactive dipolar compound - aminocyanocarbene. This compound polymerizes to form chains that interact further with hydrogen cyanide to yield heteropolymidines that are finally converted by water to heteropeptides containing up to 15 of 20 alpha-amino acid residues commonly found in proteins.

M.M.

The evolution of the photosynthetic apparatus is shown to have probably involved an isolation of structures which are the site of the pigment apparatus and light reactions of photosynthesis. Complication of the photosynthetic apparatus is likely to have increased the energetic efficiency of photosynthesis, providing closer conjugation of oxido-reductive reactions and their better coupling with formations of energy-rich compounds. It is felt that the evolution of the photosynthetic apparatus can be regarded as completed when it has acquired the capability of utilizing water and evolving oxygen.

**M.V.E.**


Discussion of some metabolic processes that are triggered by an absorption of light quanta by photoreceptors. It is suggested that, at a certain stage of the evolution of the earth's atmosphere, photobiological processes - such as flavin-photocatalyzed reactions with absorption maxima at the shorter end of the visible light range - could have become very important.

**M.V.E.**


Consideration of the random processes that may have played a role in biogenesis: (1) in producing the right pattern of proteins and nucleic acids, and (2) in constructing the apparatus of reproduction from a series of proteins and nucleic acids with the right patterns. The probabilities of functional proteins and those for a nucleic acid to be a gene for a protein are discussed, and an attempt is made to estimate the orders of magnitude of the chances for the formation of protobionts. A sequence of possible steps is reviewed that may explain the evolution of eobionts in the direction of familiar cells.

**M.V.E.**


Two nucleoprotein coacervate model systems are analyzed wherein the hydrolysis and synthesis lead to the formation of new properties which can be regarded as specific functions of these systems. In the investigation, ribonuclease and polynucleotide phosphorylase are used as enzymes.

**M.V.E.**


The composition is considered of coacervate systems in terms of distribution of coacervate drops, polyphenol oxidase-carbohydrate-histone-quinones, and of the diameter, volume, and weight of individual coacervate drops. It is shown that photomolecules (protoproteins, protonucleic acid, etc.) may have been present in primitive prebiological systems (coacervate and other systems) many billion years ago. It is felt that the differing stability of coacervate drops is of interest from the point of view of selection of drops best suited for evolution.

**M.V.E.**


Lipid systems are studied both before and during coacervation, and the structure forming action of pigments in diluted aqueous solutions of surface-active agents is examined. Two particular problems are considered: (1) whether chlorophyll exhibits photos-chemical activity in surface-active agents, and (2) what the effect is of the type of structure of a surface-active agent on the photos-chemical activity of the pigment.

**M.V.E.**


The problem of molecular organization of biological membranes is considered in the light of some implications based on bacterial membrane biochemistry and a few selected facts from other fields of membranology. A biological membrane is thought to develop from a biomolecular liquid film to an assembly of lipoprotein particles with a partial 'survival' of the lipid as a phase.

**M.V.E.**


With the aid of a simple model membrane system, the properties of cellulose enzymes and of membrane selectivity and pump-like action are considered. The model is based on materials possibly present on a primitive earth, as well as on a membrane able to sort or concentrate these materials. An overview of the model membrane system is presented in terms of how it is constructed, what its properties are, and what to expect in performance characteristics. The model system is shown to be useful for studying the selective and in some cases accelerated transfer of nutrients and metabolites.

**M.V.E.**


The model of selective accumulation of carbohydrates is considered. The model is based on a simple model membrane system, the properties of which are considered in terms of how it is constructed, what its properties are, and what to expect in performance characteristics. The model system is shown to be useful for studying the selective and in some cases accelerated transfer of nutrients and metabolites.

**M.V.E.**
effort to obtain substantive evidence for a hypothesis which related properties of polyphosphates are outlined, and the evidence of their phosphate material in vertebrate tissues is considered. Characteristic precellular organization. Specifically, the distribution of poly-


A review is presented of the recent investigations initiated in an effort to obtain substantive evidence for a hypothesis which related the excitability phenomenon of neural tissues to the concept of precellular organization. Specifically, the distribution of polyphosphate material in vertebrate tissues is considered. Characteristic properties of polyphosphates are outlined, and the evidence of their occurrence in a large number of microorganisms and, in particular, mammalian tissues is discussed. It is shown that polyphosphates are apparently ubiquitous to living matter, and that the possibility exists that they were ubiquitous before recognizable life forms emerged.

M.V.E.


The primitive process of antibiotic polypeptide synthesis is studied by the example of gramicidin S and tyrocidine. It is shown that, in terms of process evolution, the antibiotic synthesis is closely related to the multienzyme fatty acid synthesis, where the growing fatty acid chain remains enzyme-linked through thioester bonds. A next step in the evolution toward protein synthesis is antibiotic polypeptide synthesis, a much more compact procedure than ribosome-linked protein synthesis with only enzymes, ATP, and amino acids as ingredients. A primitive model is thus obtained for a process of sequential addition of amino acids to form functionally defined polypeptides.

O.H.


The amino acid sequences of proteins from living organisms are dealt with. The structure of proteins is first discussed; the variation in this structure from one biological group to another is illustrated by the first halves of the sequences of cytochrome c, and a phylogenetic tree is derived from the cytochrome c data. The relative geological times associated with the events of this tree are discussed. Errors which occur in the duplication of cells during the evolutionary process are examined. Particular attention is given to evolution of mutant proteins, globins, ferredoxin, and transfer ribonucleic acids (tRNA's). Finally, a general outline of biological evolution is presented.

O.H.


Some problems associated with DNA are examined. First, the possibility of an estimation of the 'age' of DNA as genetic material is considered based on the available data on the degree of variability of the DNA primary structures in the species belonging to various taxons. The evolution pattern of the primary DNA structures is then investigated. Finally, the feasibility of application of the data on the variability degree of the DNA primary structures to determine the formal scale of taxons in the existing systems of animals, plants, and microorganisms is discussed.

O.H.


Processes occurring in the third stage of biogenesis - i.e., the evolutionary phase from the coacervate to the protocell - are studied. In particular, the problem of what were the early stages of protein synthesis, and the primary ribosomes and their nucleic acids, is examined. It is suggested that in the course of evolution of ribosomal RNA, the problem of protein biosynthesis has taken different, sometimes opposite routes, and these routes have often changed.

O.H.


Some observations on the numerical structures of the genetic code as they have been experimentally established are studied. The problem is examined whether the structure of the genetic code as a whole does not conform to some optimization rule so that conclusions relevant to the problem of the origin of life may be ultimately drawn from the observed regularities. It is shown that the genetic code is constructed in accordance with a hierarchy of structures, all associated in harmonized succession to some rule of optimization relative to a logarithmic criterion. When speculating on the origin of the genetic code, it is therefore not possible to disregard the numerical optimization linked to its hierarchy of structures.

O.H.


Various hypotheses concerning the primordial background of the generation of metabolic energy through oxidative phosphorylation in bacteria are considered. The following hypotheses are noted: photosynthesis preceded sulfate respiration when the atmosphere was still anoxic; thiobacilli evolved from colored sulfur bacteria after the formation of an oxygenic environment; pure aerobes evolved from facultative anaerobes and aerobes in the oxygenic atmosphere. A diagram of the evolution of bacterial respiration on the earth is given.

V.Z.

Papers relating to the evolution of biochemical processes in the biosphere are reviewed. Covered are redox reactions during the Archean, Proterozoic, Paleozoic, Mesozoic and Cenozoic eras, the elementary composition of organisms in the biosphere, and the participation of metal compounds in the evolution of photosynthesis.


The possible effect of inorganic polyphosphates on the development of phosphorus metabolism in living organisms is examined. The structure of polyphosphates is briefly discussed. Two possible schemes are considered: one of a glycoside-dependent reaction involving the participation of polyphosphate synthetase isolated from N. crassa, the other of a reaction involving polyphosphate hexokinase, isolated from mycobacteria. The distribution of polyphosphate glucokinase in different microorganisms is presented. It is suggested that in primary living organisms high polymer inorganic polyphosphates could have played the role ATP has in contemporary organisms.


Two questions are considered that are concerned with prebiological and early biological energy transformation: the first is, what mechanisms of energy transformation existed at the time when chemical (prebiological) systems evolved into biochemical systems; the second is, what was the nature of the energy-rich compounds involved in mobilization of free energy for reproduction and other energy requiring reactions of the earliest living systems. The features of inorganic pyrophosphate (PPI) and its reactions in chromophores are discussed. It is suggested that inorganic phosphates preceded adenosine phosphates as energy carriers in both substrate level and electron transport level phosphorylation systems, and that convergence may have occurred also at the chemical stage in the evolution of energy transformation.


Demonstration that the classical form of glycolysis, having passed through the long evolutionary period from primitive anaerobic organisms to higher organisms, could not be the primary and only form of energy exchange. Glycolysis is the result of a long biochemical evolution. It could have been preceded by more simple types of energy metabolism not requiring preliminary phosphorylation of the substrate at the cost of ATP - e.g., anaerobic oxidation of pyruvate and acetaldehyde into acetate and ATP.


Development of a model for the evolutionary relationship between Early Precambrian prokaryotic cells and Late Precambrian euukaryotic cells. The model is explicit and testable on many grounds. Implied in the model is the concept that hereditary endosymbiosis has been a significant evolutionary mechanism in the origin of the euukaryotic cell. The model theorizes that the euukaryotic cell is a product of temporally ordered, specific symbioses.


Study of contemporary organisms that show that life can exist under more extreme conditions than are normally thought possible. Several microorganisms can live at high temperatures, near the boiling point of water, and some require high temperatures for growth. Quite low or high external pH values are consistent with life, and many organisms can live in high concentrations of salt or sugar. Some of the effects of salt on enzyme activity and configuration are illustrated.


Discussion of the proposition that mutual comet collisions in planetary nebulae were a valuable source of organic compounds in the preplanetary era. Carbonaceous meteorites, allegedly originating from comets, show evidence of plentiful fairly complex organic compounds including some of the nucleic acid bases. Detailed experiments have shown that these types of organic compounds can be reproduced in reactions, approaching thermodynamic equilibrium of meteoritic material and other elements, through heating to a few hundred C followed by a cooling for a few hours or at most a few days. These conditions are similar to those which could have been achieved when the planets in the solar system were formed through comet clashes followed by temporary overheatings. It is considered that a more comprehensive study of comets will make it possible to get more useful data to solve the problem of the occurrence of life within space and, more particularly, on the earth.


Study of contemporary organisms that show that life can exist under more extreme conditions than are normally thought possible. Several microorganisms can live at high temperatures, near the boiling point of water, and some require high temperatures for growth. Quite low or high external pH values are consistent with life, and many organisms can live in high concentrations of salt or sugar. Some of the effects of salt on enzyme activity and configuration are illustrated.
A72-14864

Further studies on the dimensionless parameters associated with the 'in vivo' transport of heat within biological tissue. A. Shitzer and J. C. Chato (Illinois, University, Urbana, Ill.). Aerospace Medicine, vol. 42, Dec. 1971, p. 1279-1283. 16 refs. Research supported by the Hebrew Technical Institute; Grant No. NGR-14-005-103.

A72-14863


Blood carboxyhemoglobin has been measured in man and related to existing concentrations of oxygen and carbon monoxide in inspired air. An equation is presented to estimate the equilibrium COHb levels when the inspired air composition is known. A subject on a small closed rebreathing system at atmospheric pressure achieves equilibrium between O2, CO, and Hb in about 15 minutes. The CO in the gas phase and the blood COHb remain in essential equilibrium, increasing only as a result of endogenous CO production and accumulation. Subjects in a closed system at elevated (19 atmospheres absolute) or decreased (10 psia) pressure excrete endogenous generated CO into the restricted atmosphere leading to increases in the blood COHb and in the CO concentration in the habitat gas.

(Author)

A72-14862


The theoretical relationship between the time constant of pulmonary RC network and the time constant of pulmonary nitrogen washout has been mathematically analyzed. Experimental data obtained from multiple breath end-tidal nitrogen washout and resistance and compliance determinations in fourteen subjects showed a good correlation between these. The greater the ventilatory efficiency of the lung as demonstrated by nitrogen washout, the shorter the time constant of the RC network. The study demonstrated that multiple breath nitrogen washout could be offered as second method to measure mechanics of breathing. It also directly proved that rapidity of nitrogen washout is closely related to pulmonary resistance and lung compliance.

(Author)

A72-14860


Investigation and consideration of all circumstances and possibilities under which the evolution of organic matter beyond the earth occurred or, on the contrary, was stopped. These may be decisive factors in the correct understanding of the problems of the origin of life. An attempt is made to estimate the possibility of existence on the near-earth planet Mars, Venus, and Jupiter of the living systems or molecules which are the precursors of complex organic compounds. It appears that Mars is the only planet besides the earth where the existence of living systems appears to be likely.

G.R.

A72-14850


Consideration of ambiguities of communication that can occur between man and machine, a classical example of this in aviation being the three-pointer altimeter. Research into human behavior has demonstrated three major factors which give rise to the misinterpretation of information: inadequate or ambiguous information gathered by the sense organs; inadequate previous experience of the information being presented; and the expectation on the part of the receiver of getting a different message from that actually sent. Delays occurring when dealing with information; distortion of the information as it is transmitted; and loss of information in transmission are discussed.

F.R.L.

A72-14861


Groups of conventional and germfree (GF) Sprague-Dawley rats were held in a Reynier's type germfree isolator in an atmosphere of 20% oxygen and 80% helium. The animals were allowed to accommodate to the esoteric environment for five days and were then inoculated IP with 1 cc of 20% sheep RBC. Five days after inoculation the rats were killed, serum harvested, and microagglutinin and hemolysin titres determined. Compared to controls, conventional rats in the oxygen-helium atmosphere showed very significantly lower antibody titres. But conventional rats held in the same isolators under normal atmospheric gaseous conditions also showed reduced agglutinin and hemolysin titres. However, GF animals under the esoteric atmospheric conditions did not show reduced titres. No significant morphological differences were found between the two groups, so it is possible that a stress phenomenon due to certain aspects of the isolator environment such as noise, altered diurnal rhythm, vibration or mere confinement may directly or indirectly be responsible for the altered antibody response.

(Author)

A72-14805


It is pointed out that planetary exploration is not simply a program designed to detect life on another planet. A planet similar to earth, such as Mars, when studied for evidence as to why life did not arise, may turn out to be scientifically more important than a planet which has already produced a living system. Of particular interest after Mars are Venus and Jupiter. Jupiter has a primitive atmosphere which may well be synthesizing organic molecules today. Several nations have been made concerning the possibility of a bio-zone in the upper atmosphere of Venus.

F.R.L.
It is pointed out that planetary exploration is not simply a program designed to detect life on another planet. A planet similar to earth, such as Mars, when studied for evidence as to why life did not arise, may turn out to be scientifically more important than a planet which has already produced a living system. Of particular interest after Mars are Venus and Jupiter. Jupiter has a primitive atmosphere which may well be synthesizing organic molecules today. Speculations have been made concerning the possibility of a bio-zone in the dark (1900-0700 hr), and fasted for 15-16 hr prior to exposure to hyperbaric oxygen. The animals were placed in a 1 G environment flushed chamber and raised to 60 psi (gauge) oxygen at a rate of 3 psi/min. Time of exposure started with attainment of 60 psi. End point was first convolution. The animals' weights were equally distributed within the groups, and the groups were defined by hour of exposure. Time of exposure in minutes prior to seizure was significantly longer in those exposed at 0700-0800 hr and 1000-1100 hr than in four other groups. There was no relationship between animals' weights and time of exposure to seizures. All R values were negative, and the highest R value was -0.35. These data suggest a definite circadian rhythm in susceptibility to oxygen toxicity seizures.

**A72-14865**  

A static object revolving at a constant velocity is stationary with respect to that environment. When the object is rotated outside the plane of spin, a gyroscopic or cross-coupled acceleration is produced orthogonal to the two planes of rotation. In this situation, a man feels himself moving in a direction other than that which his visual or proprioceptive sensors perceive. The conflict in spatial orientation is the cross-coupled acceleration imposed on the semicircular canals. This perceptual conflict and the thresholds involved were studied by partial isolation of the physiological stimuli through sensory deprivation. Subjects weighted to neutral buoyancy were submerged in 94 F water in the dark. The subjects were then rotated while being revolved about a displaced axis. Thresholds for detection of angular acceleration were higher than those reported in the literature for detection of acceleration of a single plane. This discrepancy may be attributable to the length of time the stimuli are imposed to each of the canals and the cumulative response periods.

**A72-14866**  

The effect of altered weight upon animal tolerance to restraint was determined by simulating various accelerative forces with directed lead weights using restrained and nonrestrained domestic fowl (chickens). Weighting (increased weight) and comerweighting (mean plus or minus standard error) 58.3 plus or minus 41% of their body weight, whereas restrained birds tolerated only 32.2 plus or minus 2.6% reduction in body weight. A training regimen for restrained birds was not effective in improving their tolerance to a reduced weight environment. It was concluded that domestic fowl living in a weightless (space) environment should be restrained minimally and supported by ventrally directed tension equivalent to approximately 50% of their body mass (their weight in a 1 G environment).

**A72-14867**  

The circadian rhythm in susceptibility to oxygen toxicity seizures was investigated by using six groups of 20 male Sprague-Dawley rats (101-196 gm.). The animals were given standard chow, exposed to standard diurnal conditions of light (0700-1900 hr) and dark.

**A72-14868**  

The urinary excretion of noradrenaline and adrenaline of 18 young healthy pilots was measured under conditions of ground activity and flight as a pilot before and after a three-months' period of progressive endurance training. An increased excretion of adrenaline was found in waiting for the flight and that of noradrenaline and adrenaline during the flight as compared to the situation of ground activity. Some adaptation was noticed in the excretion of adrenaline but not of noradrenaline. During flight the ratio of NA/A was significantly smaller than in waiting for the flight before the training period but not after it.

**A72-14869**  

The development of pressurized cabins has been one of the most important factors relating to the comfort, reliability and safety of modern air transportation. A brief history is given of the problems encountered in the early balloon ascents, as well as during the early days of aviation and in the initial attempts at pressurized flight. Findings relating to the effects of high altitude and changes in barometric pressure are then highlighted from experiments carried out at high terrestrial altitudes, during aircraft flight, and in laboratory studies at simulated altitudes. The implications are considered in relation to predicting the effects of loss of pressure, and for selecting the most desirable cabin altitudes for air transports.

In conclusion, the operating experience in military and civilian pressurized aircraft is reviewed, with special attention given to an analysis of loss of pressure incidents. In general, the number of rapid decompressions has been less than anticipated.

**A72-14870**  

Data on the incidence of in-flight incapacitation of pilots have recently become available from three sources: reports by airlines, a study of career termination of pilots from medical causes and responses to a questionnaire addressed to pilots. Three corresponding estimates are derived of the incidence of in-flight incapacitating events with the flight stage as the measure of exposure. These estimates are compared with similar event probabilities used for
A72-14871 Immobilization hypercalcemia - Treatment and a possible pathophysiologic mechanism. D. P. Griffith (U.S. Veterans Administration Hospital; Baylor University, Houston, Tex.). Aerospace Medicine, vol. 42, Dec. 1971, p. 1322-1324. 11 refs.

Calcium excretion has been reduced by 30%-60% in seven chronically recurrent patients by depletion of extracellular volume. Extracellular volume depletion was achieved by use of a 1.0 gm NaCl diet and a thiazide diuretic. It is postulated that the intercompartmental shift of fluids and electrolytes during chronic recumbency could contribute to the syndrome of recurrent hypercalcemia and recurrent osteoporosis. (Author)


INH was administered to a group of tuberculin positive, healthy aviators for one year while multiple physiological parameters were monitored. The aviators were allowed to continue their flying duties while taking the drug. There was no evidence of severe drug reactions. There was a high incidence of various, mild, transient, complaints but these were interpreted as minimal drug intolerance rather than actual toxic or adverse reaction. INH therapy was discontinued in only 2 of 58 subjects: one because of persistent arthralgias, the other because of steadily increasing transaminases and hepatomegaly. The abnormalities in both subjects abated after cessation of therapy. The search for subclinical toxicity uncovered several borderline changes whose significance is not known at the present time. It is recommended that aviators be allowed to continue flying duties while taking INH, but in the interest of aviation safety, a regular program of careful clinical observation and periodic measurements of transaminase levels seems warranted. (Author)


Although aviators' flight helmets may possess exceptionally good noise attenuation qualities, maximum attenuation may not always be realized when the helmet is worn, particularly if the helmet does not fit well. The lack of a standardized procedure for fitting flight helmets often results in a poor compromise that sacrifices noise exclusion for comfort. A procedure that involves the use of a noise source and an automatic recording audiometer has been developed as an aid in the fitting process. The noise source allows the aviator to detect acoustical leakage around his ears so that a better fit can be effected. Masked hearing threshold levels obtained with the helmet's earphones can be used to demonstrate improved performance. (Author)


The morphological effects of daily bouts of exercise and denervation on teres minor intrafusal muscle fibers were investigated in male Sprague-Dawley rats. After denervation, nuclear bag and nuclear chain muscle fiber cross-sectional area atrophied only 25% and 33% of the amount experienced by extrafusal fibers. Of the two fiber types, the nuclear chain fibers appeared to be more responsive to the effects of exercise than the nuclear bag fibers; however, this trend for enlargement had no statistical significance. Length measurements did not reveal any marked changes of any fiber type to the experimental conditions of this study. It was concluded that the possible differences in function and innervation of the nuclear bag and nuclear chain fibers could partly account for these findings. (Author)


The problem of thermoregulation in body exercise was examined in two healthy subjects, an athlete and a nonathlete. The tympanic temperature, sweat rate, and oxygen intakes during the exercise were measured. The interpretation of the results suggests that the training of man's thermoregulatory and maximum aerobic power mechanisms are not necessarily interdependent, and that the rise in the tympanic temperature is due to the proportional nature of central nervous control mechanisms and ability of the body to dissipate rather than to produce heat.

O.H.


An investigation was undertaken in order to determine whether maximum aerobic power can be predicted from changes in serum activities in response to a constant test exercise. Activities of creatine phosphokinase (CPK), lactate dehydrogenase (LDH), malate dehydrogenase (MDH), and glutamate-pyruvate transaminase (GPT) were measured before and immediately after exercise, and correlation coefficients relating these changes with maximum oxygen uptake were calculated.

O.H.


An investigation has been undertaken of the effects of prolonged muscular work in healthy subjects on erythrocyte 2,3-diphosphoglycerate as a mediator of acute changes in the affinity of hemoglobin for oxygen. Results are consistent with the contention that time is a critical determinant of any contribution the generation of erythrocyte 2,3-DPG may make to oxy-hemoglobin affinity, regardless of the apparent intensity of demand for increased oxygen delivery.

O.H.
A72-14900 Effects of physical conditioning upon the central and peripheral circulatory responses to arm work. R. Simmons and R. J. Shephard (Toronto, University, Toronto, Canada). Internationale Zeitschrift für angewandte Physiologie einschliesslich Arbeitsphysiologie, vol. 30, no. 1, 1971, p. 73-84. 30 refs. Research supported by the Ontario Heart Foundation.

Results of a test program in which ten sedentary young men completed four weeks of endurance training involving biweekly 30 min sessions of exercise at an arm ergometer on an arm ergometer at 80% of maximum aerobic power. Maximum oxygen intake increased by 8%, and there was also a 4% increase in the mechanical efficiency of effort. The cardiac output (measured by acetylene rebreathing) increased in both submaximum and maximum effort. There was an 8% increase in maximum stroke volume, but no change of maximum heart rate. Strain gauge measurements showed a diversion of blood flow from skin to muscle with training. This adaptation is of value to the athlete only after alternative methods of heat dissipation have developed. The possible application of the arm ergometer to the training of patients with leg injuries is briefly discussed. (Author)


Aspects of ecogenesis regarding an island which owes its origin to volcanic eruptions or which is completely covered with lava during a volcanic eruption are discussed, giving attention to processes and developments taking place on the island of Surtsey after the last lava eruption in 1967. Two biomes can be distinguished in the ecogenesis concerning such an island including the marine littoral and sublittoral on one hand, and the island surface as terrestrial domain on the other. In both biomes cryptogams are characteristic for the early stages of ecogenesis. Differences between the two biomes are considered together with the appearance of the various biotic species, giving particular attention to different types of algae. G.R.


The relation between arrhythmia of heart rate and work load has been investigated in several male subjects. It is concluded that, due to the nonnormal distribution of the single heart rate values, simple statistic measures of variation are not suitable for the description of arrhythmia. A measure for arrhythmia has to take into account variations of heart rate in both amplitude and frequency. The derived 'quotient of arrhythmia' is found to decrease with work load and also with heart rate. A stochastic part of the quotient has been derived by extrapolation. O.H.


Experiments in animals were carried out in which the vascular beds of the coeliac, upper mesenteric, and splenic arteries were hemodynamically isolated and perfused with a constant volume of the animals' own blood drawn from the abdominal aorta. In each of the separately perfused vascular areas pressure changes could be produced by leading the perfusate directly into the distal aorta. Results show that pressure drop in the coeliac artery causes marked vasocstriction in the upper mesenteric artery and vice versa; the area of reflex responses is not restricted to the intestinal vessels, but seems to extend over the entire abdominal splanchnic circulation; pressure lowering in the hepatic artery produces a reflex vasocstriction in the vascular bed of the upper mesenteric artery. A nutritional function of the mesenteric vascular reflexes is highly probable. O.H.


A model of red blood cell rotation in the flow toward an orifice had been reported by Breitmeyer et al. (1971) for cell volume determination applications. A holographic technique is described for making moving red blood cells visible. Measurements regarding the orientation of the red blood cells, which flow toward the orifice, are transformed into distribution data regarding the form factor for the three orientations. The results are compared with the data predicted by the model. G.R.
Local cooling of the legs without change in trunk skin temperature or oral temperature improved the ability to withstand positive (headward) acceleration in the sitting position. Arterial systolic, diastolic, and pulse pressures were maintained at higher levels, ankle circumference increased less, and the acceleration at which peripheral vision was lost increased on average by 0.27 G, when the legs were cold. The effects of leg cooling were attributable to reduced pooling of blood and increased vascular resistance in the legs due in turn to direct effects of low temperature on their blood vessels.

A study was undertaken to determine the physiologic effects of transfusing into patients with anemic hypoxia 3-5 units of washed liquid-stored red cells that were depleted of 2,3-diphosphoglycerate (DPG) and had an increased affinity for oxygen. Immediately after the therapeutic transfusion there was no change in oxygen consumption, but there was a significant decrease in both the arterial blood pH and the systemic arteriovenous difference in oxygen content, and the circulating red cells had an increased affinity for oxygen and a decreased red cell 2,3-DPG level. Within 4 hr after the transfusion, both the arterial pH and the systemic arteriovenous difference in oxygen content had returned toward the pretransfusion levels. During the 24-hr posttransfusion period the 2,3-DPG level and P50 value of the oxyhemoglobin dissociation curve were restored to normal in vivo. Prior to and 8 and 24 hr after transfusion, the cardiac index values measured by the indocyanine method and those calculated by the Fick formula were in accord. However, during the 4-hr posttransfusion period the cardiac index calculated by the Fick formula was significantly increased, while the cardiac index measured by the dye method was unchanged.


Three subjects performed from 15 to 20 bouts of 10-min bicycle ergometer exercise in a 26 C ambient. The procedure imposed a consistent pattern of internal (esophageal) temperature increase in the presence of a constant mean skin temperature. Body weight loss was continuously recorded and rate of evaporative loss due to sweating was calculated during each minute of exercise. It was confirmed that both local and total sweating are functions of internal temperature at a fixed constant mean skin temperature. In the presence of a constant central drive for sweating, the sweating response could be modified at the periphery according to the area-specific characteristics and/or by local temperature.


On 3 successive days each of the 5 subjects used ran 16.1 km on the horizontal treadmill. Before and within 5 min after each run muscle biopsies were obtained from the vastus lateralis for glycogen determination. Muscle glycogen utilization was greatest during the first 16.1-km run but was markedly less during the second and third runs. Successive days of prolonged severe exertion produced a marked reduction of muscle glycogen concentration. Lactate accumulation during running was reduced with successive days of exercise, whereas serum free fatty acid levels tended to increase. G. R.
A72-15217


Results of a study in which six supine resting subjects, wearing water-perfused suits, had body skin temperature controlled at 35°C for 30 min (control period), then rapidly increased to 40.5°C for 43 to 50 min (heating period) in a two-part experiment. In the first part of the experiment arterial mean pressure (MP) in three men was increased back to, or above control levels at the 30 to 35th min of heating by total occlusion of both legs for 8 to 10 min. Splanchnic blood flow (SBF), which had fallen from 1.4 to 0.9 L/min at occlusion, rose only 0.05 L/min during occlusion. Splanchnic vascular resistance (SVR) rose throughout heating and occlusion. In the second part of the experiment (three men) SBF fell despite a spontaneous rise in MP and aortic pulse pressure prior to leg occlusion. Cardiac output (CO) was measured just before, during and after occlusion. Occlusion raised MP 10 to 15 mm Hg and reduced CO only slightly. It is concluded that falling MP or aortic pulse pressure are not major causes of the splanchnic vasoconstriction in response to heating man. (Author)

A72-15218


Observation that six of seven subjects while reading aloud increased minute ventilation from spontaneous levels 6 to 21%. They took fewer breaths per minute (average of 14 reading compared to 19) and all increased alveolar ventilation (average increase 27%). Every subject ventilated more while reading material with a preponderance of consonants requiring large volume increments (e.g., letters 'h' and 's') than material with mainly consonants requiring small volume increments (e.g., 'i', 'm,' and 'n'). The subject who hyperventilated the most (62% increase in alveolar ventilation) and had the lowest end-tidal CO2 partial pressure (29 mm Hg) had periods of apnea lasting up to 18 sec immediately after reading. The ventilatory response to CO2 was reading averaged 1 liter/min per mm Hg increase in end-tidal CO2 partial pressure compared to 3.6 during spontaneous breathing. The increase in ventilation was brought about by an increase in flow during phonation and by the introduction in five of the subjects of quick nonphonated expirations, usually at the end of a phrase. The frequency and relative duration of inspiration did not change. (Author)

A72-15219


The effect of chronic exercise on plasma corticosterone and on the adrenal cortex was studied in the rat. Groups of male rats were exercised on a treadmill for 2, 4, 6, and 8 weeks. Chronic exercise was found to increase the resting levels of plasma corticosterone after 2 and 4 weeks. After 6 weeks these levels returned to near normal and were normal after 8 weeks. Both the trained and control rats after 8 weeks had similar high levels of corticosterone after an exhaustive exercise bout. The response of the adrenal cortex to exercise was similar to that of other stressors. The adrenal cortex was still responsive after long-term chronic exercise even though the plasma corticosterone levels were low at rest. The width of the zona fasciculata of the adrenal cortex increased significantly in trained rats and was responsible for the adrenal hypertrophy and the increased width of the adrenal cortex observed. (Author)

A72-15220


Neurophysiological and psychological effects of subanesthetic concentrations of cyclopropane, diethyl ether, methoxyflurane, and ethane were studied in healthy human volunteers. Cerebral somato-sensory potentials were evoked by ulnar nerve stimulation. All drugs studied preferentially suppressed long-latency components. Cyclopropane usually reduced direct lemniscal activity, while diethyl ether and the halogenated ethers had little effect. Methoxyflurane and ethane produced bursts of 14- to 20-Hz activity in the EEG. Diethyl ether had a similar but less marked effect. Cyclopropane was unique in producing 4- to 7-Hz activity. Only the halogenated ethers elevated sensory thresholds. All drugs impaired ability to concentrate and affected time perception. Ether alone produced amnesia. Chemically different anesthetics thus produce differential neuro-physiological and psychological effects. (Author)

A72-15221


Description and evaluation of a new method which demonstrates the feasibility of quantifying the changing viscoelastic parameters of isometric frog sartorius muscle at rest and throughout contraction using pseudo-random white noise vibrations. Displacements as small as 0.06% of sub zero disturb the cross bridges and other fine structures in a minimal way while identifying a muscle model in successive periods as brief as 50 msec. One elastic and one viscous element that derive their nonlinear properties from the contractile myofibrillar machinery were found for the resting and active states of this muscle. The analyses also defined a component corresponding to the conventional series elastic element and permitted measurement of the tension propagation velocity which reflected the mean elastic modulus in the frequency range from 2.5 to 670 Hz. Force-velocity characteristics and the time variation of the internal force generator may be derived from these results. (Author)

A72-15222


Comparison of the sensitivity of four methods used to measure respiratory flow resistance. Small changes in flow resistance in human subjects were induced with sulfur dioxide (SO2), an irritant gas. Before, during, and after the exposure the flow resistance was determined by the following methods: esophageal catheter, plethysmographic (DuBois), forced pressure oscillations, and airway interrupter method. The first method estimates total pulmonary flow resistance; the second estimates airway resistance alone; the third estimates total respiratory resistance - i.e., lungs plus chest wall; and the fourth estimates total pulmonary flow resistance plus some fraction of chest wall resistance. Thus, all four methods are responsive to changes in airway caliber. Insofar as SO2 affects only the latter, it might be expected that the absolute changes seen with these methods are identical. On the other hand airway resistance, once it becomes elevated, may vary as a function of frequency. Since the four methods rely upon widely different cycling frequencies, they in turn might be expected to register different degrees of change. It is found that the absolute changes in flow resistance...
during exposure to SO2 did vary among the methods. The changes were inversely correlated with the cycling frequencies. Nevertheless, once the variance or ‘error’ of each method and the volume history of the lungs prior to each measurement were taken into account, three of the methods showed nearly comparable sensitivities. The fourth, the interrupter method, appeared to be the least sensitive to change. (Author)


Different criteria for separating the electrical activity of multiple single muscle units recorded with the same microelectrode are discussed, and a simple multichannel spike height discriminator is presented which uses state-of-the-art integrated circuitry. Several advantages of the device are (1) its accuracy, fast response time, and high noise immunity; (2) its low cost and ease of construction; and (3) its multichannel capability. (Author)


Gel filtration and radioimmunoassay were used to determine the molecular size and immunoneurochemical reactivity of parathyroid hormone present in gland extracts, in the general peripheral circulation, and in parathyroid effluent blood from patients with hyperparathyroidism, as well as from calves and from cattle. It was found that parathyroid hormone secreted from the parathyroids in man and cattle is at least as large as the molecule extracted from normal bovine glands. However, once secreted into the circulation the hormone is cleaved, and one or more fragments, immunologically, dissimilar to the originally secreted hormone, constitute the dominant form of circulating immunoreactive hormone. G.R.


Comparison of the variation of the functional state indices of the central nervous system and the motor apparatus in young people after measured mental and physical work. Short-term mental work is found to have a certain beneficial effect both on the indices of the central nervous system and on the state of the motor apparatus. More prolonged mental work causes deterioration of the investigated indices. A muscular load in a range of small physical stresses which do not cause extreme fatigue of the motor apparatus improves the indices of the central nervous system. The results of a correlation analysis show that certain relations are observed between variations in the parameters of the central nervous system and the motor apparatus during both mental and physical labor. A.B.K.


Study of the intercentral relations in chronic experiments on cats and dogs in various poses and during motor activity, according to the bioelectric activity index. The cross-correlation function method is used to study these relations, and two types of connections are distinguished - pulsed and cyclic. A variation of the relation between the bioelectric processes of the cortex and certain deep structures of the brain is noted in various poses and during motor activity. The most noticeable variations are those of connections between structures which pertain to the realization of motor activity and between the motor cortex and these structures on the side of the moving extremity. A.B.K.


Experimental study of the variation of the basic hemodynamic indices of unanesthetized dogs during hypoxia at rest and during muscle activity performed in the presence of normal and reduced O2 contents in the inhaled air. The hemodynamic shifts are compared with variations in the oxygen parameters of the blood. It is found that both physical exertion and a decrease in the O2 content in the inhaled air lead to qualitatively similar but quantitatively different changes in the basic hemodynamic parameters. It is suggested that the mechanisms of the hemodynamic shifts occurring during motor activity and hypoxia are of common nature. It is thought that this may serve as a confirmation of notions concerning the role of a decrease in the oxygen partial pressure in the blood and tissues in mechanisms of development of hemodynamic variations during muscle activity. A.B.K.


Study of the coagulating and anticoagulating blood systems in 226 men subjected to emotional stress during parachute jumps. It is found that during preparation for a jump and immediately after one changes in the coagulating and anticoagulating blood systems occur which lead to a state of hypocoagulation. In particular, a statistically meaningful increase in the plasma recalification time is observed, as well as a decrease in the prothrombin index, an increase in the heparin time and number, and an increase in fibrinolytic activity. A.B.K.


Study of the reactions of dogs of various ages to a stepwise ascension in a pressure chamber to altitudes from 1 to 13 km and to
an abrupt ascension to altitudes of 7 and 10 to 13 km. It is shown that the initial homeostasis during all forms of ascension is retained longer in adult dogs than in puppies 1 to 15 days and 18 to 60 days old. On the other hand, the altitude ceiling and the survival time of adult dogs are less than those of puppies 1 to 15 days old. It is concluded that it is necessary to distinguish between the concepts and criteria of resistance (with respect to length of retention of homeostasis) and endurance (with respect to differences in altitude ceiling and survival time in a state of collapse). A.B.K.

A72-15235


Evaluation of recordings of the afferent impulses in the sciatic nerve of frogs and rabbits during prolonged (1 hour) sinusoidal vibration of the foot (vibration frequencies from 25 to 350 Hz). A synchronism between the responses of the receptors to vibratory stimulation is noted in frogs subjected to an hour-long excitation at frequencies from 25 to 40 Hz and in rabbits at frequencies from 25 to 300 Hz. At increasingly higher frequencies, the duration of synchronous responses is shortened proportionately, until finally synchronous responses are observed only during the first seconds of excitation.

A72-15248


New techniques were used in which language stimuli, in the form of word and nonsense syllable trigrams, were presented visually and the evoked cortical responses from scalp electrodes were analyzed by appropriate electroencephalographic and computer techniques. Visual evoked responses (VERs) from word stimuli and nonsense stimuli were compared, and responses from left and right cerebral hemispheres were evaluated to see if there were differences between the dominant and nondominant sides. In the initial studies, the word stimuli were relevant to a problem-solving task, and the nonsense syllables were not. The problems of correlating VERs with meaningfulness, task relevance, and other psychophysiological variables were investigated further. The basic long-term objective was to develop a neurophysiological test for studying reading disabilities.

A72-15249


Adult responses from cochlea and cochlear nucleus were recorded in cats through gross electrodes, using stimulus conditions under which masking effects had been demonstrated with human subjects. With successive intensity increments of the noise masker relative to the tone stimulus, the neural "frequency-following response" (FFR) showed a significantly greater diminution in amplitude than did the cochlear microphonic. In order to explore further the neural mechanisms involved, experiments were performed to study the activity of single cells in the cochlear nucleus under the same stimulus conditions. Cells that fired in phase-locked fashion to the tone frequency showed progressive desynchronization with increasing intensity of the noise masker. These results support the hypothesis that the noise preempts the activities of units which would otherwise be part of the phase-locked neural population contributing to the grossly recorded FFR envelope.

A72-15250


Blink reflexes were studied in man during the sleep-wakefulness cycle and in wakefulness in relation to the vigilance level and emotional state. Mono- and polysynaptic responses to electrical stimuli to the supraorbital branch of the fifth nerve were recorded electromyographically from orbicularis oculi. Electrical cerebral activity, eye movement, supraventricular muscle activity, electrocardiogram, and skin resistance were monitored at the same time. The obtained data reveal the particular functional situation of the reflex arcs controlling the facial muscles supporting mimetic expression.

A72-15251


Responses from cochlea and cochlear nerve nuclei were recorded in cats through gross electrodes, using stimulus conditions under which masking effects had been demonstrated with human subjects. With successive intensity increments of the noise masker relative to the tone stimulus, the neural "frequency-following response" (FFR) showed a significantly greater diminution in amplitude than that of the cochlear microphonic. In order to explore further the neural mechanisms involved, experiments were performed to study the activity of single cells in the cochlear nucleus under the same stimulus conditions. Cells that fired in phase-locked fashion to the tone frequency showed progressive desynchronization with increasing intensity of the noise masker. These results support the hypothesis that the noise preempts the activities of units which would otherwise be part of the phase-locked neural population contributing to the grossly recorded FFR envelope.

A72-15252


The localized cooling produced at the tip of a cryogenic probe, which is insulated by a vacuum jacket up to about 1 mm from its extremity, is controlled by a closed circuit apparatus. The apparatus regulates the fluid expansion and gives the desired cooling temperatures with a precision of 1 C. At the tip of the probe inserted in the brain, the range of cooling extends from -20 to +20 C. Any particular level of cooling is reached within 5 sec, and the return to 37 C is within 10 sec.

A72-15253


A neuroelectric signal recognition system is described that uses a laboratory computer which fully compensates for such sources of variation as (1) small random changes, (2) slow trends in a given unit, and (3) interference potentials of simultaneously occurring units. The system possesses a very reliable sorting capability and can be readily integrated with existing laboratory setups since it requires no special peripheral equipment.

Discussion of the results of a kinetic analysis of spore survival as a function of water activity, aimed at shedding light on the nature of water activity's role in dry heat sterilization. The results obtained suggest that the role of water activity may be that of altering molecular stability through changing the entropy of activation with water activity changes.

M.V.E.


Bacillus subtilis var. niger spores were placed on the surfaces of test coupons manufactured from typical spacecraft materials including stainless steel, magnesium, titanium, and aluminum. These coupons were then juxtaposed at the inoculated surfaces and subjected to test pressures of 0, 1000, 5000, and 10,000 psig. Tests were conducted in ambient, nitrogen, and helium atmospheres. While under the test pressure condition, the spores were exposed to 125 C for intervals of 5, 10, 20, 50, or 80 min. Survivor data were subjected to a linear regression analysis that calculated decimal reduction times.

G.R.


Progress in modeling the mechanical response of man exposed to various environmental forces is discussed. Starting with a mathematical description of the mechanical and physical characteristics of the integument, soft and hard tissue, the approaches taken and results obtained from modeling various integrated elements such as the human vertebral column under vibration and impact loads, the chest, and respiratory system under vibratory and blast loads and of the whole body system for selected force input conditions and locations are reviewed. To derive a capability of modeling specific injury modes or experimentally observed probabilities of injury curves for various parenchymatous and hollow organs as a function of the force input variables, more detailed and specialized models are being used such as, for example, the lumped parameter, discrete parameter, and continuum model of the spine or models considering nonlinear tissue behavior.

M.M.


An amoebe, Hartmannella castellanii, which possesses many features typical of higher-order animal cells, was irradiated with 1-MHz ultrasound while suspended in ordinary growth medium and in one with increased viscosity. The ultrasonically produced cavitation was monitored and a strong correlation is found between the number of discrete cavitation events occurring and the decrease in cell numbers, on irradiating at 515 W/sq cm for 10 min. The growth of treated cells was also examined.

(Author)


Stimulation at several mesencephalic and diencephalic sites abolished responsiveness to intense pain in rats while leaving responsiveness to other sensory modes relatively unaffected. The peripheral field of analgesia was usually restricted to one-half or to one quadrant of the body, and painful stimuli applied outside this field elicited a normal reaction. Analgesia outlasted stimulation by up to 5 minutes. Most electrode placements that produced analgesia also supported self-stimulation. One placement supported self-stimulation only in the presence of pain.

(Author)


The effects of exercise on the pulmonary circulation were studied in seven experiments of five dogs. Pulsatile pulmonary arterial flow and pressure and left atrial pressure were measured by chronically implanted transducers. Pulmonary vascular input impedance, resistance, and hydraulic power were computed. The average effects of running on a treadmill at 6.5 mph, as compared with the resting state, were an increase in cardiac output from 2.59 liters/min to 5.30 liters/min, and a rise in mean pulmonary arterial pressure from 18 mm Hg to 28 mm Hg.

G.R.

A72-15465 * Mechanism of pulmonary conversion of angiotensin I to angiotensin II in the dog. S. Oparil, G. W. Tregear, T. Koerner, B. A. Barnes, and E. Haber (Harvard University; Massachusetts General Hospital, Boston, Mass.). Circulation Research, vol. 29, Dec. 1971, p. 682-690. 28 refs. Research supported by the John A. Hartford Foundation; NIH Grants No. HE-14150-01; No. 5-F03-HE-44850-02; Grant No. NGR-22-016-007.

The conversion mechanism was studied in vivo in the pulmonary circulation of the intact anesthetized dog and in vitro in plasma by using L-Leu-angiotensin I, D-Leu-angiotensin I, and des-Leu-angiotensin I which had been synthesized by the solid-phase technique. The results obtained indicate that pulmonary conversion in vivo and plasma conversion in vitro occur via a dipeptidylcarboxypeptidase and that a D-amino acid at the C-terminus prevents conversion.

G.R.


Investigation of the effects of blood viscosity on dissipation as well as dispersion of small waves in arteries and veins by means of a parametric study. A linearized analysis of axisymmetric waves in a cylindrical membrane that contains a viscous fluid indicates that there are two families of waves: a family of slow waves and one of fast waves. The faster waves are shown to be more sensitive to variations in the elastic properties of the medium surrounding the blood vessels and at high values of the frequency parameter alpha. At low values of alpha the effects of viscosity on attenuation are reversed.

F.R.L.
A72-15467


Comparison of previously described theoretical predictions with in vivo data from anesthetized dogs. It is shown that the observed attenuation of the pressure and axial waves cannot be accounted for by fluid viscosity alone. For large values of the frequency parameter alpha, the previous analysis is extended to include the effects of viscoelasticity model while the attenuation per wavelength is

V.Z.

A72-15516


Evidence is given for photorecovery of Anacystis nidulans after exposures to Co 60 gamma radiation. After irradiation the levels of viable cells were higher in cultures kept in white light than in cultures kept dark for 24 hr. The post-irradiation survival rate increase after 30-min exposures to visible light is demonstrated in cultures irradiated with 35 krad. An increase in survival rates was not observed after exposures to ‘red’ light.

V.Z.

A72-15546


Unidirectional active and passive fluxes of K and Na were measured in red blood cells of ground squirrels (hibernators) and guinea pigs (nonhibernators). As the temperature was lowered, ‘active’ (ouabain-sensitive) K influx and Na efflux were more considerably diminished in guinea pig cells than in those of ground squirrels. The fraction of total K influx which is ouabain-sensitive in red blood cells of ground squirrels was virtually constant at all temperatures, whereas it decreased abruptly in guinea pig cells as temperature was lowered.

M.V.E.

A72-15581


Sound was used as a conditioned stimulus and 0.5, 3 and 6-sec light signals were used as reinforcing unconditioned stimuli in a study of the generation and storage of trace responses in 36 subjects 14 to 24 years old. Observations of galvanic skin reactions indicated a longer persistence of trace responses after 0.5 and 6-sec light signals than after 3-sec light signals. Skin reactions vanished quickly when the subjects closed their eyes during exposures to 3-sec light stimuli.

V.Z.

A72-15582


Demonstration that a conditioned reflex is a component of a conditioned-unconditioned reflex system which controls the development of adaptive behavioral patterns. Experiments are conducted to show that a natural conditioned reflex is an intermediate component of such reflex systems. The usefulness of a study of such systems for the understanding of complex higher nervous activity forms is pointed out.

V.Z.

A72-15583


Conditional motor reflexes were investigated in four baboon apes with extirpated and separated sections of Lobus frontalis. The effect of this damage on the higher nervous activity of the animals was manifested in a disturbed sense of relationship to each other, in an upset communication capability and in emotional behavior. A stimulated motor activity and alimentary reflex excitation were also apparent in the operated apes.

V.Z.

A72-15584


Description of a technique for estimating the prevalence of the right ear in a hearing process when different words are delivered simultaneously to both ears. The right ear prevalence was 15.4% in a group of 24 healthy subjects examined by this technique. The left ear prevalence rates in individual subjects are discussed.

V.Z.

A72-15585


Actographic observations of night sleep in parkinsonism patients prior to and after electric current applications to the ventrolateral and dorsomedial nuclei of the optic thalamus, to the nucleus caudatus, to the globus pallidus and to the internal capsule. Decreased duration of deep sleep was observed after neuron population stimulation in Globus pallidus and ventrolateral nucleus.

V.Z.

A72-15586


74
The effect of phenamine and aminazine injections was investigated in a group of emotionally unstable subjects who were brought in a state of emotional stress by disturbing oral information. A relation is established between the perception characteristics of the subjects and the inherent excitability of their adrenoreactive structures.

V.Z.


Description of a technique for examining the visual perception of a rotating kymographic drum by the human eye. The drum, covered with millimeter graph paper, is observed through a slot in a screen during rotation in either direction, intermissions and reversed rotation at different speeds and exposure times. The images of the subject are recorded during and after exposures.

V.Z.


The mechanics of contraction of regional areas of the myocardium were examined during transient ischemia and reoxygenation in 10 open-chested anesthetized dogs. Following reoxygenation, there was an increase in the duration of contraction and relaxation time, together with a slight overshoot in force development in the left anterior descending coronary artery (LAD). Repeated or prolonged episodes of ischemia produced local contractile alternans in the LAD area, associated with pulsat alternans. Thus, the results of this study demonstrate that the segmental alteration of contractile force induced by ischemia and reoxygenation may produce local asynchrony and pulsat alternans by virtue of changes in force development, the duration of contraction and relaxation, and segmental patterns of contractile alternans.

M.M.


Short-term hypothermic animals, resting tension was increased while peak isometric tension, generated tension after 10 min of anoxic exposure, glycogen, and catecholamines were all reduced. All of the functional parameters recovered in the long-term hypothermic group, while glycogen and catecholamines showed a trend toward recovery. It is concluded that myocardial hypoxia develops during induction into hypothermia when using the helium-cold method. This effect is reversible and hypoxic damage does not increase as the hypothermic exposure is prolonged.


The basal level of mean renal nerve activity (MRNA-0) measured in anesthetized cats was found to be modified by the additive interaction of hypothalamic and baroreceptor reflex influences. Data were collected with four major baroreceptor nerves either intact or cut, and with mean aortic pressure (MAP) either clamped with a reservoir or raised with L-epinephrine. With intact baroreceptor nerves, MRNA stayed essentially constant at level MRNA-0 for MAP below an initial pressure P1, and fell approximately linearly to zero as MAP was raised to P2. Cutting the baroreceptor nerves kept MRNA at MRNA-0 (assumed to represent basal central neural output) independent of MAP. The addition of hypothalamic stimulation produced nearly constant increments in MRNA for all pressure levels up to P2, with complete inhibition at some level above P2. The increments in MRNA depended on frequency and location of the stimulus. A piecewise linear model describes MRNA as a linear combination of hypothalamic, basal central neural, and baroreceptor reflex activity.

(Author)


Hypothermia was induced in the golden hamster Mesocricetus auratus, using the helium-cold method. The first group of hamsters was sacrificed immediately after induction to rectal temperature 7°C. A second group was sacrificed after being maintained at a body temperature of 7°C for 18-24 hr, and a third group consisted of unexposed controls. The hearts were excised and the ventricles analyzed for hypoxic damage, glycogen, and catecholamines. In the short-term hypothermic animals, resting tension was increased while peak isometric tension, generated tension after 10 min of anoxic exposure, glycogen, and catecholamines were all reduced. All of the functional parameters recovered in the long-term hypothermic group, while glycogen and catecholamines showed a trend toward recovery. It is concluded that myocardial hypoxia develops during induction into hypothermia when using the helium-cold method. This effect is reversible and hypoxic damage does not increase as the hypothermic exposure is prolonged.


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(Author)
Their tolerance to an altitude test remained unchanged. Author

A noticeable loss in their capacity for performing muscular work. substantial weight losses due to a decrease in muscle mass and the 30th-60th day of hypokinesia. The rats also revealed regional oxygen consumption in muscles by the 90th-100th day. hypokinesia exhibited a distinct acceleration of gas exchange and experiment gas exchange increased and immediately returned to clearly pronounced by the 30th day. By the end of the dogs showed a decrease in gas exchange which was most tolerance of animals. During an exposure to 60-day hypokinesia performed to determine work capacity and acute hypoxia gated. On the 120th day of hypokinesia. functional tests were

Avail: NTIS

Changes in enzymic activity of liver homogenate fractions of CHANGES IN THE ACTIVITY OF ASPARTATE AMINOTRANSFERASE AND MITOXHONDRIAL MEMBRANES IN RESPONSE TO ACCELERATIONS L. A. Rubaskina and I. D. Yertanov In its Space Biol. and Med.. vol. 5. no. 4, 1971 3 Nov. 1971 p 19-26 refs

Avail: NTIS

It was found that the activity of aspartate aminotransferase in the serum of humans exposed to transverse accelerations of 12 g for 35 sec and rats centrifuged at 36 g for six minutes decreased. During exposures of lesser intensity the value increased. The changes in enzymic activity of liver homogenate fractions of animals gave evidence that aspartate aminotransferase molecules may pass from mitochondrial membranes into the blood stream during exposures to accelerations up to 25 g for six minutes and remain fixed to them during exposures up to 36 g. Author

N72-119997# Joint Publications Research Service, Washington, D.C.


Avail: NTIS

Streptococcal flora transfer between subjects during a 15-day isolation was studied. Confinement in a small enclosed volume was characterized by microbial transfer from one man to another. The test subjects exhibited no significant changes in antihyaluronidase and anti-o-streptolysine titers during the experiment.

N72-119995# Joint Publications Research Service, Washington, D.C.


Avail: NTIS

The radiation monitoring activities in preparation for and during the Soyuz 9 flight are described. Solar radiation, bursts, flares, and sunspots, and cosmic ray radiation were observed. The dosimetry was performed onboard the spacecraft and also by the earth satellite Molniya 1. The total dose of cosmic radiation in the spacecraft was 195 Mrad with a dose intensity of 11 Mrad/day. N.E.N.

N72-119996# Joint Publications Research Service, Washington, D.C.

RELATIONSHIP BETWEEN THE THRESHOLDS OF CUPULAR ENDOLYMPHATIC SYSTEM RESPONSE AND HUMANS TOLERANCE TO MOTION SICKNESS B. I. Polyakov and A. D. Matveev In its Space Biol. and Med., vol. 5. no. 4, 1971 3 Nov. 1971 p 45-52 refs

Avail: NTIS

Response thresholds to angular and Coriolis accelerations (as evidenced by illusory sensations and nystagmus) to 65 test subjects were compared with their tolerances to repeated exposures to Coriolis accelerations of special configuration. The correlation coefficients between the threshold of response to Coriolis accelerations as evaluated from nystagmus and tolerance to accumulated Coriolis accelerations was 0.306 (P > 0.95). Mean values of response thresholds of test subjects with different tolerances to accumulated Coriolis accelerations could not be reliably discriminated. The results give evidence that data on the thresholds of cupular-endoendyphatic response are of low prognostic significance with respect to human motion sickness tolerance. They also indicate a need for differentiating the concepts of vestibular excitation and vestibular tolerance when making professional screenings of astronaut candidates.

N72-119992# Joint Publications Research Service, Washington, D.C.

CHANGES IN THE ACTIVITY OF ASPARTATE AMINOTRANSFERASE AND MITOXHONDRIAL membranes in RESPONSE TO ACCELERATIONS L. A. Rubaskina and I. D. Yertanov In its Space Biol. and Med., vol. 5. no. 4, 1971 3 Nov. 1971 p 19-26 refs

Avail: NTIS

It was found that the activity of aspartate aminotransferase in the serum of humans exposed to transverse accelerations of 12 g for 35 sec and rats centrifuged at 36 g for six minutes decreased. During exposures of lesser intensity the value increased. The changes in enzymic activity of liver homogenate fractions of animals gave evidence that aspartate aminotransferase molecules may pass from mitochondrial membranes into the blood stream during exposures to accelerations up to 25 g for six minutes and remain fixed to them during exposures up to 36 g. Author

N72-119994# Joint Publications Research Service, Washington, D.C.

STUDY OF SELECTIVITY IN ADAPTATION TO CORIOLIS AND LINEAR ACCELERATIONS B. B. Bolokhov, V. P. Buranova, and A. A. Guyev In its Space Biol. and Med., vol. 5. no. 4, 1971 3 Nov. 1971 p 53-58 refs

Avail: NTIS

The effect of habituation to one of three tests (including Coriolis and linear accelerations) on tolerance to the other two
was studied. The experiments revealed a nonspecific increase in
tolerance to those tests to which no adjustment was acquired.

EXTERNAL RESPIRATION AND GAS EXCHANGE DURING A PASSIVE ORTHOSTATIC TEST
B. S. Katkovskiy In its Space Biol. and Med., vol. 5, no. 4, 1971
3 Nov. 1971 p 77-84 refs
Avail: NTIS
Most parameters of exhalation and gas exchange, which were measured during 33 orthostatic tests involving 30 minutes
standing, varied significantly. Causes of hyperventilation and exhalation lag with subsequent changes of respiratory frequency
and depth are discussed as factors responsible for the lack of significant changes in some external respiration parameters.
The necessity of registering external respiration and gas exchange during orthostatic tests is emphasized for clarifying the
mechanisms underlying the homeostasis maintained when man is in an erect position. The need for registering the CO2
goingence in healthy and sick people during orthostatic

N72-12002# Joint Publications Research Service, Washington, D.C.
HYPODYNAMIA AND HORMONAL ACTIVITY
I. V. Fedorov In its Space Biol. and Med., vol. 5, no. 4, 1971
3 Nov. 1971 p 85-89 refs
Avail: NTIS
Data in the literature on changes in the production of hormones (corticosteroids, adrenalin, adrenocorticotrophic

N72-12003# Joint Publications Research Service, Washington, D.C.
ODORMETRIC EVALUATION OF POLYMERS USED IN CONSTRUCTING ISOLATION CHAMBERS
c05
0. N. Shevkun, E. I. Semenenko, Ye. I. Kosterina, and G. A.
Gagiyev In its Space Biol. and Med., vol. 5, no. 4, 1971
3 Nov. 1971 p 90-96 refs
Avail: NTIS
Methods for determining odor thresholds by dynamic and static techniques are described, and it is found that the modified
static method is advantageous. Experimental data are given on odorometric and chemical investigations of polymers and
lacquer-stain coats indicating the relationship between the odor level and the concentration of toxic compounds in the gaseous
phase. It is recommended that the method be used for screening polymers and selecting the materials with the best hygienic

N72-12004# Joint Publications Research Service, Washington, D.C.
DETERMINING MICROELEMENTS IN HUMAN FOOD RATIONS AND EXCRETA USING THE EXTRACTION METHOD
3 Nov. 1971 p 97-102 refs
Avail: NTIS-
An analytical method is described which was used in studying the elimination of microelements by subjects eating a
diet of dehydrated foods during a year of confinement in an isolation chamber. A mixture of hexamethylene ammonium
reagents and 8-oxychinoline and a mixture of solvents, chloroform,

and isobutyl alcohol were used. The optimum ratios and pH of the mixtures are given for the different trace metals.
N.E.N.
N72-12005### Joint Publications Research Service, Washington, D.C.
METHOD FOR DETERMINING SEROTONIN (5-HYDROXYTRPTAMINE) IN THE BLOOD BLOOD OF RATS
Avail: NTIS
A method is presented for determining the blood 5-HT, using acidic butanol in the first stage of extraction. A clean quartz vessel is used for collecting blood and precipitating proteins. The sensitivity of the procedure is 0.01, the accuracy is 5, and the return of the added serotonin is 94% to 98%. N.E.N.

N72-12006### Joint publications Research Service, Washington, D.C.
METHOD FOR PROCESSING MUSCLE BIOPOTENTIALS FOR INPUT INTO AN ELECTRONIC COMPUTER
Avail: NTIS
Instrumentation for isolating the most important characteristics of muscle biopotentials and representing the results in a form convenient for the computer is described. For each of the electromyograms there is an amplitude channel, a frequency channel, and a general synchronism channel. The circuitry is diagrammed and the error in the automatic processing exceeded 3% to 5% only when there was a marked change in the E.M.S. frequency or amplitude.

N72-12007### Joint Publications Research Service, Washington, D.C.
USE OF AUTOMATIC VOLUME CONTROL IN SYSTEMS FOR REGISTERING PHYSIOLOGICAL FUNCTIONS c05
Avail: NTIS
An automatic volume control system is described which registers complex signals with a broad frequency spectrum on an ultrasonic Doppier cardiogram. The circuitry is diagrammed and the operation is outlined. The control system is also suitable for processing phonocardiogram, sphygmogram, and other physiological signals.

N72-12008### Joint Publications Research Service, Washington, D.C.
STUDY OF VESTIBULAR REACTIVITY USING A GALVANIC CURRENT
Avail: NTIS
The vestibular reactivity in humans to a galvanic current was investigated by applying discrete and increasing stimuli and constructing an excitability curve from stabiographic data. Stimuli of 0.5, 1, 2, and 4 mA were given for 1 sec duration with 3 minutes between them. The subjects stood with eyes closed and legs apart with the right leg in front of the left by a half-step. There is a direct, almost linear dependence between the mean amplitude of oscillations of the center of gravity and the strength of the stimuli during the first five seconds. The reaction of impaired stability dies out rapidly after the five seconds.

N72-12009### Joint Publications Research Service, Washington, D.C.
COORDINATION STRUCTURE OF HUMAN VOLUNTARY MOVEMENTS ACCOMPANYING STIMULATION OF THE HORIZONTAL SEMICIRCULAR CANALS BY ANGULAR ACCELERATIONS
Avail: NTIS
The results of a photocyclogrammetric study of the coordination of voluntary movements are presented. The subjects were exposed to negative angular accelerations (by stopping a rotating seat) in the plane of the horizontal semicircular canals. The ability to perform simple motor skills during the nystagmic reaction was observed. Effects of low accelerations were negligible, but the lack of skill after strong acceleration was marked.

N72-12010### Joint Publications Research Service, Washington, D.C.
MORPHOLOGICAL CHANGES IN THE CEREBRAL VASCULAR SYSTEM INDUCED BY TRANSVERSE ACCELERATIONS
Avail: NTIS
The morphological changes in brains of dogs subjected to transverse accelerations of 20 to 40 g on a centrifuge 4.75 m in radius are described in detail. After rotation, parts from different sections of the brain were fixed in formalin and Bouin's fluid. Parasmin sections 7 to 10 microns thick were stained with hematoxylin-eosin, chrome hematoxylin, and paraldehyde-fuchsin.

N72-12011### Research Triangle Inst. Durham, N.C.
ADVANCES IN MEDICINE FROM AEROSPACE RESEARCH
A program designed to find ways of transferring space technology to non-space medicine is discussed. The methodology used to attack the problem and several illustrative examples of the results are given.

N72-12012### Martin Marietta Corp., Denver, Colo.
EXPERIMENTAL SYSTEM FOR THE CONTROL OF SURGICALLY INDUCED INFECTIONS
The results are presented of the development tests performed on the experimental system for the control of surgically induced infections. Tests were performed on the portable clean room to demonstrate assembly, collapsibility, portability and storage. Collapsing, relocating and storing within the surgery room can be demonstrated. Smoke tests with simulated air flow velocity profile within the enclosure was measured. In the undisturbed area of the enclosure the air flow met the Federal Standard 209A requirements of 27.45 meters per minute + or - 6.10 meters per minute. Smoke tests with simulated surgery equipment and personnel in the enclosure did not
THE UTILIZATION OF THE ACHIEVEMENTS OF SPACE MEDICINE IN THE CARE OF PUBLIC HEALTH

General are presented. Emphasis is given to problems of hypokinesis, and suggestions are advanced for ways in which to cope with this modern problem. Authors

ALPHA-HYDROXYBUTYRIC DEHYDROGENASE OF THE RELATION BETWEEN LACTIC DEHYDROGENASE AND METABOLISM

functions. E.H.W. allows orderly, straightforward expansion to include exercise, metabolism (thermal stress), respiration, and other body functions. A computer program was written which were functions of flight duration. Experiments with plant seeds and animals (turtles) are also summarized. Author

THE UTILIZATION OF THE ACHIEVEMENTS OF SPACE MEDICINE IN THE CARE OF PUBLIC HEALTH

THE EFFECT OF VARIABLE CALCIUM AND VERY LOW CALCULI DIETS ON HUMAN CALCIUM METABOLISM


THE ROLE OF WATER IN THE GENESIS OF BIOLOGICAL ORGANIZATION


THE BASIC STEPS LEADING FROM ENERGY ABSORPTION TO BIOLOGICAL LESION ARE SUMMARIZED AND THE PRINCIPLE FEATURES OF RADIATION SICKNESS ARE DESCRIBED. DAMAGE TO THE DIGESTIVE SYSTEM IS EMPIRIZED. SPECIAL ATTENTION IS PAID TO THE EFFECTS ON THE ACTIVE TRANSPORT CAPACITY AND THE METABOLISM OF THE SMALL INTESTINE. ORIGINAL EXPERIMENTS SHOW A PROGRESSIVE INHIBITION OF Glucose ABSORPTION DURING THE 5 HOURS FOLLOWING X-IRRADIATION. AFTER 600 r, AN INITIAL DECREASE IS FOUND, THEN AN INCREASE, LATER A PROGRESSIVE INHIBITION. THE EFFECTS ARE THE SAME WITH TOTAL BODY OR ABDOMEN IRRADIATION, BUT THEY ARE NOT PRODUCED WHEN THE WHOLE BODY EXCEPT FOR THE ABDOMEN IS IRRADIATED. CYSTAMINE WHEN INJECTED BEFORE IRRADIATION HAS A VERY EFFECTIVE RADIOPROTECTIVE ACTION. THIRTY MINUTES AFTER IN VITRO IRRADIATION OF Everted sacks of jejunum the active transport of galactose is found to be inhibited. The O2 uptake of intestinal strips which were irradiated in vitro becomes, after 3 hours of exposure, much lower than that of the normal ones. This respiratory effect does not appear when irradiation was made in the presence of cystamine. Author
CURRENT INTERNATIONAL AVIATION STANDARDS FOR COLOURS AND FOR COLOUR PERCEPTION, AND THE INTERPRETATION OF THESE STANDARDS BY AUSTRALIA AND OTHER COUNTRIES ARE DESCRIBED. THE IMPORTANCE OF COLOUR CODING IN CHART AND PANEL DISPLAYS, IN SIGNAL RECOGNITION AND IN ASSESSMENT OF TERRAIN CONDITIONS IS EXAMINED. THE FARNSWORTH LANTERN, USED BY DCA AT PRESENT, IS A VALID TEST SELECT IN PRESENT CIRCUMSTANCES. THE CURRENT AIR TRAFFIC SIGNAL LAMP FILTERS AND CODE MIGHT BE IMPROVED. CHANGES TO THE CONVENTIONAL COLOUR CODE AND TO FILTER SPECIFICATIONS TO PERMIT NIGHT FLYING BY DEUTERANOPES ARE FEASIBLE IN PRINCIPLE AND PROBABLY ALSO IN PRACTICE; CORRESPONDING CHANGES FOR PROTOANOPES ARE MUCH MORE DIFFICULT.

THE CORPUSCLE VOLUME AND PLASMA VOLUME OF 16 TEST SUBJECTS WERE DETERMINED BY THE CHROMIUM-51 AND THE S.A. SYSTEM.

THE DYNAMICS OF VARIOUS RHYTHMS IN THE ELECTROCORTICOCGRAM OF A CAT ASLEEP AND AWAKE WERE STUDIED AT DIFFERENT PHASES OF SLEEP AND WAKEFULNESS BY TRANSFERRING THE CELLS IN THE EXPONENTIAL GROWTH PHASE, AT REGULAR INTERVALS OF 3 DAYS, TO A FRESH MEDIUM. RESPIRATION (MEASURED DURING A WHOLE CELL CYCLE OF 12 HOURS) WAS 20 + OR - 6 MICRON/H/MILLION CELLS ON (GM) AND 46 + OR - 7 MICRON/H/MILLION CELLS ON (L) MEDIUM. AT THE SAME TIME AS THE INCREASED RATE OF OXYGEN UPTAKE ON LACTATE MEDIUM, A GIANT CHONDRIOME WAS OBSERVED IN THE CELLS. ON GLUTAMATE-MALATE CONTAINING MEDIUM, THE SIZE OF MITOCHONDRIA WAS NORMAL.

THE FEASIBILITY, FUNCTIONALITY, AND OVERALL ACCURACY OF THE USE OF LITHIUM WERE INVESTIGATED AS A CHEMICAL TRACER IN URINE FOR PROVIDING A MEANS OF INDIRECT DETERMINATION OF TOTAL URINE VOLUME BY THE ATOMIC ABSORPTION SPECTROPHOTOMETRY METHOD. EXPERIMENTS WERE CONDUCTED TO INVESTIGATE THE PARAMETERS OF INSTRUMENTATION, TRACER CONCENTRATION, MIXING TIMES, AND METHODS FOR INCORPORATING THE TRACER MATERIAL IN THE URINE COLLECTION BAG, AND TO REFINE AND OPTIMIZE THE URINE TRACER TECHNIQUE TO COMPLY WITH THE SKYLAB SCHEME AND OPERATIONAL PARAMETERS OF +/- 2% OF VOLUME ERROR AND + OR - 1% ACCURACY OF AMOUNT OF TRACER ADDED TO EACH CONTAINER. IN ADDITION, A BACK-UP METHOD FOR URINE COLLECTION AND SAMPLING SYSTEM WAS DEVELOPED AND EVALUATED. THIS BACK-UP METHOD INCORPORATES THE TRACER TECHNIQUE FOR VOLUME DETERMINATION IN EVENT OF FAILURE OF THE PRIMARY URINE COLLECTION AND PREPARATION SYSTEM. ONECHEMICAL PRESERVATIVE WAS SELECTED AND EVALUATED AS A CONTINGENCY CHEMICAL PRESERVATIVE FOR THE STORAGE OF URINE IN EVENT OFFAILURE OF THE URINE COOLING SYSTEM.
EFFECTS OF RADIATIONS ON THE GENETIC SYSTEMS OF ORGANISMS IN RELATION TO THEIR PHYSICAL AND BIOCHEMICAL SYSTEMS Comprehensive Report, 1968

Mary L. Alexander 1971 29 p refs

(Contract AT(40-1)-3844)

(ORO-3844-7) Avail: NTIS

Males of Drosophila melanogaster were treated with 250 kV X-rays for studies on germinal mutations induced in the germ cell cycle. Rates for complete sex-linked lethal damage induced in various germ cells were determined. Complete and mosaic lethal rates in mature sperm, spermatids, spermatocytes, and spermatogonia are discussed. Genetic characteristics of X-ray induced mosaic lethals are described. Studies on induction of mutations in Drosophila by DNA feeding included genetic tests for sex-linked lethals, mosaic lethals, and autosomal recessive lethals. Dose rate studies on spermatogonial cells indicated that a large amount of genetic damage was expressed in the second and not the first generation after treatment. For studies on combined chemical and radiation treatments young males were injected with ethylenimine and given 1500 R X-rays. Results for autosomal recessive lethals showed that X-rays interfered with the mutagenic effect of ethylenimine one day after injection but not after four days. NSA

ACTION OF IONIZING RADIATION ON THE MOLECULAR BIOLOGY OF E. COLI

Ernest C Pollard and Anna Tilberg 1970 37 p refs

The effects of anoxia and genetic strain on the gamma radiosensitivity of DNA degradation and repair in Escherichia coli were investigated. Possible molecular reactions involved are discussed.

ACTION OF IONIZING RADIATION ON SENSITIVE STRAINS OF ECHERICHIA COLI

Ernest C Pollard and Anna Tilberg 1970 48 p refs

NYSSTAGMUS RESPONSE DURING ROTATION ABOUT A TILTED AXIS

Charles W. Stockwell, Gene T. Turnipseed, and Fred E. Guedry, Jr. 9 Mar. 1971 19 p refs

(IM Proc. 12.524.004)

(AD-726172; NAMRL-1129; USAARL-71-15) Avail: NTIS CSCL 06/19

A persistent horizontal nystagmus response is elicited when a man is rotated at constant velocity about an Earth-horizontal axis. This response comprises two components: a directional bias and a cyclic modulation of the bias level. Observations were made of the effects of three stimulus variables: rate of initial acceleration, rate of steady rotation, and angle of tilt of the rotation axis. Bias and cyclic modulation were affected differently by stimulus variables, especially by rate of steady rotation, suggesting the presence of two separate response mechanisms. Previous experiments indicate that both mechanisms depend upon the otoith system, although the possibility of a semicircular canal contribution remains. Thus it is reasonable to conclude that these response components provide a means of assessing the dynamics of otoith-regulated responses. Author (GRA)

NYSSTAGMUS AND VISUAL PERFORMANCE DURING SINUSOIDAL STIMULATION OF THE VERTICAL SEMICIRCULAR CANALS

Fred E. Guedry, Jr. and Alan J. Benson 10 Mar. 1971 22 p refs

(IM Proc. 12.524.004)

(AD-726173; NAMRL-1129; USAARL-71-16) Avail: NTIS CSCL 06/19

Men were positioned on their sides and oscillated sinusoidally about an Earth-vertical axis. Initially, nystagmus slow phase velocity was about equal during the forward-and backward-pitch halves of the stimulus cycle in darkness; but when subjects tracked a dimly illuminated aircraft instrument, slow phase velocity during forward pitch was about ten times that during backward pitch. Consequently, tracking errors were much greater during forward pitch. Change in luminance level from 0.01 ft-L to 1.0 ft-L produced small, statistically significant decrements in slow phase velocity and substantial improvements in tracking performance. Following this part of the experiment, nystagmus was again recorded in darkness. There was a differential decline in slow phase velocity, the slow-phase-down response showing significantly greater decline. Stimulus-response phase relations were also altered for the slow-phase-down response, but were unaltered for the slow-phase-up response. It is proposed that...
interactions between eyelid and eyeball movements caused
different frequencies of upbeating and downbeating nystagmus,
which, in turn, produced different visual suppression of slow
phase velocity in the two halves of the stimulus cycle. The asymmetrical visual suppression may have contributed to the
asymmetric habituation of the two reactions. Author [GRA]


The report advises the U.S. Navy concerning hearing conservation aboard future submarines. Included are criteria for
control at the source. Author (GRA)


A modified pattern recognition approach has been designed for use on a general purpose digital computer for all night epoch
by epoch sleep stage scoring. Comparison with experienced human scorers indicates an overall average agreement, for five
nights, of 85 percent. On the same records, the overall average agreement for the three human scorers was 91.3 percent. There
are five primary programs involved in the computer classification: (1) analog-to-digital conversion; (2) spectral analysis; (3) delta
measurement; (4) pattern recognition; and (5) REM logic to identify stage REM. The stages 3 and 4 classifications are
assigned by the delta measurement program. The pattern recognition program consists of two decision networks which separate stage 2, awake, and stage 1 or stage REM patterns. The stage 1 vs. REM dichotomy is performed later by the REM logic program. [GRA]


Results of investigations of physiological problems arising from exposure to high pressures, as in an underwater environment,
are summarized. [GRA]


An adequate model of piloted weapon delivery is needed in order to relate pilot tracking performance, and the aircraft
response to pilot command, to the overall accuracy of tactical weapon delivery. By modeling the entire pilot-aircraft
system xor the air-to-ground weapon delivery task, an
understanding of the interaction and relative importance of the various elements of the system can be obtained. With this
insight the designer is able to treat the correction or improvement of system deficiencies in a logical order of their importance to a
specific measure of system performance. A complete model of the piloted weapon delivery task is now possible through the
application of mathematical models of the human operator's
performance characteristics to the dynamic description of the
combined control-display-vehicle system. The approach taken is to
derive a linear expression for projectile impact error in terms of
the task variables which are directly under the pilot's control. A
statistical model of the propagation of these pilot-induced
errors into impact error is then developed by considering each of
the pilot inputs to be a random variable. A method for including
the effect of pilot compensation of an observed error in one of
the variables with an intentional deviation in another is also
introduced. An analytical model of the human pilot is used to
estimate the tracking error from the controlled-element dynamics
and the turbulence environment. Author [GRA]


Eight healthy male subjects were exposed to 100% oxygen for four hours at a simulated depth of 11-13 feet of seawater in a
wet compression chamber. No symptoms of central nervous system or pulmonary oxygen toxicity were observed. Four of the
subjects, however, demonstrated decreases in vital capacity
ranging from 137 to 786 ml BTPS following the exposure. These changes were believed to be due to atelectasis formation in the inert gas-free, immersed lung. Author [GRA]


1. COMPUTER ENGINEERING AND PROBLEMS OF AUTOMATION OF CONTROL V. M. Glushkov p 1-11
2. SPECTRAL ANALYSIS AND CYBERNETICS A. F. Plonskiy p 12-22
3. HORIZONS OF CHEMICAL TECHNOLOGY V. V. Kafarov p 23-35
4. ELECTROMAGNETIC FIELDS NEW STIMULI Y. A. Kholodov p 36-53
5. SIMULATION OF MEMORY S. N. Braynes p 54-66

construction. An example of spectral analysis applied to
electrocardiogram printouts is given. J.A.M.
Electromagnetic fields: New Stimuli

Yuri Andreyevich Kholodov In its Future of Sci. 29 Oct. 1971 p 36-53
Avail: NTIS
Electromagnetic fields are classified as isolated stimuli for the brain. Stimulus paths to the brain, electromagnetic field penetration into sensitive sphere, harmful effects, electromagnetic fields as an ecologic factor, specific stimulus, and direct effects on the brain are summarized. J.A.M.

Simulation of Memory

Samuil Natanovich Braynes In its Future of Sci. 29 Oct. 1971 p 54-66
Avail: NTIS
The theoretical field of biocybernetics is reviewed, including the general laws of controlling the self-organizing and self-regulating systems of the organism. A mathematical model is used to simulate the memory. The applied field of biological and medical cybernetics is used to derive improved methods of experimental data processing and analysis. J.A.M.

To Develop a Spectral Analyzer for Physiological and Medical Use

A. Iberall, S. Cardon, M. Weinberg, and A. Schindler Sep. 1971 21 p refs
A preliminary plan and procedure are presented for conducting an extended manned test program for a regenerative life support system. Emphasis will be placed on elements associated with long-term system operation and long-term uninterrupted crew confinement.

Definition Study for an Extended Manned Test of a Regenerative Life Support System, Preliminary Test Plan

Nov. 1971 163 p
(Contract NAS1-10790) Avail: NTIS CSCL 06K
A preliminary plan and procedure are presented for conducting an extended manned test program for a regenerative life support system. Emphasis will be placed on elements associated with long-term system operation and long-term uninterrupted crew confinement.

Definition Study for an Extended Manned Test of a Regenerative Life Support System Final Report

Nov. 1971 172 p
(Contract NAS1-10790) Avail: NTIS CSCL 06K
A program was defined which consists of extended ground-based manned tests of regenerative life support systems. The tests are to evaluate prototypes of advanced life support systems under operational, integrated conditions, thus providing data for the design of efficient environmental control and life support systems for use in long-duration space missions. The requirements are defined for test operations to provide a simulation of an orbiting space laboratory. The features of Phase A and B programs are described. These tests use proven backup equipment to ensure successful evaluation of the advanced subsystems. A pre-tests all-systems checkout period is provided to minimize equipment problems during extended testing and to familiarize all crew and operating staff members with test equipment and procedures.

Handbook of Human Engineering Design Data for Reduced Gravity Conditions

(Contracts NAS9-8640: NAS8-18117) Avail: NTIS HC $5.00/MF $0.95 CSCL 06B
A Handbook is presented for the use of engineers, designers, and human factors specialists during the developmental and detailed design phases of manned spacecraft programs. Detailed and diverse quantified data on man's capabilities and tolerances for survival and productive effort in the extraterrestrial environment are provided. Quantified data and information on the space environment as well as the characteristics of the vehicular or residential environment required to support man in outer space are also given.

Analytic Evaluation of Display Requirements for Approach to Landing

David L Kleinman and Sheldon Baron Washington NASA Nov. 1971 101 p refs
(ANASA-59622) Avail: NTIS CSCL 06B
A computerized analysis procedure, based on a control theoretic model of the human pilot, is used to evaluate display requirements for longitudinal control in the landing approach. The display employed a digitally generated, perspective runway image with a superimposed artificial horizon for pitch indication. System performance measures are obtained for the approach phase of a light aircraft and a DC-8; predictions are made as to the effects of several display modifications. It is found that augmenting the basic display with glide slope reference bars and a velocity aim point yields adequate performance in calm air. Under moderate turbulence, the augmented display appears to be adequate for a DC-8 approach but not for a light aircraft.

Experimental Basis of Several Methods of Preventing Unfavorable Effects of Weightlessness

Experiments dealing with the suitability of laboratory simulation of weightlessness in order to test various preventive measures against the unfavorable effects of weightlessness on human subjects are described. It is concluded that laboratory simulation, although not the final solution, is a step in the right direction.
N72-12051*
Colorado State Univ., Fort Collins.
STIMULATION OF CARDIOVASCULAR ADAPTABILITY DURING PROLONGED SPACE EXPOSURE Final Report
Harry A. Gorman 30 Jun. 1971 66 p refs
(Grant NGR-06-002-038; Proj. 1912)
Avail: NTIS CSCL 06S

The deconditioning effects of weightlessness on the cardiovascular system of astronauts are discussed. It is believed that man cannot tolerate indefinite exposure to weightlessness without considerable circulatory deterioration. Analyses of data collected from space flights to date substantiate these beliefs, and confirm the fact that some form of compensation must be provided to keep the cardiovascular system of space travelers properly conditioned. Sequential pulsatile devices were investigated to produce periodic hydrostatic pressure gradients in the venous system of eight subhuman primates. Intermittent venous pooling of blood in the extremities triggers and stimulates the vascular reflex mechanisms of the cardiovascular system that may have significant benefits in maintaining the circulatory system in proper tone under weightless conditions. Electrocardiograms, blood pressure measurements, cardiac output and stroke volume determinations were used to evaluate the efficiency of the described technique. Results were amazingly consistent to indicate an efficient system for intermittently exercising the heart within safe and medically acceptable limits.

N72-12052*
SPACE STATION/BASE FOOD SYSTEM STUDY. VOLUME 1: SYSTEMS DESIGN HANDBOOK Final Report
31 Dec. 1970 537 p ref
(Contract NAS9-11139)
(NASA-CR-115231; MS128W0010-Vol-1; MSC-01814-Vol-1)
Avail: NTIS HC S6.00/MF $0.95 CSCL 06H

A description is given of the approach used in a study to identify and define engineering data for a spectrum of possible items and equipment comprising potential food systems. In addition, the material presented includes: (1) the study results containing the candidate concepts considered and technical data, performance characteristics, and sketches for each of the concepts by functional area; (2) human factors considerations for crew tasks; (3) shuttle supply interface requirements; (4) special food system study areas; and (5) recommendations and conclusions based on the study results.

N72-12053*
SPACE STATION/BASE FOOD SYSTEM STUDY. VOLUME 2: SYSTEM ASSESSMENTS Final Report
31 Dec. 1970 257 p ref
(Contract NAS9-11139)
(NASA-CR-115229; MS128W0010-Vol-2; MSC-01814-Vol-2)
Avail: NTIS CSCL 06H

The evaluation modeling technique is described which was used to combine the candidate element concepts into systems that meet mission requirements. Results of the assessment are presented in terms of systems performance data and plots of system trade-off data by highest ranking variable.

N72-12054*
SPACE STATION/BASE FOOD SYSTEM STUDY. BOOK 1: ELEMENT CONCEPT DATA SHEETS
31 Dec. 1970 908 p ref
(Contract NAS9-11139)
(NASA-CR-115229; MS128W002-1; MSC-01816-Bk-1)
Avail: NTIS HC (individually priced)/MF $0.95 CSCL 06H

The detail engineering data sheets are presented for all concepts considered in the final phase of the study as well as those only carried through the interim phase due to non-applicability or deleted missions.

N72-12055*
SPACE STATION/BASE FOOD SYSTEM STUDY. BOOK 2: SUPPORTING TECHNICAL DATA 31 Dec. 1970 264 p ref
(Contract NAS9-11139)
(NASA-CR-115230; MS128W002-Bk-2; MSC-01816-Bk-2)
Avail: NTIS CSCL 06H

The formulae, assumptions, calculations, and supporting analyses for the element concept data sheets are given.

N72-12056*
National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MISHAPS WITH OXYGEN IN NASA OPERATIONS
Avail: NTIS CSCL 13L

Data from a substantial number of oxygen mishaps obtained from NASA and contractor records are presented. Information from several Air Force records, concerning oxygen accidents involving aircraft operations, are also included. Descriptions of the mishaps and their causes, for both liquid and gaseous oxygen in ground test facilities and space vehicle systems, are given. A number of safety regulations aimed at reducing the accident probability is discussed. The problems associated with material compatibility and materials testing are considered, and the limited information on factors affecting the ignition of materials in oxygen is presented. In addition, details are given of several of the accident/incidents listed in order to define the combination of conditions causing the mishap. In addition to propellant system mishaps, accident/incidents which occurred in space and ground system structures were included, as well as those in electrical systems, ground support facilities, ordinance, and related operations.

N72-12057*
Joint Publications Research Service, Washington, D.C.
EXTERNAL RESPIRATION, GAS METABOLISM, AND ENERGY EXPENDITURE IN THE CASE OF VARYING HUMAN ACTIVITY UNDER CONDITIONS OF WEIGHTLESSNESS
JPRS-54493: CSO-1850-SI
Avail: NTIS

Human external respiration, gas metabolism, and energy expenditure during performance of various tasks carried out under conditions involving brief periods of weightlessness are examined. Weightlessness was created during aircraft flights along parabolic trajectories, in a water medium, and on special floating stands. Results indicate that regardless of the way in which weightlessness was simulated, human energy expenditures on the performance of the same tasks were 22 to 42 percent higher than under ordinary conditions on the ground, both when the individuals being tested were normally dressed and when they wore special garments. A tendency was noted toward a decrease in the energy consumption rate under weightless conditions as the individuals being tested became accustomed to these conditions. It was concluded that the metabolic shifts observed are connected with the general nonspecific reaction of the organism to the influence of unusual physical factors (weightlessness), causing a disturbance of motion coordination.

N72-12058*
Joint Publications Research Service, Washington, D.C.
TOXICOCLOGICAL CHARACTERISTICS OF THE ARTIFICIAL ATMOSPHERE OF CLOSED ECOLOGICAL SYSTEMS
V. V. Kustov and L. A. Tyunov 19 Nov. 1971 29 p refs

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flights as a data source for experimenting with signal enhancement in frequency, and counting respiration rates. These techniques were based on waveforms, plotting histograms of heart rate versus time. Automatic means for counting heart rates, averaging electrocardiograms, and estimating cardiac output were conducted using physiological data from X-15 and X-15A flights. The results were reliable, and the data obtained during a 1000-flight study are described. To reduce the quantity of physiological data obtained during a 1000-flight study, a digital automatic data reduction techniques was used to reduce more than 2000 hours of physiological data recorded in flight.

Techniques developed to automatically process a large quantity of physiological data obtained during a 1000-flight study are described. To reduce this data reliably, a study was conducted using physiological data from X-15 flights as a data source for experimenting with signal enhancement and noise elimination techniques. These techniques include an automatic means for counting heart rates, averaging electrocardiogram waveforms, plotting histograms of heart rate versus time, and counting respiration rates. These techniques were used to reduce more than 2000 hours of physiological data recorded in flight.

An objective method of assessing information workload based on physiological measurements was developed. Informing a workload, or reserve capacity, was measured using a visual discrimination secondary task and subjective rating of task difficulty. The primary task was two axis (pitch and roll) tracking, and the independent variables in this study were aircraft pitch dynamics and wind gust disturbances. The study was structured to provide: (1) a sensitive, nonloading measure of reserve capacity, and (2) an unencumbering reliable measurement of the psychophysiological state. From these, a measured workload index (MWI) and physiological workload index (PWI) were extracted. An important measure of the success of this study was the working of the MWI and PWI as a comparison of actual performance with some reference: and (3) Absolute Measures, which are based on a comparison of actual performance with some reference; and (3) Relative Measures, which are based on relations among performance variables. The results show that the AMM system can be used to effect a systematic attack on the problems of pilot performance measurement using representative flight data. Face-validity of measures derived by the AMM is illustrated by the AMM. The results were analyzed to determine the practical capability of the AMM in automatically deriving measures and criteria. Flight data for a series of performances of the Lear 8 and Barrel Roll maneuvers were processed first by a set of Boolean functions. These functions describe the data in the form of Boolean time sequences (BTS), which are then operated upon by the AMM to derive three types of performance measures: (1) State Transfer Measures, which are based on overall trends in the performance; (2) Absolute Measures, which are based on a comparison of actual performance with some reference; and (3) Relative Measures, which are based on relations among performance variables. The results show that the AMM system can be used to effect a systematic attack on the problems of pilot performance measurement using representative flight data. Face-validity of measures derived by the AMM is illustrated by comparison with performance evaluations made by an instructor pilot.
and frostbite in environments to -65°F and 35 mph wind velocities. The mask provides physical compatibility with military clothing and equipment and will not occlude the field of vision. It weighs less than 2 1/2 ounces, covers the forehead, cheeks, nose, ears, chin and mouth, and is designed such that a single-size mask can adequately accommodate the U.S. Army population. Provisions are included to permit eating, smoking, relief of excess moisture accumulations, and elimination of oral and nasal body wastes. The mask is composed of a laminated insulating material facepiece, an oronasal thermal control barrier and an adjustable retention harness. The laminated material consists of a stretch nylon outer layer, a cotton jersey inner layer and an insulating interlayer. In the final configuration, mask models were produced using either a 1/4-inch polyurethane foam or a 3/8-inch polyester felt for the insulating interlayer. The laminated material has sufficient compliance and stretch to conform well to a wide range of facial contours. Author (GRA)


A SYSTEMS APPROACH TO C-130E AIRCREW TRANSITIONAL TRAINING. Final Report

Horace H. Valverde and Bob P. Burkett (Tactical Air Command, Little Rock AFB, Ark.) Mar. 1971 72 p refs (AF Proj. 1710)

The report describes the development and evaluation of a Tactical Air Command (TAC) C-130E transitional aircrew training program based on a systems approach. The systems approach to training emphasizes the importance of specifying objectives derived from a task analysis of the aircrew member's job. A training program was prepared to develop proficiency in the specific duties required of the C-130E pilot, co-pilot, and the flight engineer. The training program was designed to be highly job relevant and included multimedia and self-instructional materials. Training objectives were derived from a task analysis of the C-130E aircrew members' job requirements. Aircrew flight training course materials and various training media were prepared based on the specific end-of-course objectives. The training program was evaluated over a six-month period, revised as needed, and implemented by TAC in the USAF formal school for C-130E transitional training for all military services. The results were as follows: students in the new course achieved all training objectives; classroom instruction was reduced about 50%; flying hours were reduced from 45 to 35 hours; length of training was reduced 37% per trainee; pilots and co-pilots, graduates of the new course, were rated significantly higher by their supervisors than were graduates of the old course; there was no significant difference in ratings received by the two flight engineer groups; and verified annual savings of about five million dollars was realized. Author (GRA)

N72-13010*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

THE PILOT-AIRCRAFT INTERFACE

George E. Cooper In its Vehicle Technol. for Civil Aviation 1971 p 271-286 refs (See N72-12995 04-02)

Avail: NTIS HC $5.00/MF $0.95 CSCL 05E

The pilot-aircraft interface centers in the cockpit but is specifically represented by the means through which the pilot receives his information and through which he, in turn, controls or communicates with the aircraft and the environment. In any aircraft each of the pilot's channels of sensory perception is utilized in one way or another. The predominate input channel is visual. First an attempt to define the nature of the problem is made; then the state of technology in this area is briefly considered. Next, the requirements for applying this technology as well as that for assessing promising technology for application to the pilot-aircraft interface are examined. Then a review is made of the most important elements of technology which should be used during the 1970's and which will have a significant impact on the civil transport cockpit of the 1980's. Author

N72-13050# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.

EFFECTS OF INHALATION OF FREON 113 ON LABORATORY ANIMALS


Avail: NTIS CSCL 06T

Four monkeys, 8 dogs, 40 mice, and 50 rats were exposed continuously to 2000 ppm Freon 113 in a Thomas Dome for 14 days. This exposure produced no mortalities nor adverse symptomology. There were no significant alterations in hematological values, clinical chemistries, electroencephalographic findings, body weights, or organ to body weight ratios. The effect of 2% Freon 113 on nicotinic transmission through the stellate ganglion of the spinal dog was also evaluated. The exposure induced a reduction in nicotinic transmission comparable to 2% halothane. Author

N72-13051# Biospherics, Inc., Rockville, Md.

AUTOMATED MICROBIAL METABOLISM LABORATORY


The effect of several environmental parameters on previously developed life detection systems is explored. Initial attempts were made to conduct all the experiments in a moist mode (high soil volume to water volume ratio). However, only labeled release and measurement of ATP were found to be feasible under conditions of low moisture. Therefore, these two life detection experiments were used for most of the environmental effects studies. Three soils, Mojave (California desert), Wyaconda (Maryland, sandy loam) and Victoria Valley (Antarctic desert) were generally used throughout. The environmental conditions studied included: incubation temperature 3°C to 80°C, ultraviolet irradiation of soils, variations in soil/liquid ratio, specific atmospheric gases, various antimetabolites, specific substrates, and variation in pH. An experiment designed to monitor nitrogen metabolism was also investigated. Author

N72-13052# Academy of Sciences (USSR), Moscow.

METHODS OF SEPARATING BIOLOGICALLY IMPORTANT UNITS FROM THE ORGANIC MATTER IN SOILS

G. A. Lavrentyev 1971 34 p refs In RUSSIAN (PR-80) Avail: NTIS

Organic materials in soils were studied for C, N, and P content. Solutions of Na4P2O7, Na3PO4, Na2CO3, NaOH, HF, and EDTA-Na2 were used for the extractions of various organic elements. The effectiveness of the different reagents in removal of the amino acids glycine, aspartic acid, valine, leucine, alanine, glutamic acid, and treonine was investigated. Nucleic acids, nucleotides, xanthine, hypoxanthine, and various enzymes, as well as DNA and RNA, were also considered. It was concluded that the effectiveness of extraction was directly proportional to the pH and the complex-forming ability of the ions in the extracting reagent. Transl. by K.P.D.

N72-13053# Michigan Univ., Ann Arbor. Research Center for Group Dynamics.

ORGANIZATIONAL STRESS AND INDIVIDUAL STRAIN: A SOCIAL-PSYCHOLOGICAL STUDY OF RISK FACTORS IN CORONARY HEART DISEASE AMONG ADMINISTRATORS, ENGINEERS, AND SCIENTISTS


Robert Dennis Caplan Nov. 1971 691 p refs (Grant NGR-23-005-185)

(NASA-CR-125217) Avail: NTIS HC $5.00/MF $0.95 CSCL 06S
It is hypothesized that organizational stresses, such as high quantitative work load, responsibility for persons, poor relations with role senders, and contact with alien organizational territories, may be associated with high levels of psychological and physiological strain which are risk factors in coronary heart disease. It is further hypothesized that persons with coronary-prone Type A personality characteristics are most likely to exhibit strain under conditions of organizational stress. Measures of these stresses, personality traits, and strains were obtained from 205 male NASA administrators, engineers, and scientists. Type A personality measures included: sense of time urgency, persistence, involved striving, leadership, and preference for competitive and environmentally overburdening situations.

Author

N72-13054# Royal Aircraft Establishment, Farnborough (England).

DELAYED REACTIONS IN HUMANS
(RAE-Lib-Tran-1498; BR25162) Avail: NTIS
Experiments involving enforced delay of response to stimuli in a choice situation are widely used in research on memory and higher mental processes. At the time that the response is actually made the stimuli are no longer present. A number of research findings are reviewed. The success of the response following delay depends on a great variety of factors including length of delay, species and stage of development of the subject and presence of mediating cues, e.g. color. For human adults and older children the amount of tolerable delay may be regarded as unlimited.

Author


THE MEASUREMENT OF RADIATION EXPOSURE OF ASTRONAUTS BY RADIOCHEMICAL TECHNIQUES (Quarterly Research Report, 4 Jan. - 4 Apr. 1971)
R. L. Brodzinski 15 Apr. 1971 45 p refs Sponsored by NASA
(Contract AT(4S-1)-1830)
(NASA-CR-124713; BWNL-1183-8) Avail: NTIS CSCL 06R
The concentrations of 23 major, minor, and trace elements in the fecal samples from the Apollo 12 and 13 astronauts are reported. Most elemental excretion rates are comparable to rates reported for earlier missions. Exceptions are noted for calcium, iron, and tin. Body calcium and iron losses appear to be reduced during the Apollo 12 and 13 missions such that losses now seem to be insignificant. Refined measurements of tin excretion rates agree with normal dietary intakes. Earlier reported tin values are in error. A new passive dosimetry canister was designed which contains foils of tantalum, copper, titanium, iron, cobalt, aluminum, and scandium. By measuring the concentrations of the various products of nuclear reactions in these metals after space exposure, the characteristics of the incident cosmic particles can be determined.

Author


APPLICATIONS OF AEROSPACE TECHNOLOGY IN BIOMEDICINE. A TECHNOLOGY TRANSFER PROFILE: PATIENT MONITORING
Donald M. Murray Sep 1971 36 p refs
(Contract NASw-2022)
(NASA-CR-124817) Avail: NTIS CSCL 06E
NASA contributions to cardiovascular monitoring are described along with innovations in intracardiac blood pressure monitoring. A brief overview of the process of NASA technology transfer in patient monitoring is presented and a list of bioinstrumentation tech briefs and the number of requests for technical support is included.

F.O.S.

N72-13057# John B. Pierce Foundation of Connecticut, New Haven.

DEVELOPMENT OF MATHEMATICAL MODELS OF ENVIRONMENTAL PHYSIOLOGY (Final Report)
(Contract NAS9-9531)
(NASA-CR-115268; FR-8) Avail: NTIS CSCL 06P
Selected articles concerned with mathematical or simulation models of human thermoregulation are presented. The articles presented include: (1) development and use of simulation models in medicine, (2) model of cardio-vascular adjustments during exercise, (3) effective temperature scale based on simple model of human physiological regulatory response, (4) behavioral approach to thermoregulatory set point during exercise, and (5) importance of skin temperature in sweat regulation. F.O.S.

Author

N72-13058# Beckman Instruments, Inc., Fullerton, Calif.

Advanced Technology Operations. PROTOTYPE SLIDE STAINER Final Report
Aug. 1971 65 p
(Contract NAS9-11929)
(NASA-CR-115264; FR-1088-101) Avail: NTIS CSCL 06N
The prototype slide staining system capable of performing both one-component Wright's staining of blood smears and eight-step Gram staining of heat fixed slides of microorganisms is described. Attention was given to liquid containment, waste handling, absence of contamination from previous staining, and stability of the staining reagents. The unit is self-contained, capable of independent operation under one- or zero-g conditions, and compatible with Skylab A.

Author

N72-13059# National Aeronautics and Space Administration.

Goddard Space Flight Center, Greenbelt, Md.

BIBLIOGRAPHY: CODES, STANDARDS, PROCEDURES, SPECIFICATIONS AND REPORTS RELATING TO CONTAMINATION CONTROL
Francis N. Ledoux Jun. 1970 54 p refs
The bibliography is arranged in separate sections under headings that include: (1) spacecraft cleanliness, (2) general cleaning, (3) clean room and work stations, (4) contamination, (5) decontamination, (6) manufacturing, (7) miscellaneous, (8) particle count analysis, (9) passivation, (10) packaging, (11) water, and (12) acids and detergents.

D.L.G.

N72-13060# SysteMed Corp., Dayton, Ohio.

J. D. MacEwen and E. H. Vernot Wright-Patterson AFB, Ohio

AMRL Oct. 1971 29 p refs
(NASA Order T-80498: Contract F33615-70-C-1046)
(NASA-CR-124835; Task-01; ATR-7; W-71044; AMRL-TR-71-B3) Avail: NTIS CSCL O6T
The activities of the Toxic Hazards Research Unit (THRU) for the period of June 1970 through May 1971 reviewed. Modification of the animal exposure facilities primarily for improved human safety but also for experimental integrity and continuity are discussed. Acute toxicity experiments were conducted on hydrogen fluoride (HF), hydrogen chloride (HCl), nitrogen dioxide (NO2), and hydrogen cyanide (HCN) both singly and in combination with carbon dioxide (CO). Additional acute toxicity experiments were conducted on oxygen difluoride (OF2) and chlorine pentafluoride (CF5). Subacute toxicity studies were conducted on methylisobutylketone and dichloromethane (methylene dichloride). The interim results of further chronic toxicity experiments on monomethylhydrazine (MMH) are also described.

Author
N72-13061# Civil Aeromedical Inst., Oklahoma City, Okla.
THE ACUTE TOXICITY OF BRIEF EXPOSURES TO HF, HC1. NO2 AND HCN SINGLY AND IN COMBINATION WITH CO
E. Arnold Higgins, Vincent Fiorica, A. A. Thomas (AMRL), and Harvey V. Davis (Standard Oil Co., Chicago) Nov. 1971 10 p refs
(Contract Dot-1AC-60027-D) Avail: NTIS
Experiments were conducted with animals to determine the toxic effect of short-term exposures to some of the products produced in aircraft fires. The products were tested both singly and in combination with carbon monoxide. The studies show the toxicity rankings of the four materials tested to be HCN, NO2, HF and HC1, in decreasing order. Carbon monoxide concentrations which alone are not hazardous to life do not enhance the toxic response to these substances. Author

GLYCOLYSIS IN ADENOVIRUS INFECTED RAT CELL CULTURES AND IN ADENOVIRUS TYPE 12 INDUCED HAMSTER SARCOMA CELLS
Vop. Onkol. (USSR), v. 16, no. 9, 1970 p 49-53 (Contract NASw-2038)
It was demonstrated that in cultures of fibroblasts of rat embryos (REF) infected with human adenoviruses, statistically reliable (p > 0.00) increase of glycolytic reactions in contrast with the control, depending on types of inoculated viruses were observed. Cultures of REF cells, infected with onecogenic adenovirus, type 12, were characterized by more pronounced aerobic and anaerobic glycolysis than REF cultures infected with adenovirus, types 3 and 6. Cells of rat fibroblasts infected with human adenovirus utilize glucose under aerobic conditions more intensively in comparison with control ones. There were noted identical shifts in glycolytic reactions in REF cell cultures infected with adenovirus, type 12, and in cells of hamster sarcoma A-12 cultivated in vitro. Author

N72-13063# Oak Ridge Associated Universities, Tenn. Medical Div.
31 Dec. 1970 216 p refs Sponsored by AEC
(ORAU-113) Avail: NTIS
The effectiveness of radioisotope scanning of Ga-67 for the localization of neoplasms in lymphatic tissues was evaluated. The uptake of Ga-67 in human tissues obtained at autopsy and in 22 different types of rat, hamster, and mouse tumors was studied. The radiation dose to human spleen, kidneys, adrenal glands, bone marrow, and liver at various times following the administration of tracer doses of Ga-67 was measured. The development of computer data analysis and recording systems for the analysis and storage of information of effects of whole-body irradiation on man and for the analysis of data from clinical radioisotope diagnostic tests is discussed. NSA

N72-13064# United Kingdom Atomic Energy Authority, Harwell
(England).
J. E. Johnston, ed. May 1971 66 p refs
(AERE-PR/HPM-15) Avail: AEC Depository Libraries; HMSO 55p; PHI $2.35
Research projects reported include, (1) aerosol research, (12) human metabolic studies: (3) whole-body counting, (4) occupational hygiene, (5) collaborative work with medical research laboratories, (6) operational techniques in radiation protection, (7) atmospheric pollution, (8) radiation physics, (9) neutron dosimetry and radiobiophysics, (10) personnel dosimetry service, (11) cellular radiobiology, (12) radiation spectrometry and computer processing, (13) fallout, (14) environmental analysis, (15) soil radiocology, and (16) biological applications of radiation processing and radiology. A list of 71 papers and reports issued during the year is included. NSA

N72-13065# Air Force Academy, Colo.
CROSS-SENSORY EFFECTS OF WHITE NOISE ON COLOR PERCEPTION
Lloyd R. Chason and Gene A. Berry May 1971 26 p refs
(AE-728189: USAFA-RR-71-8) Avail: NTIS CSCL 06/16
The perceived intensity of red, green and blue lights was measured under conditions of dark-adaptation or nondark-adaptation and silence or 100 dB white noise. Sixty male subjects were randomly assigned over twelve experimental cells and required to match a colored light to a white standard. No significant differences were found between dark-adaptation and monadark-adaptation. Significant differences were found between the silence and noise conditions (p +.01) and between the three colors (+.001). Light sensitivity or perceived intensity was increased under the white noise conditions. The data are viewed as supporting theories of sensory interaction stressing the importance of considering vision and hearing as interactive systems. Possible implications in human engineering design and subsequent research efforts are discussed. Author (GRA)

N72-13066# Pennsylvania Univ., Philadelphia. School of Medicine.
Myron Yanoff Aug. 1971 10 p refs
(Contract DADA17-70-C-0011) (AD-728533: APR-2) Avail: NTIS CSCL 06/5
The purpose of the project was to obtain information on the biologic effects of the argon laser on the retina. In addition, the biological retinal effects of other lasers (Ruby, gallium arsenide, neodymium and carbon dioxide) were carried out. After owl and tharsus monkeys were exposed to one or more of the above lasers, serial sections were cut with a microtome through the suspect retinal areas in order to determine the presence or absence of retinal damage. The pigment epithelium was the most sensitive area of the retina exposed to threshold argon and ruby laser energies. The photoreceptor and outer nuclear layers were the next most sensitive retinal areas exposed to argon radiation. Author (GRA)

N72-13067# Naval Medical Research Inst., Bethesda, Md.
A RADIOGRAPHIC METHOD FOR DEMONSTRATING DECOMPRESSION SICKNESS IN HAMSTERS
Wesley D. Ulrich, Benjamin E. Smith, Jr., and Thomas Hernandez 13 Jul. 1971 10 p
(AD-728596: NAVMED-M4306.01-1010BXK9-1) Avail: NTIS CSCL 06/19
The major vessels of the hind legs of male golden hamsters were examined with contrast angiography and air infusion angiography. The angiograms were compared with the intravascular gas patterns that were present on radiographs of hamsters with severe decompression sickness. Author (GRA)

VEGETATION DENSITY DETERMINATIONS BY GAMMA RAY ABSORPTION
Carmen M. Cialetta and James G. Dante Jun. 1971 32 p ref
(AMCMS Proj. 5672.15.39800)
(AD-729319; BRL-MR-2101) Avail: NTIS CSCL 06/3
A method of nondestructive determination of vegetation density in place is presented. This method utilizes a gamma ray absorption technique. The 122 keV gamma rays from Cobalt 57 were used for this work. The determinations are made using the principle of narrow beam absorption, observing the attenuation of the gamma ray photopeak produced in a 7.62 cm dia. x 7.62 cm long sodium-iodide scintillation crystal. Results of measurements performed at Eglin Air Force Base are included.

Author (GRA)

N72-13069# Naval Medical Research Inst., Bethesda, Md.
ANALYSIS OF THE PHYSIOLOGIC EFFECTS OF MICRO-WAVE RADIATION Interim Report
Byron D. McLees and Edward D. Finch Jun. 1971 74 p refs
(AD-728397; NAVMED-MF12.524.015-0001B; Rept-3) Avail: NTIS CSCL 06/18
An analysis of studies on the physiologic effects of animal exposure to microwave radiation is presented. Topics include: Electromagnetic waves as they interact with tissue; Technique of microwave irradiation and evaluation of exposure; Temperature changes induced by microwave radiation; Hematologic effects; Serologic changes; Changes in testicular structure and function; The effects of microwave radiation on the eye.

Author (GRA)

DATA BOOK: SPACE STATION/BASE FOOD SYSTEM STUDY, BOOK 3: STUDY SELECTION RATIONALE SHEETS
31 Dec. 1970 193 p
(Contract NAS9-11139)
(NASA-CR-115232; M3128W0002-Bk-3; MSC-01816) Avail: NTIS CSCL 06C
The supporting rationale sheets are presented which were utilized in the selection and support of the concepts considered in the final phase of the study. Each concept, conceived to fulfill a specific function of the food system, was assessed in terms of the eight critical factors depicted in the rationale sheet. When weighted and totaled, the resulting selection factor was used as a guide in making the final decision.

D.L.G.

APPLICATIONS OF AEROSPACE TECHNOLOGY IN INDUSTRY, A TECHNOLOGY TRANSFER PROFILE: FOOD TECHNOLOGY
Donald M. Murray Sep. 1971 56 p refs
(Contract NASW-2022)
(NASA-CR-124815) Avail: NTIS CSCL 06H
Food processing and preservation technologies are reviewed, expected technological advances are considered including processing and market factors. NASA contributions to food technology and nutrition are presented with examples of transfer from NASA to industry.

F.O.S.

DEVELOPMENT OF A PORTABLE LIFE SUPPORT SYSTEM AND EMERGENCY LIFE SUPPORT PACK Final Report
13 Jun. 1970 112 p
(Contract NAS9-8135; Contract NAS9-8135)
(NASA-CR-108541; Publ-70-586; Publ-70-586) Avail: NTIS CSCL 06K
The design, development, and fabrication of a feasibility model of a breathing bag life support system for extravehicular activity are discussed. The breathing vest and back pack portable life support system contains connectors which allow external water and gas supply. At a metabolic rate of 2000 BTU per hour, the two low pressure bottles provide 27 minutes of breathing gas for a total filled system weight of 30.5 pounds.

Author

N72-13073# Joint Publications Research Service, Washington, D.C.
MEANS OF PENETRATING THE OCEAN
(JPRS-54789, UDC-557.4) Avail: NTIS
The physiological effects and limitations imposed on human subjects during deep water diving are discussed. Methods for preventing adverse effects by improved protective clothing and various gas mixtures for breathing are presented. The subject of saturation diving and living at great depths for extended periods of time is examined. A brief history of scientific expeditions by various countries to increase understanding of underwater physiology is included.

P.N.F.

A GUIDE TO ONBOARD CHECKOUT. VOLUME 2: ENVIRONMENTAL CONTROL AND LIFE SUPPORT
Sep. 1971 63 p
(Contract NAS9-11199)
(NASA-CR-115286; IBM-71W-00309-1Vol-2) Avail: NTIS CSCL 06B
A description of space station equipment for environmental control and life support is presented. Reliability and maintenance procedures are reviewed. Failure analysis and checkout tests are discussed. The strategy for software checkout is noted.

K.P.D.

N72-13075# Martin Marietta Corp., Denver, Colo.
EXPERIMENTAL SYSTEM FOR THE CONTROL OF SURGICALLY INDUCED INFECTIONS
M.D. Tevebaugh 1 Oct. 1971 32 p
(Contract NASW-2210)
(NASA-CR-124762; D203813-006; MCR-71-328) Avail: NTIS CSCL 06L
The development tests to be performed on the experimental system are described in detail. The test equipment, conditions, and procedures are given. The portable clean room tests include assembly, collapsability, portability, and storage; laminar flow rate; static pressure; air flow pattern; and electrostatic buildup. The other tests are on the ventilation system, human factors evaluation, electrical subsystem, and material compatibility.

N.E.N.

N72-13076# Joint Publications Research Service, Washington, D.C.
TRAINING OF ASTRONAUTS ON LABORATORY AIRCRAFT UNDER CONDITIONS OF WEIGHTLESSNESS FOR LABOR ACTIVITY IN SPACE
(JPRS-54649) Avail: NTIS
The special training of astronauts in aircraft flight for later IVA and EVA in space is described. The general training procedures and the particular procedures during the final training stages are discussed. The complex activity of the astronaut as investigator and tester and the effect of performing activities in weightlessness environments are considered for evaluating the types of labor according to difficulty and reliability of astronaut performance. The change in motor skills under weightlessness conditions, and the engineering/psychological evaluation of astronaut activity are also discussed.

N.E.N.
The development of a series of prototype space activity suit (SAS) assemblies is discussed. The SAS is a new type of pressure suit designed especially for extravehicular activity. It consists of a set of carefully tailored elastic fabric garments which have been engineered to supply sufficient counterpressure to the body to permit subjects to breathe O2 at pressures up to 200 mm Hg without circulatory difficulty. A closed, positive pressure breathing system (PPBS) and a full bubble helmet were also developed to complete the system. The ultimate goal of the SAS is to improve the range of activity and decrease the energy cost of work associated with wearing conventional gas filled pressure suits. Results are presented from both laboratory (1 atmosphere) and altitude chamber tests with subjects wearing various SAS assemblies. In laboratory tests lasting up to three hours, the SAS was worn while subjects breathed O2 at pressures up to 170 mm Hg without developing physiological problems. The only physiological symptoms apparent were a moderate tachycardia related to breathing pressures above 130 mm Hg, and a small collection of edema fluid in the hands. Both problems were considered to be related to areas of under-pressurization by the garments. These problems, it is suggested, can ultimately be corrected by the development of new elastic fabrics and tailoring techniques. Energy cost of activity, and mobility and dexterity of subjects in the SAS, were found to be superior to those in comparable tests on subjects in full pressure suits. The physiological responses of exercising subjects were investigated under conditions in which the temperature of the coolant water was varied according to the subjective state of thermal comfort. Conditioning water was maintained at a constant flow rate of 240 lb/hr and at a temperature controllable within the range of 45 to 90 F. In addition to skin temperature, rectal temperature and heart rate were monitored in the course of each trial. Total and evaporative weight losses were determined by measurements before and after each test. The levels on metabolic loading, measured indirectly on the basis of O2 consumption in the course of treadmill activity, ranged from the resting state to 2000 BTU/hr at increments of about 400 BTU. Under the experimental conditions, six volunteer subjects established a level of thermal comfort, as sensed subjectively, by controlling inlet water within the available range of temperature.

Author

N72-13078*# Naval Air Development Center, Johnsville, Pa.
DETERMINATION OF SKIN TEMPERATURE UNDER A COMFORT-CONTROLLED LIQUID-COOLED GARMENT IN EXERCISING SUBJECTS Final Report
L. J. SantaMaria 26 Oct. 1971 17 p refs
(NASA Order T-91349)
(NASA-CR-115299; NADC-CS-7118) Avail: NTIS CSCL OSE
The physiological responses of exercising subjects were investigated under conditions in which the temperature of the coolant water was varied according to the subjective state of thermal comfort. Conditioning water was maintained at a constant flow rate of 240 lb/hr and at a temperature controllable within the range of 45 to 90 F. In addition to skin temperature, rectal temperature and heart rate were monitored in the course of each trial. Total and evaporative weight losses were determined by measurements before and after each test. The levels on metabolic loading, measured indirectly on the basis of O2 consumption in the course of treadmill activity, ranged from the resting state to 2000 BTU/hr at increments of about 400 BTU. Under the experimental conditions, six volunteer subjects established a level of thermal comfort, as sensed subjectively, by controlling inlet water within the available range of temperature.

Author

N72-13079*# Royal Aircraft Establishment, Farnborough (England).
THE EFFECT OF DAZZLE ON ELECTRONIC DISPLAY VISIBILITY FROM MODERN HIGH-PERFORMANCE AIRCRAFT COCKPITS, A SUMMARY
(RAE-LIB-TRANS-1545: T-808-I-203) Avail: NTIS
Data are presented for various effects on threshold light intensity. A dazzle formula is developed. K.P.D.

Author

N72-13080*# McDonnell-Douglas Astronautics Co., St. Louis, Mo.
CREW INTERFACE DEFINITION STUDY, PHASE 1 Pre-simulation Report
J. C. Calihan, J. W. Kraemer, and J. A. Alles 1 Oct. 1971 150 p refs
(Contract NAS9-12079)
The timeline analysis of the Shuttle orbiter missions which was conducted in the Phase I Crew Interface Definition Study and the requirements for the man-in-the-loop simulation study are presented. Mission definitions and objectives are presented as they relate to various Shuttle Orbiter missions. The requirements for crew participation and the information required by the crew are discussed, and finally the rationale behind the display concept and calling procedures is given. The simulation objectives, the simulation mechanization, including a detailed presentation of the display and control concept, the simulator test plan and the results are discussed.
solar wind composition foil and blank foils were obtained for analysis of the Po-210 (Pb-210, Rn-222) content. It is expected that the determination of the Po-210 content of these foils will yield the concentration of radon atoms incident on the foil while exposed to the lunar atmosphere, and this indirectly will permit an estimate of the average uranium concentration of the lunar surface. Proposals to measure the cosmic-ray intensity and energy spectra inside and outside of late Apollo and Project Skylab spacecraft by exposing and subsequently analyzing pure metal foils, and to measure the elemental mass balance in Project Skylab astronauts by instrumental neutron activation analysis of the intake and excreta are summarized.

Author (NSA)

N72-13084#

Glasgow Univ. (Scotland). Dept. of Aeronautics and Fluid Mechanics.
SIMULATION OF RENDEZVOUS OF A MAN IN DEEP SPACE M.S. Thesis
Daniel Pablo Mendez Mar. 1971 130 p refs Sponsored in part by ESRO
Avail: NTIS
The rendezvous in deep space with his mother ship of an isolated astronaut using a self-maneuvering booster unit is studied by means of analog and digital simulation to determine major influences. The analog computer was used to represent the mother ship and stellar background, providing insight into the maneuver and astronaut performance. The digital computer simulated human behavior in various circumstances. Obtaining an optimum value for booster thrust which minimizes fuel consumption was of great importance.

ESRO

N72-13085#

Ohio State Univ., Columbus. Dept. of Electrical Engineering.
IMPROVED TECHNIQUES FOR THE CONTROL OF REMOTE DEVICES Final Scientific Report
Robert B. McGhee 10 Mar. 1971 7 p refs
(Grant AF-AFOSR-1901-70; AF Proj. 9769)
AD-728214: AFOSR-71-2176TR) Avail: NTIS CSCL 06/2
Two major aspects of remote device control were investigated: locomotion and visual sensing. The remote device locomotion studies carried out under this grant have been aimed at the development of a theoretical understanding of the principles of legged vehicle design. It has long been recognized that the versatility of human beings in the extraction of relevant information from visual (optical) images far exceeds that of any machine. Yet, in particular circumstances, such as the reading of fixed font printed material, it has been possible to design special purpose processors with performance characteristics superior to those of humans. Recognizing this fact, the goal of this aspect of the present research program has been to attempt to devise automatic pictorial pattern recognition schemes comparable effective to character recognizers, but capable of operating in a less well controlled environment.

Author (GRA)

N72-13086#

Army Aeromedical Research Lab., Fort Rucker, Ala.
CRASH INJURY ECONOMICS: THE COSTS OF TRAINING AND MAINTAINING AN ARMY AVIATOR
Armand E. Zilioli Apr. 1971 26 p refs
(DA Proj. 3AO-62110-A-819)
AD-725482: USAARL-71-17) Avail: NTIS CSCL 05/9
While the hardware costs of Army aviation accidents are known, the monetary costs of injuries and fatalities have not been determined. In order to ascertain these costs, the training and maintenance costs of aviators are needed. The report presents a study of training and maintenance cost of Army aviators in all grade levels from training up to, including, and after an accidental death.

Author (GRA)

N72-13087#

Air Force Human Resources Lab., Brooks AFB, Tex.
SINGLE CONCEPT FILMS IN THE TRAINING OF FLIGHT SKILLS
Milton E. Wood Nov. 1970 44 p refs
(AF Proj. 1710)
AD-728685: AFHRL-TR-70-34; Task-171003) Avail: NTIS CSCL 05/9
A study was conducted to determine the effectiveness of single-concept films in the training of T-37 landing maneuvers. Films study significantly reduced the amount of air time required to reach or exceed the levels of proficiency demonstrated by baseline students in normal landing practice. The study also provided insights into the production of in-flight films and their subsequent use as cartridge-loaded, single-concept film materials.

Author (GRA)

N72-13088#

Biomarine Industries, Inc., Devon, Pa.
Brendan P. Thompson and Irving R. Streimer 30 Jun. 1971 58 p refs
(Contract N00014-70-C-0162: NR Proj. 197-008)
AD-726225: UWCP-70-15) Avail: NTIS CSCL 05/9
The performance of two divers working at 33 ft. on a communication dependent task was observed and measured. Comparisons between productivity and error generation using closed and open cycle breathing apparatus, as well as helium/oxygen, nitrogen/oxygen and argon/oxygen mixtures, were made. Measurement of oxygen uptake and carbon dioxide production during the communication task, as well as for a series of constant swim rates, was recorded. No significant difference in productivity was noted for any gas mixture or breathing apparatus used. Significant differences were noted in error generation for the helium/oxygen mixture. In addition, the distribution of errors between specific letter-number pairs and sound groups differed significantly for helium/oxygen mixtures. Oxygen uptake during the communication task was equivalent to that previously measured for self-paced work.

Author (GRA)

N72-13089#

System Development Corp., Santa Monica, Calif.
Aiko M. Hormann, Sharon Kaufman-Diamond (Calif. Univ., Los Angeles), and Carlos Martin Cinto (Calif. Univ., Los Angeles) Jul. 1971 262 p refs
(Contracts N00014-70-C-0221; DAHC15-67-C-0149)
AD-729070: SDC-TM-4771/000/00) Avail: NTIS CSCL 06/4
The report describes research work in artificial intelligence, human and machine-aided problem solving and planning activities, interactive languages and visual input/output techniques, and man-machine synergy.

Author (GRA)

N72-13090#

ANNOTATED BIBLIOGRAPHY ON RESPONSE SURFACE METHODOLOGY AND RELATED PAPERS Interim Report
(AD-729192: AFOSR-71-1941TR)
HAC-Ref-71-27-3945/C1183; Task-61102F) Avail: NTIS CSCL 12/1
The annotated bibliography provides basic references to multivariate analysis by use of response surface methodology. The references cited are being used in the preparation of documents on the application of Response Surface Methodology to human factors engineering research.

Author (GRA)
ASSESSMENT OF TWO METHODS OF SEQUENCING GROUND TRAINER PRACTICE FOR UNDERGRADUATE PILOT TRAINING
Gary B. Reid, William V. Hagin, and David H. Coats
Dec. 1970
17 p refs (AF Proj. 1123)

The study was an operational evaluation of two methods of instruction sequencing for the T-38 phase of Undergraduate Pilot Training. Scheduling of concentrated trainer phases prior to aircraft flight improved student performance for early aircraft rides as compared with an intermixed trainer and aircraft schedule. Although grade differences washed out prior to graduation, the students who trained under the block schedule completed training in 38 fewer aircraft flights than the students who trained under the intermixed schedule. Author (GRA)

DIVER INSTRUMENTATION Final Report

The diver instrumentation program was initiated for the purpose of conducting a study leading to the development of small, lightweight instruments to be used to monitor physiological parameters of divers. Tasks were defined as follows: Design, fabricate and test sensors to monitor respiratory heat loss; Design, fabricate and test a multipurpose diver instrument pack containing power supply, tape recorder, signal conditioners and pressure sensor; Package for evaluation a sensor for measuring the partial pressure of oxygen in a diver's breathing apparatus.

HUMAN INFORMATION PROCESSING AND REACTION TIME

The report was prepared to summarize for an engineering-oriented audience some of the basic principles underlying the determination of the time for human information processing.

VISUAL RECONNAISSANCE FROM THE NOSE VERSUS SIDE SCANNER STATIONS OF AN AIRCRAFT Final Report

The study investigated airborne visual reconnaissance from the nose versus side scanner stations of an aircraft. Six subjects performed the search task at the nose station of a B-50 aircraft and six different subjects performed the task at the two side scanner stations, located aft of the wings. During each pass one subject at the nose station and one at each of the scanner stations searched for tactical target sites located in rolling farm and woodland, and identified and counted the individual targets at the sites that they located. A mean of 65 percent of the target sites was detected by the subjects in the two scanner stations, whereas only 36 percent were detected by the subjects in the nose station. On the other hand, for the target sites that were detected, the scanner subjects identified only 37 percent of the individual targets while the subjects in the nose identified 60 percent. Wide differences between subjects were found in their search and identification performance.

NEW KNOWLEDGE OF LIFE PROCESSES
In its Develop, in Res. and Technol. during 1970 1970 p 84-92 refs In SWEDISH

Based upon recent developments in enzyme synthesis, the latest knowledge on genes, and particularly their isolation, synthesis, and functions, are discussed.

ENVIRONMENTAL PROBLEMS
In its Develop, in Res. and Technol. during 1970 1970 p 193-203 refs In SWEDISH

Swedish environmental problems are critically analyzed, in particular the use of DDT, chlorinated biphenyls, heavy metals, and plastics. Reference is made to several methods of control and legislation.

in the nose station. On the other hand, for the target sites that were detected, the scanner subjects identified only 37 percent of the individual targets while the subjects in the nose identified 60 percent. Wide differences between subjects were found in their search and identification performance. Author (GRA)
Subject Index

AEROSPACE MEDICINE AND BIOLOGY / A Continuing Bibliography (Suppl.100) MARCH 1972

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ABIOGENESIS

Chemical evolution and life origin - Conference, Pont-aux-Fourmi, France, April 1970, Volume 1, Molecular evolution

A72-14751

Life origin in space from point of hydrocarbons, cyanides, abiogenic organic synthesis and protobionts evolution

A72-14752

Energetical conditions of primeval biosynthesis and transdehydration feasibility on simplified present day templates

A72-14757

Possible origin of dinamsym of life, excluding synthesis under influence of optically active quartz

A72-14758

Enzymes and amino participation in prebiotic polymers, discussing ribosome bonds and messenger RNA

A72-14767

Energy transfer conditions of transdehydration reactions on primeval earth leading to transphosphorylation, transacylation and peptide synthesis

A72-14768

Atmospheric model for proteins abiogenesis, considering heteropolypeptides formation from hydrogen cyanide and water

A72-14771

Protobionts formation by random aggregation and reproduction from proteins and nucleic acids macromolecules

A72-14782

Cooccurrence drops oxidoreductases and stability in primitive prebiological systems, using polynuclear oxinde-carbohydrate-histone-quinones

A72-14788

Plants participation in lipid systems formation, considering chlorophyll photochemical activity in surface active agents

A72-14789

Ion selective accumulation model of carboxydrates diffusing through artificial polymer membranes, relating prebiological systems to catalytic microsystems

A72-14795

Antibiotic polypeptide synthesis of gramicidin S and tyrocidine, using primitive model of sequential addition of amino acids on polynucleases

A72-14790

Genetic code numerical structure association with logarithmic optimization rule for hierarchy of structures from molecular biology experiments

A72-14794

Inorganic polyphosphates effect on phosphorus metabolism evolution in primary living organisms, noting polyphosphate glucokinase distribution in various microorganisms

A72-14797

Biological energy transformation origin and evolution, discussing inorganic pyrophosphates precursor to adenosine phosphates as energy carriers

A72-14798

Prebiological food origin in carbonaceous meteorites, considering extraterrestrial environments, organic synthesis and terrestrial analogs

A72-14803

Extraterrestrial life on Mars and Venus and Jupiter atmospheres, discussing abiogenesis failures on life-supportable planets

A72-14805

ABSORPTION SPECTRA

Gamma ray absorption method for nondestructive determination of vegetation density

[AD-729319] N72-13068

ABSTRACTS

Annotated bibliography of published articles on short term memory

[AD-721656] N72-12026

ACCELERATION STRESSES (PHYSIOLOGY)

Human centrifuge tests for semicircular canal gyrocopic stimulation during sensory deprivation, discussing angular acceleration detection thresholds

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[NASA TM-6-3982] N72-13059

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