NASA SP-7011(53)



# AEROSPACE MEDICINE AND BIOLOGY

## A CONTINUING BIBLIOGRAPHY

### WITH INDEXES



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NASA SP-7011 (53)

# AEROSPACE MEDICINE AND BIOLOGY

## A CONTINUING BIBLIOGRAPHY WITH INDEXES

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA Information System during July 1968.


*Scientific and Technical Information Division*
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. AUGUST 1968

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*Aerospace Medicine and Biology* is a continuing bibliography which, by means of periodic supplements, serves as a current abstracting and announcement medium for references on this subject. The publication is compiled through the cooperative efforts of the Aerospace Medicine and Biology Bibliography Project of the Library of Congress (LC), the American Institute of Aeronautics and Astronautics (AIAA), and NASA. It assembles, within the covers of a single bibliographic announcement, groups of references that were formerly announced in separate journals, and provides a convenient compilation for medical and biological scientists. Additional background details for this publication can be found in the first issue, NASA SP-7011, which was published in July, 1964. Supplements are identified by the same number followed by two additional digits in parentheses.

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 will be placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion. The contents of this issue are comprised of abstracts that were prepared by the three contributing organizations.

Each entry consists of a standard citation accompanied by its abstract. It is included in one of three groups of references that appear in the following order:

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*(continued)*

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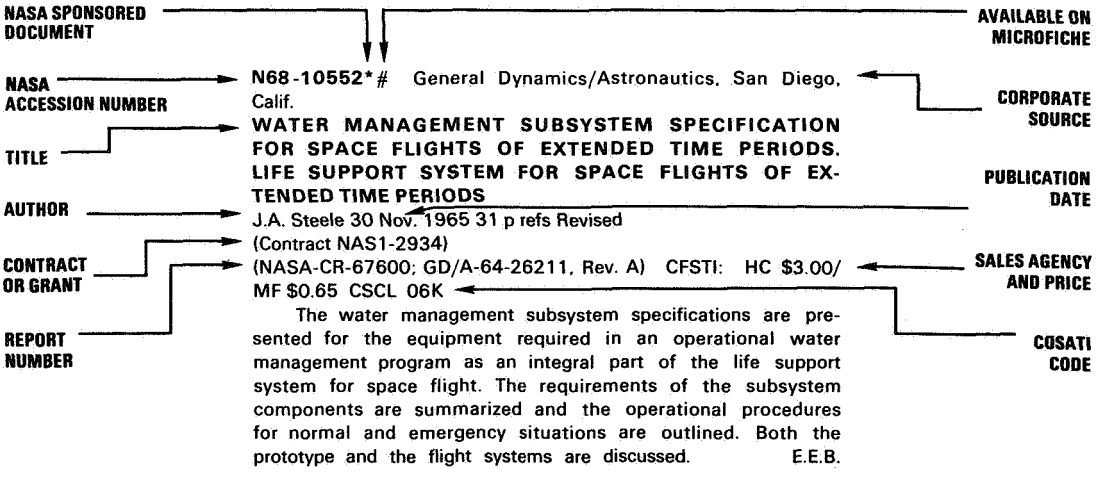
## TYPICAL CITATION AND ABSTRACT



# AEROSPACE MEDICINE AND BIOLOGY

*a continuing bibliography* AUGUST 1968


## STAR ENTRIES

**N68-23057#** School of Aerospace Medicine, Brooks AFB, Tex.
**THYROID STATUS OF DOGS CONTINUOUSLY EXPOSED TO ONE-HALF ATMOSPHERE, JUNE 1965–JULY 1966**
David H. Wood Nov. 1967 21 p refs
(SAM-TR-67-106; AD-666906)

Six male beagle dogs were maintained on ambient air at one-half atmosphere for 33 days and were monitored for protein-bound iodine (PBI), thyroid I 131 avidity, plasma triiodothyronine uptake, and plasma 17-hydroxycorticosteroids. Data were compared with those from Littermate controls held at ground level. Increased I 131 uptake and reduced triiodothyronine uptake were observed in the altitude-exposed dogs, while no change in the peripheral blood hydrocortisone level was seen. No difference in the gross, microscopic, or ultrastructural anatomy of the thyroid glands of groups was noted. Author (TAB)

**N68-23080** California Univ., Berkeley.
**BIRD VOICES AND RESONANT TUNING IN HELIUM-AIR MIXTURES**
George Louis Hersh (Ph.D. Thesis) 1966 79 p
Available from Univ. Microfilms: HC $4.20/MF $3.00 Order No. 67-5078

Steller's Jays *(Cyanocitta stelleri)* and Japanese Quail *(Coturnix coturnix)* undergo pronounced voice changes in helium air. These changes are upward translations of relative frequency emphasis. There is no apparent change in the spacing or fundamental frequency of harmonic components. Comparisons were made of normal vocalizations, artificially elicited vocal events and imitation vocal events in which the vibrating membrane sound source was replaced by a probe loud speaker. The observed properties of the vocal tracts of female Mallards *(Anas platyrhynchos)*, Bantam Chickens *(Gallus domesticus)* and Japanese Quail *(Coturnix coturnix)* can be incorporated in a source-filter description of avian vocalization. The birds whose voices remained constant in helium air produced high frequency pure tones. Birds whose voices changed in helium air produced broad spectrum sounds. The effect of the helium is an alteration of the vocal tract filter, and this effect would only be detectable when the sound source produced many simultaneous frequencies. Dissert. Abstr.

**N68-23083** California Univ., Los Angeles.
**SOLAR RADIATION THROUGH THE BODY WALL OF LIVING VERTEBRATES WITH EMPHASIS ON DESERT REPTILES**
Warren Paul Porter (Ph.D. Thesis) 1966 161 p
Available from Univ. Microfilms: HC $7.60/MF $3.00 Order No. 67-4478

A quantitative analysis of the absorption of solar radiation by vertebrate tissues was made using a new, highly sensitive spectrophotometric technique. In vivo light transmission was measured through scales, hair, feathers, skin, muscle and the peritoneim in the spectral region from the ultraviolet through the near infrared (290 mμ to 2600 mμ). Spectral transmission curves are discussed in relation to their adaptive importance and the general physical structues of the tissues comprising the body wall are examined. The presence of the black peritoneum in reptiles is explained. Dissert. Abstr.

**N68-23132** Baylor Univ., Waco, Tex.
**THE EFFECT OF MICROWAVE EXPOSURE UPON THE AUDITORY THRESHOLD OF HUMANS**
Anthony Emile Bourgeois, Jr. (Ph.D. Thesis) 1967 117 p
Available from Univ. Microfilms: HC $5.80/MF $3.00 Order No. 67-2927

The purpose of this experiment was to investigate the effects of exposure to UHF radiation on the auditory thresholds of humans. Thirty-six male volunteers between 18 and 25 years of age and possessing normal hearing were exposed to low intensity radiation at 1,000 Mhz for 2 minutes previous to and during the presentation of the auditory stimuli. Continuous wave (no modulation), 400 cps, and 1,000 cps sine wave amplitude modulated energy were used. The thresholds for 500 cps, 2,000 cps, and 5,000 cps were computed. Analyses revealed that exposure to UHF radiation resulted in a significant decrease in the auditory thresholds and that this decrease was directly proportional to the magnitude of the average power density to which the subjects were exposed. The thresholds were also found to be a function of the type of modulation used since the auditory thresholds were significantly lower upon exposure to the 1,000 cps modulated radiation than upon exposure to 400 cps modulated radiation. Dissert. Abstr.

**N68-23160** Purdue Univ., Lafayette, Ind.
**RELATION OF POST-EXPOSURE TEMPORARY THRESHOLD SHIFT TO POST-EXPOSURE TEMPORARY LOUDNESS SHIFT**
Donald Frank McPherson (Ph.D. Thesis) 1966 142 p
Available from Univ. Microfilms: HC $6.80/MF $3.00 Order No. 67-5462

Investigations which have been concerned with changes in the sensitivity of the ear as a result of prior or concurrent exposure to sound can be grouped into two broad categories on the

basis of the sensitivity index employed in the investigation. These categories would be: (1) investigations in which the sensitivity index is the temporary threshold shift (TTS) measured following exposure of the ear, and (2) investigations in which the sensitivity index is the temporary loudness shift (TLS) in a comparison signal presented to the contralateral ear either during or following exposure of the ipsilateral ear. This investigation was designed to explore the relationships between post-exposure TTS and post-exposure TLS when both measures were obtained under similar experimental conditions. A special paradigm was designed which could be adapted to measure either TTS or TLS. Three different measures of sensitivity (TTS, TLS with loudness balances made at the exposure level, and TLS with loudness balances made at a constant 30 dB SPL) were obtained on one ear of each of five normal-hearing trained observers. Dissert. Abstr.

**N68-23165** Tufts Univ., Medford, Mass. Inst. for Psychological Research.

**HUMAN FACTORS ENGINEERING BIBLIOGRAPHIC SUPPLEMENT NUMBER 1: A BIBLIOGRAPHY ON THE USE OF INFORMATION THEORY IN PSYCHOLOGY (1948–1966)**

E. M. Johnson Dec. 1967 80 p refs *Its* HEL Bibliographic Suppl. no. 1
(Contract DA-18-001-AMC-1004(X))
(AD-664773)

The bibliography contains 756 citations of work that have been done relevant to psychology in information theory. Information theory is distinguished from the broader disciplines of communication theory and cybernetics by the use of a particular measure of amount of information. Author (TAB)

**N68-23171#** Armed Forces Radiobiology Research Inst., Bethesda, Md.

**MONKEY PERFORMANCE TESTING APPARATUS (MAZE)**

S. J. Kaplan and H. D. Cooper Nov. 1967 25 p refs
(AFRRI-TN67-1; AD-666643)

A description is presented of a special performance testing device, the Kaplan-AFRRI Maze (KAM), designed for studying radiation effects upon the monkey. The structure and functions of this automated maze are provided. The material covered in this report also includes the environmental chamber for the KAM, manual and automatic operation, programming for automatic control, the data acquisition system and the data processing procedures. Author (TAB)

**N68-23180*#** McMaster Univ., Hamilton (Ontario). Dept. of Psychology.

**ATTENTION-LIKE PROCESSES IN CLASSICAL CONDITIONING**

Leon J. Kamin 1 Jun. 1967 32 p refs Presented at the Symp. on Aversive Motivation, Miami, Apr. 1967
(Grant NGR-52-059-001)
(NASA-CR-94532; TR-5) CFSTI: HC $3.00/MF $0.65 CSCL 05J

Naive hooded rats, reduced to 75% body weight and maintained on a 24-hr feeding rhythm, were used in conditioned emotional response (CER) studies. The rats were trained to press a bar for food reward during 2-hr daily sessions, and food pellets were delivered according to a 2.5-min variable interval reinforcement schedule. After five 2-hr sessions, stable bar-pressing rates were produced in individual rats and CER training was started. The same food schedule was in effect during CER training; but four noise, light, or combined CS-US (conditioned stimulus-unconditioned stimulus) sequences were programmed independently of the animal's behavior. After a very few trials of such training, all rats approached asymptotic suppression. M.W.R.

**N68-23187#** School of Aerospace Medicine, Brooks AFB, Tex. Aerospace Medical Div.

**MATHEMATICAL MODELS FOR THE ANALYSIS OF THE NITROGEN WASHOUT CURVE, JULY 1963–JANUARY 1967**

Robert G. Rossing, M. Bryan Danford, Earl L. Bell, and Raul Garcia Nov. 1967 63 p refs Submitted for publication
(SAM-TR-67-100; AD-666651)

A general mathematical description of the washout of nitrogen from the lung during oxygen breathing is developed. From this, several specific mathematical models are derived and compared. These models each involve one of three different variables for description of the washout process: the alveolar dilution ratio, the specific tidal volume, or the rate constant. Two different types of models are considered: one involves a discrete distribution function of the basic variable; the other, a continuous distribution function. Several such models are applied to a series of washout curves as test problems. They are all found to be capable of fitting such curves with approximately equal precision. The choice between them must, therefore, be based on other factors such as theoretical suitability and ease of interpretation. On the basis of these criteria, the model suggested is one in which the alveolar dilution ratio manifests a Normal distribution, either unimodal or bimodal. Methods are developed for the calculation of certain indices from the parameters of this model. These indices may be of value in evaluating intersubject comparisons as well as intrasubject comparisons over time. Finally it is shown that these same indices may be calculated directly from the raw data, independent of any postulated distribution model. Author (TAB)

**N68-23193*#** Miami Univ., Coral Gables, Fla. Inst. of Molecular Evolution.

**SELF-ASSEMBLY OF THE PROTOCELL FROM A SELF-ORDERED POLYMER**

Sidney W. Fox [1967] 28 p refs Presented at Intern. Conv. of Biochem., Bangalore, India, 7 Sep. 1967
(Grant NsG-689)
(NASA-CR-94534) CFSTI: HC $3.00/MF $0.65 CSCL 06C

It is reported that when amino acids are simply and suitably heated, polypeptide sequences form by themselves to at least some degree and in the "right amounts." The organization of the polypeptides is shown to take care of itself when water is added to thermal protenoid, which appears to be the right component to crystallize out as a cell. While individual properties of proteins, polynucleotides, and cells can be mimicked by other substances; thermal proteinoid and its organized particles are the only synthetic products that have been shown to possess the properties of the contemporary cell and its structural polymer. Buds are shown in a number of protenoid microspheres that were allowed to stand for two weeks; and this permits the visualization of how such microspheres could have developed the ability to participate cyclically in their own reproduction. Experiments indicated that multiplication could occur through the model of primitive kind of binary fission and growth by accretion as well as through budding. M.W.R.

**N68-23199#** Oak Ridge National Lab., Tenn.

**ON THE RELATIONSHIP OF COLLISION THEORY TO THE INTERPRETATION OF RELATIVE BIOLOGICAL EFFECTIVENESS**

J. E. Turner and Hal Hollister Jan. 1968 11 p refs
(Contract W-7405-ENG-26)
(ORNL-4215) CFSTI: HC $3.00/MF $0.65

Relative biological effectiveness (RBE) is observed to depend upon the physical characteristics of radiation and on the biological effect or end point being studied. The quantity most often used to describe the quality of radiation is its linear energy transfer (LET), or, in the case of uncharged radiation, the LET of charged secondary particles. The quantum mechanical collision theory was

applied to see which physical quantities are relevant in the sense that RBE depends on them, biological factors being kept fixed. By means of successive Born approximations it is shown that the velocity and charge of a heavy charged particle are ultimately the only physical quantities that are needed to describe RBE in terms of the properties of the incident radiation, and these two quantities enter the description of RBE in a combination other than that of the LET function. An experimental test of the practical significance of these results is suggested. Author (NSA)

**N68-23239#** Bucknell Univ., Lewisburg, Pa.
**EFFECT OF AROUSED TESTING CONDITIONS ON THE MEASUREMENT OF FEAR OF FAILURE**
Richard C. Teevan and Richard A. Dapra 1968 21 p refs
(Contract Nonr-3951(01))
(TR-25; AD-666963)

The Thematic Apperception Test (TAT) was administered to 38, male, high school Ss under both neutral and aroused conditions. The TATs were scored for fear of failure (FF) motivation as measured by the Hostile Press (HP) system developed by Birney, Burdick, and Teevan (1964). An exploratory investigation was conducted to determine the effect of aroused and neutral testing conditions on the amount of HP imagery and its intensity within the same group of Ss. The results indicated that HP scores increased significantly between the neutral and aroused conditions. Nevertheless, a dichotomy of the HP scores at the median indicated that the scores of Ss categorized Low HP under the neutral condition increased significantly under the aroused condition. HP scores of Ss categorized Hi HP under the neutral condition had significantly lower HP scores under the aroused condition. The results were discussed in terms of the FF Ss interpretation of the situation and his defensive posture. Author (TAB)

**N68-23244#** Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
**INVESTIGATION OF THE PRIMATE VESTIBULAR SYSTEM FUNCTION THROUGH ANALYSIS OF THE VESTIBULO-OCULAR REFLEX RESPONSE TO VARIOUS INPUT STIMULI**
Marvin H. Chasen (M.S. Thesis) and James W. Guthrie (M.S. Thesis) Dec. 1967 116 p refs
(GE/EE/675-7; AD-666663)

An indirect measurement of dynamic responses of the primate vestibular system was obtained through the measurement of eyeball counterroll from six Rhesus monkeys. A control system was developed to provide three types of input stimuli. These stimuli consisted of constant speed rotations, pendular oscillations, and Gaussian random noise. The experimental data was analyzed by use of correlation functions, power spectral density functions, and probability densities. Results show that angular acceleration and the acceleration resulting from centripetal force affect the counterroll response. Gaussian noise position inputs failed to produce counterroll distributions that are Gaussian. Suppression of response to random inputs was observed, indicating that suppression does not necessarily result from anticipation of the input. Author (TAB)

**N68-23251** New School for Social Research, New York.
**VISUAL BEAT PHENOMENA AND THEIR RELATION TO THE TEMPORAL CHARACTERISTICS OF PERCEPTION**
Rathe S. Karrer (Ph.D. Thesis) 1966 150 p
Available from Univ. Microfilms: HC $7.00/MF $3.00 Order No. 67-4113

This series of studies utilized the phenomena of visual beats, produced by the combination of intermittent light pulses, to investigate the temporal characteristics of visual perception. Visual beats, seen both in binocular and dichoptic vision, are characterized by apparent movement, a change in brightness and flicker rate, and a change in the figural and color phenomena which are sometimes elicited by flicker alone. Data for both photopic and scotopic vision indicated that the visual system follows the stimulus frequency accurately all the way to CFF; above this frequency no beats were perceived. All the evidence from this work leads to the conclusion that the visual system can adapt to the temporal conditions of stimulation to an extent not previously indicated by two-pulse and short-train studies. The visual beat technique indicates that temporal resolution varies over wide limits depending on the conditions of perception. Dissert. Abstr.

**N68-23255*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
**MEASUREMENT OF PILOT DESCRIBING FUNCTIONS FROM FLIGHT TEST DATA WITH AN EXAMPLE FROM GEMINI 10**
Rodney C. Wingrove and Frederick G. Edwards [1967] 16 p refs Presented at the 4th Ann. Conf. on Manual Control Systems, Ann Arbor, Mich., 21–23 Mar. 1968
(NASA-TM-X-61071) CFSTI: HC $3.00/MF $0.65 CSCL 05H

Under normal flight test conditions, it has been known that there is an error in measuring the pilot describing function due to a correlation of the input error signal with the pilot's output noise. It is shown in this paper that this measurement error can be reduced by shifting the input signal during the computer processing by an amount equivalent to the pilot's time delay. This technique is based on a theoretical development which considers the fact that the measurement is constrained to identify only physically realizable systems. The simulation and identification of an example pilot mode is presented. Data from the retrofire phase of the Gemini X flight are used to demonstrate the feasibility of this technique with normal spacecraft operating records. Author

**N68-23276#** School of Aerospace Medicine, Brooks AFB, Tex.
**AUTOMATED DETERMINATION OF GLUCOSE USING GLUCOSE OXIDASE AND POTASSIUM FERROCYANIDE Final Report, 1 May–30 Sep. 1967**
James W. Hall and Donald M. Tucker Jan. 1968 11 p refs Submitted for publication
(SAM-TR-68-4; AD-666925)

A study was undertaken to find a rapid, accurate, and reproducible method for determining blood glucose. For these reasons, the decision was made to adapt the glucose-oxidase procedure for use on an automatic system. It was subsequently found, however, that existing technics did not meet all the criteria specified. The procedure was modified so that the problem of carry-over (encountered when o-tolidine or o-dianisidine is used) was eliminated. Author (TAB)

**N68-23292#** Rome Univ. (Italy).
**KINETICS STUDIES ON HEMOPROTEINS BY FLASH PHOTOLYSIS Final Scientific Report, 31 Jan. 1967–31 Jan. 1968**
Eralso Antonini 31 Jan. 1968 7 p refs
(Grant AF-EOAR-62-82)
(AFOSR-68-0524; AD-666691)

Results in the following areas of investigation are summarized: kinetic effects of the reversible dissociation of hemoglobin into side chain molecules; reaction of isolated alpha-CO and beta-CO hemoglobin chain to form hemoglobin (alpha-2 beta-2) (CO)4; kinetic behavior on flash photolysis of the high molecular weight hemoglobin from the earthworm; spectral difference between the deoxygenated hemoglobin chains and hemoglobin. TAB

**N68-23296#** School of Aerospace Medicine, Brooks AFB, Tex.
**PHYSIOLOGIC AND BIOCHEMICAL OBSERVATIONS ON THE RHESUS MACACA MULATTA EXPOSED TO OXYGEN-RICH ATMOSPHERES**
Frode Ulvedal and H. E. Brown Sep. 1967 27 p refs
(SAM-TR-67-86; AD-666923)

Adolescent male rhesus monkeys (Macaca mulatta), weighing 2.9 to 3.4 kg., were exposed to 100% oxygen atmospheres at 258 and 380 mm. Hg pressures for 30 and 22 days, respectively, and the results obtained were compared to the observations made in a ground-level control study using the same chamber system. Physiologic, hematologic, enzymatic, biochemical, and anatomic measurements were obtained throughout the experiments. Several changes and trends were common to all three experiments; however, some were observed only for the oxygen-exposed animals and were dependent on the concentration of oxygen in the atmosphere. Author (TAB)

**N68-23317*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
**EXPERIMENTS ON AIM POINT ESTIMATION AT VARIOUS RATES OF CLOSURE**
Everett A. Palmer 23 Mar. 1968 10 p refs Presented at 4th Ann. Conf. on Manual Control Systems, Ann Arbor, Mich., 21–23 Mar. 1968
(NASA-TM-X-61077) CFSTI: HC$3.00/MF$0.65 CSCL 05H

As an aircraft approaches the earth all points on the ground appear to the pilot to expand radially out from a stationary point on the ground toward which the aircraft is aiming. If the pilot can detect this point of zero expansion, he knows precisely the point on the ground toward which his aircraft is aiming. Experimental evidence is presented as to how precisely a pilot can actually detect this aim point. Since any point in the pilot's field of view always moves radially out from the aim point, it is necessary to know only the magnitude of the velocity at any point to specify the pattern of motion seen by the pilot. This was done by plotting contours of equal angular rate. The hypothesis was then made that the expected error in detecting the aim point would be a linear function of the angular distance from the aim point to some threshold angular rate. Initial results of an experimental study in which subjects viewed a pattern of dots that simulated the apparent expansion pattern of the ground tend to confirm this hypothesis. Author

**N68-23325** Illinois Univ., Urbana.
**ATTENTION IN THE IDENTIFICATION OF STIMULI IN COMPLEX VISUAL DISPLAYS**
*Joseph Stephens Lappin* 1966 40 p
Available from Univ. Microfilms: HC $3.00/MF $3.00 Order No. 67-6654

The identification of three stimuli embedded in brief visual displays was studied under conditions varying the relationship between the relevant stimuli. The stimuli and responses themselves were same in all conditions. Displays were circular arrays of nine three-dimensional objects, and were presented to the fovea for exposure durations shorter than voluntary eye-movement latencies. In different blocks of trials, the stimuli were either all three dimensions (size, color, and angle) of a single object, a different dimension of each of three objects, or the same dimension of three objects. In the conditions with three objects, these objects were located at either three adjacent or three separated positions on the display. Performance was found to be best when the stimuli were the three dimensions of a single object, and better when they were the same dimension than when a different dimension of each of the three objects. Dissert. Abstr.

**N68-23328*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
**HUMAN INFORMATION PROCESSING RATES DURING CERTAIN MULTIAXIS TRACKING TASKS WITH A CONCURRENT AUDITORY TASK**
T. E. Wempe and D. L. Baty [1967] 30 p refs Presented at the 4th Ann. Conf. on Manual Control Systems, Ann Arbor, Mich., 21–23 Mar. 1968
(NASA-TM-X-61085) CFSTI: HC$3.00/MF$0.65 CSCL 05H

A series of experiments were conducted to determine the information processing rates of several subjects performing one and two axis compensatory tracking tasks with a secondary auditory task. The experimental variables were the order of controlled element dynamics, the forcing function and the addition of a secondary task. Human information processing rates decreased on each tracking channel with the addition of the second tracking channel or the secondary auditory task. Other than this effect, the information processing channels were additive like parallel channels until a limit in the total information processing rate was reached. This limit was related to the order of the controlled element. Author

**N68-23329*#** National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
**A SYNTHESIS OF HUMAN RESPONSE IN CLOSED-LOOP TRACKING TASKS**
James J. Adams [1968] 12 p refs Presented at the 4th Ann. Conf. on Manual Control Systems, Ann Arbor, Mich., 21–23 Mar. 1968
(NASA-TM-X-61084) CFSTI: HC$3.00/MF$0.65 CSCL 05H

Previous investigations have determined linear, average constant-coefficient models that provided a reasonable reproduction of a human controller's response in tracking tasks. However, when such models are put in a control loop in place of a human, they do not exactly reproduce the system response obtained with the human controller. These previous studies suggest that time variations of the model coefficients and a random noise signal should be added to the linear model to obtain a more accurate representation of the human's response. In this present study, experiments have been conducted to determine the variability in a human subject's control stick response to displayed displacement and rate of change of displacement to aid in the implementation of the time variations to be included in the model. Also, additional tracking tasks were added to the model. These two factors were then added to the model, and this composite model was placed in a control loop in place of the pilot. The results demonstrate that this composite model reproduces time-history characteristics and mean-square system errors which more closely match the human subject than does the linear model. Author

**N68-23343#** School of Aerospace Medicine, Brooks AFB, Tex.
**BITE-SIZE FOOD IN FIGHTER AIRCRAFT Final Report, Aug. 1966–May 1967**
May J. O'Hara and John E. Vanderveen Dec. 1967 15 p refs Submitted for publication
(SAM-TR-67-114; AD-666909)

Bite-size foods were consumed by pilots of fighter-type aircraft in two trials, and data were collected on the acceptability and ease of handling these foods. This type of feeding system offers foods that are stable without refrigeration, are easy to handle, and need no kitchen facility for preparation. Bite-size food flavors at the present time do not surpass those of conventional foods. Author (TAB)

**N68-23385** Purdue Univ., Lafayette, Ind.
**INTER-SENSORY INTERACTION AND VIGILANCE IN A BI-MODAL, NON-REDUNDANT SIGNAL DETECTION TASK**

Max Harold McDaniel (Ph.D. Thesis) 1966 89 p
Available from Univ. Microfilms: HC $4.60/MF $3.00 Order No. 67-5459

Twenty subjects performed a simultaneous, non-redundant, visual and auditory signal detection task, twenty-five minutes a day for nine consecutive days. Independent variables manipulated were visual signal frequency, visual inter-signal interval variability, and auditory signal frequency. Primary dependent variables were average reaction times per session and proportion of signals missed. Inter-sensory interaction was found. Increases in frequency of the auditory signal caused decreases in both reaction time to the visual signal and proportion of visual signals missed. Decreases in the variability of the visual signal appeared to decrease reaction time to the auditory signal. The "activation" and "expectancy" hypotheses successfully predicted effects of signal frequency and signal variability, respectively. As signal frequency (level of activation) increased, vigilance performance improved. Signal frequency and variability tended to have the same effects between modalities as within modalities. Dissert. Abstr.

**N68-23387** Illinois Univ., Urbana.
**STIMULUS-INTENSITY AND ADAPTATION-LEVEL AS DETERMINANTS OF SIMPLE REACTION TIME**
David Lloyd Kohfeld (Ph.D. Thesis) 1966 55 p
Available from Univ. Microfilms: HC $3.00/MF $3.00 Order No. 67-6650

The results of a number of experiments indicate that simple reaction time (RT) undergoes a systematic decrease with a corresponding increase in stimulus-intensity. Along these lines, RT was investigated within the framework of adaptation level (AL) and stimulus-intensity effects. Subjects were preadapted to either 35, 65, or 100 decibel (db), sound pressure level, tones, to a random combination of the three (35–65–100 db), or to silence (control). A reaction test series of 35, 50, 65, 85, and 100 db tones was presented at random immediately afterward. It was hypothesized that subjects preadapted to a 65 db tone would perform similarly to those preadapted to either the 35–65–100 db combination or to silence. It was predicted that the group with an AL of 100 bd should produce the slowest mean RT, whereas the 35 db group should have the fastest mean RT. The results confirmed the experimental hypothesis and were thus consistent with an AL interpretation of stimulus-intensity effects. Dissert. Abstr.

**N68-23389** Mississippi Univ., University.
**DETECTION OF MONAURAL SIGNALS AS A FUNCTION OF INTERAURAL NOISE CORRELATION AND SIGNAL FREQUENCY**
John Kenneth Whitmore (Ph.D. Thesis) 1966 62 p
Available from Univ. Microfilms: HC $3.60/MF $3.00 Order No. 67-6454

The effects of varying the interaural correlation for noise on the detection of 150, 200, 225, 240, 500, 1200, 3000, and 4000 Hz, monaural, 200 msec., tonal signals were investigated. Correlations of +1.00, +0.90, +0.75, +0.50 +0.25, and zero were obtained by mixing correlated and noise in the channels to the two ears. A yes-no, rating-scale procedure was used to obtain masking-level differences (MLD's) relative to purely monaural detection (Nm Sm). The results show that the magnitude of the binaural advantage for detection depends on the frequency of the signal and the interaural correlation of the masking noise. With correlated noise (NO Sm) signal frequencies of 225, 250, 500, and 1200 Hz are superior to Nm Sm by about 6, 9.5, 8, and 4.5 dB respectively. These MLD's diminished rapidly as the correlation of the noise was decreased from unity. At 200 Hz, the maximum MLD is about 3 dB. MLD's of about 2 dB were obtained for signals of 3000 and 4000 Hz. Dissert. Abstr.

**N68-23396*#** Emory Univ., Atlanta, Ga.
**[RADIATION MEASUREMENT OF RADIOBIOLOGICAL HAZARDS OF MAN IN SPACE] Semiannual Report, 1 Oct. 1967–31 Mar. 1968**
Norman A. Baily 31 Mar. 1968 55 p refs
(Grant NGR-11-001-026)
(NASA-CR-94575) CFSTI: HC $3.00/MF $0.65 CSCL 06R

Isodose patterns, cyclotron experiments on parasitic organisms, microdosimetric distributions, and energy event frequency distributions were studied in relation to radiobiological hazards to men exposed to space environments. Equipment for the cyclotron work was acquired and constructed, and tissue-equivalent absorbers were constructed for use with the tissue-equivalent proportional counter so that microdose distributions at various tissue depths could be studied. Measurement and characteristics of depth dose patterns due to proton beams were studied; and the absorbed dose by animals or humans subjected to irradiation was found to be dependent upon the organ or region under consideration, beam geometry, material through which the beam passes prior to incidence on the subject, and other factors peculiar to the particular case under investigation. A computer program was designed to use experimental depth dose data to produce isodose curves, which were computed for proton energies between 45.8 and 730 MeV. M.W.R.

**N68-23407#** Florida State Univ., Tallahassee. Dept. of Biological Science.
**RESEARCH IN PHOTOBIOLOGY AND PHOTOCHEMISTRY Final Report, 1 May 1965–30 Apr. 1967**
H. Gaffron 1 Feb. 1968 6 p refs
(Grant AF-AFOSR-662-65)
(AFOSR-68-0493; AD-666912)

A summary is given of investigations of the manganese content of chloroplasts, activation of photosynthesis by manganese, two types of damage in higher plants due to manganese deficiency, and the distribution of manganese in structurally different chloroplasts in relation to particular metabolic activities displayed by such chloroplasts. Another investigation dealt with the response of photosynthesis and respiration to desiccation in the fern Polypodium polypodioides. Author (TAB)

**N68-23408*#** Franklin Inst., Philadelphia, Pa. Research Labs.
**SPACE RELATED BIOLOGICAL AND INSTRUMENTATION STUDIES Annual Report, Mar. 1967–Mar. 1968**
R. J. Gibson, Jr. and R. M. Goodman Mar. 1968 104 p refs
(Contract NSR-39-005-018)
(NASA-CR-94542; A-B2299-2) CFSTI: HC $3.00/MF $0.65 CSCL 06B

The application of loop antennas for use with magnetic induction telemeters is discussed, along with the theoretical calculations used in deriving design approximations. Signal strengths for various antenna configurations were measured, and various circuit arrangements for improving the signal and/or reducing the noise are assessed. The temperature versus pulse count from a typical temperature telemeter is approximated, and the calibration curves are plotted. Experimental and developmental efforts continued on the low cost, high reliability, multichannel implantable telemeter, with emphasis placed on the evolution of micropower subcarrier oscillators. Summary data are provided on the design criteria for fully autoclavable brain temperature probes, requiring a small telemeter to be attached externally to the subject, and a receiver–recorder console for acquiring the transmitted signal from the telemeter and presenting a linear record of brain temperature. Consideration is also given to the problems involved in producing magnetic fields for biological experiments and designing magnetic shields. M.G.J.

**N68-23412#** Little (Arthur D.), Cambridge, Mass.
**TECHNIQUES AND MATERIALS FOR PASSIVE THERMAL CONTROL OF RIGID AND FLEXIBLE EXTRAVEHICULAR SPACE ENCLOSURES Final Report, Feb. 1966–May 1967**
David L. Richardson Wright-Patterson AFB, Ohio AMRL Dec. 1967 113 p refs
(Contract AF 33(615)-3533)
(AMRL-TR-67-128; AD-666940)

The results of the analysis indicate that when an astronaut in a flexible enclosure (soft space suit) works on the surface of a large spacecraft, the temperatures on his external surface are markedly increased over those which occur when he is not near the spacecraft. Moreover, passive thermal control of the astronaut is not possible when he is near the spacecraft. The techniques investigated for thermally coupling an astronaut with his thermal control system include liquid cooled undergarments, gas cooling, and heat transfer to the cooled walls of his enclosure. Techniques were investigated for increasing the conductance through soft space suit insulations by compressing the insulation. The insulation of a cylindrical section of a space suit arm was measured under both compressed conditions (3.7 psia) and uncompressed conditions in simulated noon and earth-umbra orbit-positions. The range of conductance increased from 0.26 Btu/sq ft-hr degrees F uncompressed to 0.81 Btu/sq ft-hr degree F compressed. Measurements were made in simulated noon and earth-umbra orbit positions of the thermal heat dissipating capability of a louver system which was designed for operation in the sun. A 6-inch square model had a net heat flow from the louvers for the four orbit conditions tested (open and closed in the sun and in the shade). The louver operation controls maintained the louver baseplate temperature in the range from 73.9 to 84.7 F for a steady heat dissipation rate of 95.5 Btu/sq ft-hr while operating in the shade.
Author (TAB)

**N68-23416#** Communication Research Inst., Miami, Fla.
**REPROGRAMMING OF THE SONIC OUTPUT OF THE DOLPHIN: SONIC BURST-COUNT MATCHING Annual Report (Final), 1 Nov. 1966–31 Oct. 1967**
John C. Lilly, Alice M. Miller, and Henry M. Truby 21 Oct. 1967 47 p refs
(Grant AF-AFOSR-415-67)
(CRI-0267; AFOSR-68-0518; AD-666690)

The sound producing mechanisms in the bottlenose dolphin (Tursiops truncatus) operate naturally underwater with a closed blowhole. In these experiments Tt's reprogrammability in the vocal airborne mode and in vocal-ascoustic interlock with another species is demonstrated. Human speech output programs were constructed from randomized vowel-consonant (V-C) and consonant-vowel (C-V) lists and simple English words and phrases. The analysis of the dolphins sonic vocal output in response to these Hs vocal programs demonstrates Tt's reprogramming: in matching number of trains of bursts, interburst silences, and latencies; ability to differentiate between Hs stimuli and other Hs comments or corrections, and ability to program from natural delphinic sounds to humanoid emissions.
Author (TAB)

**N68-23444*#** Stanford Univ., Calif. Inst. for Mathematical Studies in the Social Sciences.
**SOME SPECULATIONS ON STORAGE AND RETRIEVAL PROCESSES IN LONG TERM MEMORY**
R. C. Atkinson and R. M. Shiffrin 2 Feb. 1968 26 p refs Presented at Conf. on Res. on Human Decision Making, Moffett Field, Calif., 31 Jan–2 Feb. 1968
(Grant NGR-05-020-036)
(NASA-CR-94547; TR-127) CFSTI: HC $3.00/MF $0.65 CSCL 09B

A brief outline of the memory system is followed by somewhat speculative proposals for storage and retrieval processes, with particular care being given to distinguishing structural components from control processes set up and directed by the subject. The memory trace is conceived of as an ensemble of information, possibly stored in many places. For a given set of incoming information, the questions dealt with are whether to store, how to store, and where to store; the last question in particular deals with storage along various dimensions. Retrieval consists of a search along storage dimensions utilizing available cues to limit the search area and provide appropriate entry points. Both storage and retrieval are considered to take place in two steps, one consisting of a highly directed process under control of the subject and the other consisting of a pseudo-random component.
Author

**N68-23446*#** Scripta Technica, Inc., Washington, D. C.
**HORIZONTAL AND AMACRINE CELLS OF THE RETINA: PROPERTIES AND MECHANISMS OF THEIR CONTROL OVER THE BIPOLAR AND GANGLIONIC CELLS [CELULAS HORIZONTALES Y AMACRINAS DE LA RETINA: PROPIEDADES Y MECHANISMOS DE CONTROL SOBRE LAS BIPOLARES Y GANGLIONARES]**
G. Svaetichin Washington NASA May 1968 21 p refs Transl. into ENGLISH from Acta Cient. Venezolana (Spain), Suppl. 3, 1967 p 254–276
(Contract NASw-1694)
(NASA-TT-F-11582) CFSTI: HC $3.00/MF $0.65 CSCL 06P

A general review is presented of the morphological and electrophysiological findings which support our theory concerning the horizontal and amacrine cell control of the excitability and coding mechanisms of the retina. Evidence is presented for (1) the existence of a functional contact between horizontal cells and amacrine cells, which is different from the electrical or chemical synapse; and (2) the nonionic nature of the S-potentials, which are intimately dependent on plasma membrane respiration. Various proofs are given for the fact that horizontal cells exert their nonspecific excitability control on the bipolar cell dendrites through a transferaptic influence. By analogy, certain amacrine cells exert a specific control, wavelength- or space-dependent, on the dendrites of certain ganglion cells coding color, black-white or space.
Author

**N68-23455*#** Southwest Research Inst., Birmingham, Ala.
**SOUTHWEST RESEARCH INSTITUTE ASSISTANCE TO NASA IN BIOMEDICAL AREAS OF THE TECHNOLOGY UTILIZATION PROGRAM Cumulative Quarterly Report, 1 Oct. 1967–31 Mar. 1968**
Ray W. Ware and Louis S. Berger 15 Apr. 1968 67 p
(Contract NASw-1714; SwRI Proj. 14-2329)
(NASA-CR-94586) CFSTI: HC $3.00/MF $0.65 CSCL 06E

The operations of the research institute during the reporting period are summarized. Listed are the biomedical problems and cases that were processed, current and projected activities, program participants, operating personnel, and documents supplied to participants. The information transfer process is briefly discussed.
K.W.

**N68-23471#** General Electric Co., Syracuse, N. Y. Electronics Lab.
**SIGHTING RANGE OF TARGETS AGAINST THE NIGHT HORIZON SKY**
C. Townsend Mar. 1967 31 p refs
(R67ELS-24)

A series of graphs have been prepared giving the sighting range of targets viewed against the horizon sky at night versus horizon sky luminance. A range of target sizes, target to background contracts and meteorological ranges are considered for the case of 95% detection probability.
Author

**N68-23533*#** Arkansas Univ., Little Rock.
**RADIATION-INDUCED NUCLEIC ACID SYNTHESIS IN L CELLS UNDER ENERGY DEPRIVATION**
J. L. Sanders, Glenn V. Dalrymple, Max L. Baker, K. P. Wilkinson, and Paul A. Dixon Dec. 1967 31 p refs
(Grant NGR-04-001-014)
(NASA-CR-73220) CFSTI: HC$3.00/MF$0.65 CSCL 06R

The L cells show a brief, accelerated uptake of radioactive precursor into both DNA and RNA following relatively low doses of radiation. This response appeared for cells being starved in a glucose-free salt solution and for cells treated with 2,4-dinitrophenol. Three distinct features characterize the response. First, a relatively fixed postirradiation time delay seems necessary before the accelerated labeling of the nucleic acids occurs. Second, the labeling of the DNA fraction closely parallels the labeling of the RNA fraction. Finally, the radioactive label appears to enter and then to leave both nucleic acid fractions. Although the accelerated labeling was most apparent after 100 rads, it also happened at higher doses where several cycles of incorporation and loss of label appeared. Since comparable changes were not found under normal growth conditions, this response presumably results because of the energy-deprived state. Both continuous labeling and pulse methods were used; the nucleic acids were labeled with either inorganic phosphate–P32 or radioactive precursors specific for a given fraction. Survival studies indicated that cells treated with 2,4-dinitrophenol had an increased resistance to X-rays. Author

**N68-23581#** Stanford Univ., Calif. Instrumentation Research Lab.
**MOLECULAR BIOLOGY APPLICATIONS OF MASS SPECTROMETRY Final Report, 1 Jul. 1965–31 Dec. 1967**
Joshua Lederberg and Elliott C. Levinthal 31 Dec. 1967 53 p refs
(Contract AF 49(638)-1599)
(IRL-1073; AFOSR-68-0529; AD-666667)

Summaries are given of research efforts in the following areas: Volatilization of molecules of biological interest; spectral analysis of monomers; computer control of mass spectrometers; data retrieval and display; computer manipulation of chemical hypotheses. References to papers previously published in professional journals and technical reports are included. TAB

**N68-23619#** Army Medical Research Lab., Fort Knox, Ky. Experimental Psychology Div.
**EFFECTS OF SLEEP DEPRIVATION ON THE VESTIBULO-OCULAR REFLEX Progress Report**
James W. Wolfe and James H. Brown 13 Feb. 1968 16 p refs
(USAMRL-766; AD-666750)

Sixteen young adult men were deprived of sleep for a period of 24 hours in an attempt to assess possible interactions between sleep mechanisms and the vestibular system. Ss were given a pre- and post-test consisting of trials at angular accelerations of 8 degrees/sec sq and 24 degrees/sec sq. Following sleep deprivation, Ss showed a significant increase in fast-phase frequency at 24 degrees/sec sq, and a nonsignificant increment at 8 degrees/sec sq. Slow-phase output reflected a significant decrement at 8 degrees/sec sq, but no significant decrement at 24 degrees/sec sq. Subjective latency estimates of stimulus onset showed no significant changes for either 8 degrees or 24 degrees/sec sq. Discussion centers around possible physiological mechanisms related to sleep and vestibular responses. Author (TAB)

**N68-23653#** Hawaii Univ., Honolulu. East-West Center for Cultural Exchange.
**INTERNATIONAL CONFERENCE ON METHODOLOGIES OF PATTERN RECOGNITION Scientific Interim Report**
Michael S. Watanabe 26 Jan. 1968 64 p refs
(Grant AF-AFOSR-68-1379)
(AFOSR-68-0515; AD-666679)

The document contains the program and abstracts of papers presented at the International Conference held at the University of Hawaii on January 24 - 26, 1968. The papers are concerned with theoretical foundations of pattern recognition methodologies, and consider, inter alia, the selection of variables, definitions of class features, limitations on domains of applicability of algorithms, assessments of decision-making procedures, and measures of goodness of variables. A proceedings volume is being undertaken. Author (TAB)

**N68-23658#** United Kingdom Atomic Energy Authority, Harwell (England). Health Physics and Medical Div.
**RADIOACTIVE AEROSOLS IN SOME SELECTED AREAS AT A.E.R.E. PARTICLE SIZE DISTRIBUTIONS AND LONG TERM MEAN CONCENTRATIONS MEASURED BY PERSONAL AND STATIC AIR SAMPLERS**
D. C. Stevens Jan. 1968 20 p refs
(AERE-R-5688) HMSO: 3s

Centripeters and personal air samplers were used to measure the particle size of radioactive aerosols in various buildings and to examine the relationship between personal exposure and exposure measured by an environmental (static) sampler. The activity median aerodynamic particle diameter associated with the airborne activity in the incinerator building and filter house was 5 to 6 $\mu$m for both alpha and beta activity with a geometric standard deviation of 2.5 to 3.0. Similar size distributions were obtained for beta activity in the high activity handling building and the wet decontamination area but airborne alpha activity in the latter had a median diameter of 3.5 $\mu$m with a geometric standard deviation of 4.3. The air concentrations were statistically analysed, and the convenience of the log-normal distribution is demonstrated. It is shown that in areas where the source of airborne contamination is widespread and not directly associated with particular operations, the long term mean exposure indicated by personal samplers is similar to that indicated by the static (centripeter) sampler. However in an area, such as the decontamination area, where each man generates a localized aerosol, the mean exposure indicated by personal samplers is often 10 or more times higher than that shown by a static sampler. Author

**N68-23714*#** Baylor Univ., Houston, Tex. Urology Div.
**MODIFICATION OF NASA URINE COLLECTING SYSTEM Final Report, 1 May 1966–1 Apr. 1968**
Russell Scott, Jr. 9 Apr. 1968 44 p
(Contract NAS9-6206)
(NASA-CR-92105) CFSTI: HC$3.00/MF$0.65 CSCL 06B

This project involves four areas of research in development of an improved system of in-flight urinary collection. Anatomical form fitting condoms have been developed to reduce potential leakage and improve comfort. Methods of production are described and photographs provided. A design has been proposed for a urine collection system close-coupled to the suit of the astronaut. Observations on bacterial growth, turbidity, and alkalinity of initially sterile urine are discussed. Recommendations are made for an additive solution for control of these factors. Skin irritation from leaked urine is a potential in-flight problem. Upon advice from dermatologic consultants, a suitable commercial product is recommended to avoid this complication. Developmental concepts are discussed regarding a garment which would provide for absorption of leaked urine. Suitable sources for further development in this area are suggested. Author

**N68-23715#** Army Medical Research Lab., Fort Knox, Ky
**EFFECT OF D-TUBOCURARINE ON THE SCALING OF EFFORT OF ISOMETRIC MUSCLE CONTRACTIONS Progress Report**

Richard P. Smith (Louisville Univ.), Lee S. Caldwell, and Donald M. Thomas (Louisville Univ.) 7 Feb. 1968 9 p refs
(USAMRL-765; AD-666749)

The purpose of this study was to determine whether the alteration in voluntary strength produced by d-tubocurarine, and the consequent reduction in feedback from the muscles, would distort a subjects normal reference for judging the effortfulness of a task, and change the slope of the effort function. The effort function obtained with d-tubocurarine was not significantly different from those secured in the normal and placebo conditions. Thus, it was concluded that the motor units remaining functional after the administration of d-tubocurarine fatigue normally, and that the slope of the effort function is determined by the relative rather than the absolute number of motor units required to maintain the contraction. Author (TAB)

**N68-23716*#** Miami Valley Hospital, Dayton, Ohio. Dept. of Research.
**THE BIOCHEMICAL, PHYSIOLOGICAL, AND METABOLIC EFFECTS OF APOLLO NOMINAL MISSION AND CONTINGENCY DIETS ON HUMAN SUBJECTS WHILE ON A SIMULATED APOLLO MISSION Final Report, Feb.–Jun. 1966**
Bernard J. Katchman, James P. F. Murphy, Vickie R. Must, and Ellis Patrick Wright-Patterson AFB, Ohio AMRL Dec. 1967 122 p refs Sponsored jointly by NASA and USAF
(Contract AF 33(657)-11716)
(NASA-CR-94588; AMRL-TR-67-164) CFSTI: HC $3.00/MF $0.65 CSCL 06S

Four human male subjects participated in a 90-day experiment which consisted of 60-day and 30-day periods of confinement with a 5-day break between the confinement periods. The subjects were confined with pressure suits worn unpressurized and pressurized at 3.7 psi. The subjects ate a fresh food diet, an Apollo nominal mission diet, or an Apollo contingency diet; the diets provided 2200, 2500, and 900 kcal/day, respectively. The subjects lost about 500 g/day of body weight while on the contingency diet of which about 50% is estimated to be water. About 40 g/day of body weight was lost because of protein catabolism. Blood levels of sodium, potassium, phosphorus, chloride, calcium, and magnesium were maintained in the normal range of clinical values. Oral body temperature, pulse rate, respirations, blood pressure, and basal metabolic rate all were in the normal range of clinical values. However, the 17-hydroxycorticoids of the urine decreased to low normal and lower than normal ranges of clinical values. Three of the four subjects were able to complete a simulated Apollo emergency mission while in a pressure suit pressurized at 3.7 psi and on a 900-calorie contingency diet. Author

**N68-23729*#** Techtran Corp., Glen Burnie, Md.
**OVERRIPENESS OF THE EGGS AS CAUSAL FACTOR IN THE APPEARANCE OF MULTIPLE FORMATIONS AND TERATISMS [UBERREIFE DER EIER ALS KAUSALER FAKTOR BEI DER ENTSTEHUNG VON MEHRFACHBILDUNGEN UND TERATOMEN]**
Emil Witschi Washington NASA May 1968 9 p refs Transl. into ENGLISH from Verhandl. Naturforsch. Ges. Basel, v. 34, 1922–1923 p 33–40
(Contract NASw-1695)
(NASA-TT-F-11684) CFSTI: HC $3.00/MF $0.65 CSCL 06C

Both heat and overripeness of eggs are seen to be a factor in producing multiple formations and teratisms in frogs. Radical malformations were observed to result from either factor. Limiting himself to a description of observations of the living object, the author investigates the causal genesis of these phenomena. The following two causes are specifically named: loosening of intercellular bonds and varying degree of damage of different parts of the egg resulting from overripeness. Author

**N68-23784#** Applied Psychological Services, Wayne, Pa. Science Center.
**VISUAL DATA RELEVANT TO AIRCRAFT CAMOUFLAGE, LITERATURE SURVEY Interim Report**
Dorothy E. Fletcher and Arthur I. Siegel Johnsville, Pa. Naval Air Develop. Center 18 Mar. 1968 129 p refs
(Contract N00156-67-C-2011)
(NADC-AC-6806; AD-667838)

The psychological literature, relevant to developing military aircraft surface camouflage schemes to minimize visual detection, identification, and/or estimation ranges under varying conditions, is surveyed. The survey considers brightness, hue, saturation, spatial, temporal, and movement judgments and factors that affect attention. Special attention is given to prediction problems, specific areas requiring further research, and control and maintenance functions. Author (TAB)

**N68-23785#** RAND Corp., Santa Monica, Calif.
**COLOR DISCRIMINATION IN STATIC DISPLAYS**
J. J. Sheppard, Jr., H. L. Moshin, R. H. Stratton, D. Dugas, and A. Madansky Nov. 1967 90 p refs
(Contract DAHC15-67-C-0141; ARPA Order 189-1)
(RM-5303-ARPA; AD-667592)

A description is presented of an experimental test of the color discrimination ability of a group of untrained observers in a simulated display situation in which stationary targets on a constant background are viewed. Just-noticeable-differences (JNDs) in saturation at constant brightness were determined for 39 subjects for each of six hue series about the 3200K tungsten achromatic point. The results indicate that human chromaticity discrimination ability is only moderately degraded for widely separated 1/3-deg target spots in a dark field subtending 17 deg. Evidence of tritanopic effects was found with the 1/3-deg targets, but the effects were moderate and are approximately accounted for in a scaling procedure. These findings may be applicable not only to the monitoring of reentry vehicles, but to other similar display situations in which color is used as an additional dimension. Author (TAB)

**N68-23801#** United Kingdom Atomic Energy Authority, Harwell (England). Health Physics and Medical Div.
**THE POINT SOURCE METHOD OF DOSE CALCULATION IN MEDIA OF VARYING DENSITY WITH SPECIAL REFERENCE TO $\beta$-PARTICLES**
W. J. Whitehouse Jan. 1968 22 p refs
(AERE-R-5679) CFSTI: HC $3.00/MF $0.65

The point source method is adapted to calculating the energy deposition in media of varying density and discussed, with special reference to the dose from $\beta$-particles in trabecular bone. The dose reciprocity theorem is restated in a form consistent with the density-dependent point source formula. The Loevinger point source formula for $\beta$-rays is used to solve two models: (1) alternating infinite slabs of different substances; and (2) a hollow sphere filled with one substance and surrounded by another. The numerical values used in these solutions correspond to the bone-seeking nuclides $^{90}Sr$, $^{90}Y$, and $^{32}P$, and to substances with the density and mean composition of trabecular bone. The solutions indicate that the mean dose in trabecular bone is not markedly different from that which would be calculated on the assumption that the bone and marrow were intimately mixed. Author

**N68-23808#** General Electric Co., Philadelphia, Pa.
**VACUUM DISTILLATION, VAPOR PYROLYSIS WATER RECOVERY SYSTEM UTILIZING RADIOISOTOPES FOR THERMAL ENERGY Final Report, 5 May–4 Jul. 1967**
H. Esten, R. W. Murray, and L. Cooper Wright-Patterson AFB, Ohio AMRL Nov. 1967 94 p
(Contract AF 33(615)-3308)
(Doc.-67SD8124; AMRL-TR-67-80; AD-667571)

A laboratory prototype system for producing, storing and dispensing potable water derived from urine and wash water was designed, fabricated, and tested. The design incorporated the previously established technique of vacuum distillation of liquid wastes followed by pyrolysis of the steam in the presence of a catalyst. For the first time, radioisotope heat sources (containing Plutonium 238) were employed in both the evaporator and pyrolysis sections to minimize the electrical power requirements for a potential space application. The system was also designed to utilize electrical and waste heat sources and is capable of zero gravity operation. The basic process demonstrated its feasibility for long duration operation producing high quality potable water. Peripheral equipment, such as, liquid level sensors, and phase separators need further development. Unit weight was 120 pounds and power consumption was 56 watt-hours per pound of water recovered. A flight optimized design using isotopes would weigh 58 pounds and consume 8 watt hours per pound of water recovered.
Author (TAB)

**N68-23909** Aircraft Porous Media, Inc., Glen Cove, N. Y.
**FILTERING SYSTEM FOR AEROSPACE WATER RECLAMATION Final Report, Apr. 1966–Jul. 1967**
Klaus Feindler Wright-Patterson AFB,, Ohio AMRL Dec. 1967 41 p refs
(Contract AF 33(615)-3862)
(AMRL-TR-67-157; AD-667552)

A study was conducted to provide design criteria for a system employing multifiltration for reclaiming bacteria-free potable water from wash water, dehumidification water, and water recovered from urine. Based on the design criteria developed, a laboratory model was constructed and tested. The laboratory model consisted of a transfer pump, filtration units, a storage tank, and a dispenser. It was designed to process 22 liters of water each day during a 36-day simulated aerospace mission, with no major maintenance, replacement of parts, cleaning, or calibration. Provisions were made for the replacement of expendable parts, when required, in order to operate for 180 days. Author (TAB)

**N68-23914#** Naval Radiological Defense Lab., San Francisco, Calif.
**EFFECTS OF TOTAL-BODY IRRADIATION ON THE IMMUNE ELIMINATION OF $I^{131}$ HORSE SERUM ALBUMIN IN $LAF_1$ MICE**
Walter W. H. Weyzen, Gerald M. Vattuone, and Myron S. Silverman 8 Feb. 1968 55 p refs
(USNRDL-TR-68-22; AD-667231)

The effect of total-body irradiation on the primary antibody response to horse serum albumin in mice was studied. Mice were irradiated with doses ranging from 100 to 400 R and were immunized 24 hours later. At various time intervals thereafter, the antibody response was determined by measuring the elimination of a tracer dose of I131 horse serum albumin from the plasma. From the results of these measurements, the induction period, the slope of the elimination curve and the T99 was calculated. The immune response was expressed in terms of T99, i.e., the time (hours) required for the elimination of 99% of a given amount of antigen from the plasma. The radiation effects observed consisted in a delay of the onset of immune elimination and a decrease in the rate of appearance of anti-bodies in the plasma. The relationship between T99 and the time of injection of the tracer dose (days after immunization) in mice irradiated with doses up to 300 R was similar to that observed in non-irradiated immunized mice. However, the initial period during which T99 remained constant was lengthened in mice exposed to 200 and 300 R. In addition, the subsequent linear decrease of T99 with time occurred at a lower rate. The relative immune response, based on the T99 observed when the tracer dose was injected 7 days after immunization, provided a basis for comparison of the radiation injury to the immune system at the various dose levels. When the relative immune response was plotted against the radiation dose, a linear dose-effect curve was obtained. The radiation dose required to obtain a 50% depression of the immune response was found to be 175 R. Author (TAB)

**N68-23933#** Syracuse Univ., N. Y.
**DETECTION AND IDENTIFICATION OF MICROORGANISMS BY GAS CHROMATOGRAPHY**
J. R. Gould *In* Inst. for Defense Analyses OAR Res. Appl. Conf., 1968, Vol. 1 21 Mar. 1968 39 p refs Presented at Dept. of AF, Office of Aerospace Res., Res. Appl. Conf., Washington, D. C., Mar. 1968 Supported in part by AF (See N68-23931 13-34)

Based on the principle that differences among strains of free living microorganisms would be reflected in the products released during metabolism, a study, using gas liquid chromatography in conjunction with ultrasensitive detectors, was initiated to assess the feasibility of characterizing the organisms by the distinctions in their metabolic products. The method consists of the inoculation of a nutrient solution, incubating for the period necessary for the formation of products in detectable quantities, and extracting the metabolic products for chromatographic analysis. A signature, based on the chromatogram, is assigned to the particular organism under investigation. Since the signature expresses the presence or absence of components (peaks), the presence of unique molecules, and an ordered arrangement of the quantity of each component, it conveniently differentiates (fingerprints) the strains. It has been demonstrated that bacteria and viruses may be identified by a chromatographic analysis of their metabolites. *Bacillus licheniformis* and *B. subtilis* were identified using as little as $6\times10^{-6}$ ml of medium, and required only $2\times10^{-8}$ ml of medium to be reproducibly detected. Viruses were identified by the reaction products of the host cell response to viral infection using tissue cultures. Also, viral infection in animals was detected up to 8 days prior to the appearance of clinical symptoms. S.C.W.

**N68-23969#** Naval Air Development Center, Johnsville, Pa.
**FLEET EVALUATION: COVERALLS, FLYING, SUMMER, FIRE RESISTANT, POLYAMIDE, TYPE CS-FRP-1**
David N. DeSimone 9 Apr. 1968 18 p refs
(NADC-AC-6809; AD-667718)

A field evaluation was conducted in accordance with reference (a) on the subject coverall to obtain information regarding the acceptability of first production lots. One thousand questionnaires were distributed to the Fleet and 621 were returned to the Aerospace Crew Equipment Department representing a cross section of various activities. Coverall design was found acceptable for Fleet use.
Author (TAB)

**N68-23972#** Systems Technology, Inc., Hawthorne, Calif.
**NEW APPROACHES TO HUMAN-PILOT/VEHICLE DYNAMIC ANALYSIS Final Report, Mar. 1966–Jun. 1967**
D. T. McRuer, L. G. Hofmann, H. R. Jex, G. P. Moore, A. V. Phatak et al Wright-Patterson AFB, Ohio AF Flight Dyn. Lab. Feb. 1968 207 p refs
(Contract AF 33(615)-3652)
(STI-TR-164-2; AFFDL-TR-67-150; AD-667549)

New models for human pilot dynamics and new methods for pilot/vehicle dynamic analysis are investigated. The status of existing quasi-linear models is reviewed and deficiencies are noted as a basis for pinpointing areas needing the most effort. The pilot modeling topics explored include: low frequency lead generation using either velocity sensing at the periphery (eye) or difference computations accomplished at a more central level; mode-switching models for nonstationary or discrete inputs to the pilot/vehicle system; physiological aspects of pilot dynamics in tracking tasks; Successive Organization of Perception (SOP) theory for levels of pilot cognition higher than compensatory. For pilot/vehicle analysis,

analytical approaches from control theory which appear to have promise are studied, including: time-optimal computing feedforward elements useful in the mode switching models for response to nonstationary inputs; optimal control theory using the crossover model in the performance criterion to estimate pilot response characteristics in compensatory tasks; inverse optimal control theory using known experimental results and quasi-linear pilot response models in an effort to define the pilots adjustment rules in terms of performance indices; optimal control theory to provide a simple test for optimality (to an elementary quadratic criterion) using only average performance measure data. Author (TAB)

**N68-24041#** Clarkson Coll. of Technology, Potsdam, N. Y. Dept. of Physics.

**A STUDY OF THE THEORETICAL PERFORMANCE OF GASEOUS ADSORPTION SYSTEMS Final Report, Jul. 1966–Aug. 1967**

Richard Madey and Joseph J. Charles Wright-Patterson AFB, Ohio AMRL Dec. 1967 104 p refs

(Contract AF 33(615)-5162)

(CPDD-67-86; AMRL-TR-67-198; AD-667811)

This study of the theoretical performance of gaseous adsorption systems is based on an equation for the time-dependent transmission of a gas through an adsorber bed of length, l, and bulk density, rho, and a gas-adsorber system characterized by an isothermal adsorption capacity, K, and a dispersivity, D. For a step-function gaseous input pulse injected into a stream of carrier gas which flows through the adsorber at a superficial flow velocity, u, the time-dependent expression for the transmission is a function only of the dimensionless dispersion number, D/ul, and the dimensionless time measured in units of the inflection time. A weighted least-squares analysis is developed and programmed on a digital computer to determine from an experimental transmission versus time curve the values of the two theoretical parameters (namely, the dispersivity and the adsorptivity) in the transmission equation. The errors in the values of the two theoretical parameters are evaluated also by propagating the errors in the experimental values of the transmission through the normal equations of the least-squares analysis. The Newton-Raphson method is used for obtaining the solution of the two simultaneous normal equations of the least-squares analysis. The theory is used to analyze experimental data on the transmission of carbon dioxide in air through molecular sieve adsorber beds. Author (TAB)

**N68-24057** George Washington Univ., Alexandria, Va. Human Resources Research Office.

**VISUAL DETECTION, IDENTIFICATION, AND LOCALIZATION: AN ANNOTATED BIBLIOGRAPHY**

Bernard Lyman Feb. 1968 126 p refs *Its* Exploratory Study 27

(Contract DA-44-188-ARO-2)

(HumRRO-TR-68-2; AD-667500)

The literature survey was undertaken to explore information on the nature of and conditions for effective visual perception at low light levels. From the survey, 407 reports or studies were selected for inclusion in the annotated bibliography. With a few exceptions, the material falls within the areas of detection, identification, and localization. Many laboratory studies are included which could undergo appropriate modification for repetition in natural settings at low light levels. In each annotation the purpose and the results or conclusions of the study are stated; method and procedure are indicated only briefly. Author (TAB)

**N68-24091#** Fraunhofer-Gesellschaft Zur Forderung der Angewandten Forschung e. V., Grafschaft (West Germany). Institut fuer Aerobiologie.

**SURVIVAL CHANGES OF MICROORGANISMS UNDER THE ENVIRONMENTAL CONDITIONS OF IONOSPHERE AND STRATOSPHERE [UEBERLEBENSCHANCEN VON MIKROORGANISMEN IM MILIEU VON IONOSPHAERE UND STRATOSPHAERE]**

E. Petras and K. Bisa Jan. 1968 49 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Wiss. Forschung (BMWF-FBW-68-09) CFSTI: HC$3.00/MF$0.65

Rocket, Balloon, and laboratory experiments confirmed the assumption that within the ionosphere and stratosphere, microorganisms are endangered primarily by UV and EUV radiations. Harmful effects caused by other factors have not been detected. Spores of Bac. globigii damaged by exposure to direct solar irradiations within the stratosphere or near the earth surface could be photo-reactivated to a relevant degree. It appears that the radiation dosage of EUV must be larger than the corresponding dosage of UV in order to prevent spore reproduction, but EUV-affected cells have little or no chance to become photo-reactivated. Author

**N68-24127#** Stanford Research Inst., Menlo Park, Calif.

**INVESTIGATIONS OF LASER DAMAGE TO OCULAR TISSUES Interim Report, 5 Apr.–31 Aug. 1967**

A. Vassiliadis, N. Peppers, K. Dedrick, H. Chang, R. C. Honey et al Sep. 1967 40 p refs

(Contract F33615-67-C-1752)

(AD-667555)

Preliminary results of experimental investigations of minimally sized retinal lesions caused by neodymium lasers are presented. The experimental animals were rhesus monkeys. Data for both long-pulse neodymium and Q-switched neodymium lasers are included. Results of experimental investigation for threshold damage by a CW CO2 laser to rabbit corneas are also presented. Data for two exposure times are included. In addition, theoretical calculations based on a one-dimensional heat-flow model are reported, and comparison is made with the experimental results. Author (TAB)

**N68-24128#** School of Aerospace Medicine, Brooks AFB., Tex. Biometrics Div.

**THE NEGATIVE EXPONENTIAL WITH CUMULATIVE ERROR, JANUARY–AUGUST 1967**

M. Bryan Danford and Harry M. Hughes Mar. 1968 28 p refs

(SAM-TR-68-29; AD-667789)

In certain tracer experiments, a biologist may inject a tagged substance in an animal and, among other things, measure the fraction of material excreted in the urine each day. Assuming the true value to be a negative exponential in time, two error models (homoscedastic vs. proportional error) and two methods of analysis (incremental vs. cumulative) are compared. The general conclusion is that one should be fairly sure which model is appropriate and should have a reasonable notion of the size of the rate constant beta relative to the length of the experimental run before attempting to estimate beta from a logarithmic transformation of the periodic increments or of the cumulative amount remaining. Author (TAB)

**N68-24211#** George Washington Univ., Alexandria, Va. Human Resources Research Office.

**FLIGHT EVALUATION PROCEDURES AND QUALITY CONTROL OF TRAINING**

Paul W. Caro, Jr. Mar. 1968 36 p refs

(Contract DA-44-188-ARO-2)

(TR-68-3; AD-667512)

Aspects of flight evaluation data input at the Rotary Wing Department, U.S. Army Aviation School, during 1961-63, were studied with reference to formal quality control system requirements. It was found that significant agreement did exist between instructor and checkpilot evaluations, but that this agreement could be a reflection of information available to the checkpilot prior to the checkride, rather than commonality of instructor and checkpilot standards. Checkride grades were also found to reflect individual

checkpilot standards and the students stage of training. Current grading practices were studied to determine the usefulness, for quality control purposes, of the kinds of detailed diagnostic information available on individual student performance. Author (TAB)

**N68-24218#** Naval Radiological Defense Lab., San Francisco, Calif.

**URINARY PYRIMIDINES AFTER X RADIATION**

Charles D. Guri and Leonard J. Cole 6 Feb. 1968 18 p refs
(USNRDL-TR-68-15; AD-667237)

Urinary deoxycytidine and other pyrimidines were studied in rats after whole-body irradiation. Utilizing combined column and paper chromatography and colorimetric determination of the isolated CdR, significant elevations in the excretion of this compound were observed during the first 24 hours after rradiation. An increase in the plasma concentrations of CdR was also observed within 4 hours after X irradiation (100 R). Utilizing both anion and cation exchange chromatography X radiation has been shown to produce an increase in several other pyrimidines, including derivatives of the bases cytosine, thymine and uracil. While these data were suggestive of a radiation induced generalized pyrimidinuria, the urinary deoxycytidine and thymidine demonstrated remarkable elevation and were predominantly responsible for this phenomenon. Author (TAB)

**N68-24256#** Laboratoire de Physique Theorique et des Hautes Energies, Orsay (France).

**FORMAL ANALYSIS OF PROTEIN SEQUENCES. 2. METHOD FOR STRUCTURAL STUDIES OF HOMOLOGOUS PROTEINS AMINO ACID SUBSTITUTIONS IN CYTOCHROMES C**

A. Krzywicki and P. P. Slonimski (Centre de Genetique Mol. du C.N.R.S.) Mar. 1968 39 p refs
(TH/68/18) CFSTI: $3.00

A method of formal analysis of homologous protein sequences is developed. Structural aspects of the problem are emphasized and not the phylogenetic ones. A special mathematical treatment of the redundancy of comparisons within a set of homologous sequences is given. This treatment obtains statistically significant results with the actually available experimental information. The method is applied to the study of tandem aminoacid substitutions in mitochondrial cytochromes c. It is shown that adjacent substitutions are significantly more frequent than expected assuming that substitutions are mutually independent. This latter independence is roughly verified for more distant substitutions. A tentative genetic mechanism that could lead to such an effect is proposed. Author

**N68-24272*#** Scientific Translation Service, La Canada, Calif.

**THE ORIGIN AND INITIAL DEVELOPMENT OF LIFE**

A. I. Oparin Washington NASA May 1968 60 p refs Transl. into ENGLISH of the book "Vozniknoveniye i Nachal'noye Razvitiye Zhizni" Moscow, Meditsina, 1966
(Contract NASw-1496)
(NASA-TT-F-488) CFSTI: HC$3.00/MF$0.65 CSCL 06B

A book is presented on the history of the development of life on earth. A brief review of the attempts to solve the origin of life is given along with an objective chronology of the events leading to the origin and initial development of life. The initial stages in the development of carbon compounds is described, and the formation of the primary broth is examined. Details are given on the rise of prebiological systems, and the evolution and rise of primitive organisms with the subsequent evolution of primary organisms is described. B.S.D.

**N68-24293*#** McMaster Univ., Hamilton (Ontario). Dept. of Psychology.

**PREDICTABILITY, SURPRISE, ATTENTION, AND CONDITIONING**

Leon J. Kamin Dec. 1967 31 p refs Presented at the Symp. on Punishment, Princeton, N. J., May 1967
(Grant NGR-52-059-001)
(NASA-CR-94558; TR-13) CFSTI: HC $3.00/MF $0.65 CSCL 05J

The possible role of attention in Pavlovian conditioning is discussed, and the kinds of experimental manipulations which might direct an animal's attention to one of another element are considered. Basic conditioning procedures used in experiments on rats are described. Median suppression ratios are given, as a function of acquisition trial, for three representative groups of subjects which were conditioned with either white noise, light, or a compound of noise and light presented simultaneously. It was noted that after a few trials all groups approach asymptotic suppression. In other experiments, the results indicate: (1) Granted prior conditioning to an element, no conditioning occurs to a new element which is superimposed on the old. (2) If the superimposed element provides new information, the animal not only notices the element but can utilize the information which it provides with impressive efficiency. (3) At least on the first transitional trial, an animal previously conditioned to a single element notices the superimposition of a new element. M.G.J.

**N68-24316#** Library of Congress, Washington, D. C. Aerospace Technology Div.

**AEROSPACE LIFE SUPPORT SYSTEMS AND CREW PROTECTIVE EQUIPMENT *Surveys of Foreign Scientific and* Technical Literature**

D. Pyle and B. Mandrovsky Apr. 1968 62 p refs *Its* Work Assignment No. 22
(ATD-68-6-22-1)

The first part of this report contains a section on flight clothing suitable for various seasons of the year, gloves and foot gear, helmet liners, ventilated suits, anti-G suits, and survival equipment (sea survival gear, survival suits, life jackets, life rafts, and an emergency survival pack). The second part of this report contains 30 abstracts related to spacecraft life-support systems. They deal largely with recent developments in Soviet *Chlorella* research which are directly applicable to the use of *Chlorella* for regeneration of spacecraft cabin air and to the possible use of algae as a source of food for cosmonauts on extended spaceflights. Author

**N68-24330*#** National Aeronautics and Space Administration, Washington, D. C.

**ON METHODS FOR THE DETERMINATION OF THE RESPIRATORY QUOTIENT DURING REST AND WORK [ZUR METHODIK DER RESPIRATORISCHEN QUOTIENT BESTIMMUNGEN IN RUHE UND BEI ARBEIT]**

E. H. Christensen and O. Hansen Feb. 1968 40 p refs Transl. into ENGLISH from Skand. Arch. fur Physiol. (Leipzig), v. 81, 1939 p 137–179
(NASA-TT-F-11466) CFSTI: HC$3.00/MF$0.65 CSCL 06S

Reliable determinations of the respiratory gas exchange in man may be of greatest significance in the laboratory and in the clinic. With untrained subjects one usually has to be content with the determination of the $O_2$-uptake since the $CO_2$-output, as measured in metabolic studies, frequently is a poor expression for the simultaneous $CO_2$-production so that a reliable interpretation of the experimental results is not possible. However, also the results of experiments with trained subjects may be afflicted with considerable errors in the case of poorly controlled experimental conditions. In the following we have attempted to demonstrate several of these sources of error with specific consideration of determinations during work and to discuss them. Author

**N68-24339*#** AiResearch Mfg. Co., Los Angeles, Calif.
**PROJECT GEMINI: EXTRAVEHICULAR LIFE SUPPORT SYSTEM (ELSS) Final Report, 30 Jan. 1964–31 Mar. 1967**
W. J. O'Reilly Feb. 1967 384 p refs
(Contract NAS9-2412)
(NASA-CR-92066; Rept.-66-1483) CFSTI: HC $3.00/MF $0.65 CSCL 06K

The evaluated Gemini extravehicular life support systems permits the astronauts to perform a 20 minute outside operation with 5 minutes additional operation while sustaining a 10-cfm suit leak. The selected semi-open-loop system concept utilized three pneumatic loops, an evaporating-condensing heat exchanger, and a complete malfunction detector system in addition to wrist thrusters for field support. All qualification, interface, and pre-flight checkouts were completed throughout the program and the final chestpack assembly and its components performed satisfactorily. G.G.

**N68-24340*#** Miami Univ., Coral Gables, Fla. Inst. of Molecular Evolution.
**CAN MAN START AN EVOLUTION?**
Sidney W. Fox [1967] 31 p refs Presented at Le Conte du Nuoy Mem. Symp., Notre Dame, Ind., 28 Oct. 1967 *Its* Contrib. No. 097
(Grant NsG-689)
NASA-CR-94557) CFSTI: HC $3.00/MF $0.65 CSCL 06A

Primoridal formation of protein and nucleic acid are regarded as origin of life with eventual evolution from primitive cell to contemporary cell and to contemporary multicellular organisms. Spontaneous organic synthesis involved in the production of organic molecules was experimentally investigated by analyses of polypeptide sequences. It is shown that when amino acids are carefully heated, polypeptide sequences to at least some degree take place. The addition of water seems to be the right component to crystallize out as a cell. G.G.

**N68-24354#** RAND Corp., Santa Monica, Calif.
**NEURAL ORGANIZATION IN THE PRIMATE RETINA**
R. J. Mac Gregor Nov. 1967 86 p refs
(Contract DAHC15-67-C-0141; ARPA Order 189-1)
(RM-4912-ARPA; AD-667244)

A survey is presented of the neurohistological, neuroelectrical, and neurophysiological data relevant to retinal organization. The data are derived from studies of the neural organization of the primate retina. Major current problems include mechanisms of adaptation, spontaneous activity, and efferent influence, details of interconnection patterns, and amacrine function. A theoretical framework for an initial consideration of retinal organization is developed and a model that attempts to account for the properties of graded potentials in the external plexiform layer is presented. The model specifies a hypothetical mechanism as the fundamental source of logarithmic intensity encoding. Author (TAB)

**N68-24369*#** Public Health Service, Cincinnati, Ohio. Food Protection Research.
**ECOLOGY AND THERMAL INACTIVATION OF MICROBES IN AND ON INTERPLANETARY SPACE VEHICLE COMPONENTS Quarterly Progress Report, 1 Jan.–31 Mar. 1968**
Robert Angelotti 31 Mar. 1968 19 p ref
(NASA Order R-36-015-001)
(NASA-CR-94681; QPR-12) CFSTI: HC $3.00/MF $0.65 CSCL 06M

Previous dry heat resistance studies of *Bacillus subtilis* var. *niger* spores impregnated in filter paper indicated that a wet heat kill mechanism was involved as evidenced by a $z_D$ of 12.9°C. Because sufficient water remained in the system to effect a wet heat system during the drying process, lyophilization was investigated as an improved drying method. D and z values for spores on paper dried by lyophilization are reported. An unusually high $z_D$ value (32.0°C) was previously reported for spores located between steel washers mated at 150 inch-pounds of torque. An explanation for this high value is presented which is based on the slow loss of spore moisture to the hot gaseous environment in the TDT tube during heating. Sealing the mated surface units with epoxy resin prevented loss of moisture and resulted in a $z_D$ value of 21.9°C which was comparable to that observed for the same spores heated in lucite, epoxy, and on stainless steel strips. The rate at which dried spores absorb water from a humid environment and the effects of such absorption on thermal resistance was also studied. Results indicated that the spores did absorb water and that the thermal resistance was increased in proportion to the increased spore moisture content. Also developed was a dry heat exposure system employing spores embedded in epoxy resin. This system will be used to determine the effect of $a_w$ on z values. Results were comparable to those reported for spores embedded in lucite. S.C.W.

**N68-24406#** Royal Aircraft Establishment, Farnborough (England).
**ON THE PROBLEM OF THE AFFERENTATION OF EYE MOVEMENTS. A STUDY OF EYE MOVEMENTS USING A PHOTOELECTRIC METHOD [K PROBLEME AFFERENTATSII DVIZHENII GLAZ]**
E. D. Khomskaya Jan. 1968 19 p refs Transl. into ENGLISH from Vopr. Psikhologii (Moscow), v. 3, 1962 p 73–84
(RAE-LIB-TRANS-1280) CFSTI: HC $3.00/MF $0.65

An experimental study designed to determine whether a change of afferentation influences the realization of eye movements is reported. A comparison was made between eye movements controlled by a visual signal and those performed without visual control. The characteristics of these types of movement, their form, frequency characteristics, and stability were elucidated; the relationship between the form of eye movements and their frequency was investigated; and the possibility of reproducing various given parameters of movements (form and frequency) from memory were also studied. Primarily, the experimental study was devoted to a comparative analysis of eye movements performed with and without visual control. Results showed that changes in afferentation had a marked effect on eye movements. Eye movements controlled by a visual signal and those carried out without visual control showed a number of differences which related in the first instance to the form of eye movements. The second difference between eye movements controlled by a visual signal and those carried out independently by subjects without visual control was related to their frequency characteristics. It was found that there is a direct relationship between the form of pursuit eye movements and their frequency characteristics. On the basis of these findings it is concluded that there are different levels of eye movement control which are linked with different forms of afferentation, one of these being the level of pursuit movements controlled to a considerable extent by a visual stimulus; the other is the level of independent changes of fixation without visual reference but controlled by a program created by the subject. S.C.W.

**N68-24408#** Systems Technology, Inc., Hawthorne, Calif.
**A REEXAMINATION OF EYE MOVEMENT DATA**
Warren F. Clement, Dunstan Graham, and John J. Best 28 Feb. 1967 121 p refs
(Contract N00014-66-C-0072)
(TM-163-A; AD-667768)

An analysis is presented of aircraft pilot eye movement data obtained in the past by other investigators from piloted flight tests. This includes a comprehensive account and reanalysis of the data contained in several reports, by different investigators, and it suggests some features of a useful systems model which should be compatible with (i.e., explain) all, or nearly all, of these data. A review is presented of key contributions to the literature,

primarily of Fitts and Senders work. Pilots eye fixation frequency measurements are first discussed with respect to four possible variables on which they may depend: display-control closed-loop bandwidth, flight maneuvers, instrument arrangement, and the redundancy of information. Pilots eye fixation dwell times are then discussed with respect to a quantized time interval which appears in certain experiments, and the purpose for and type of sampled signal reconstruction which may be performed by the pilot. An approximate method suggested by Senders for calculating paired-display fixation link values is applied to one of the extant cases not investigated by him. Some experiments are suggested to resolve questions, validate models and fill voids in existing results.
Author (TAB)

**N68-24427#** Rome Univ. (Italy).
**STUDY OF THE ACTION MECHANISM OF IONIZING AND ULTRAVIOLET RADIATIONS IN VITRO CULTURES OF MAMMALIAN CELLS [STUDIO DEL MECCANISMO D'AZIONE DELLE RADIAZIONI IONIZZANTI ED ULTRAVIOLETTE NELLE CELLULE DI MAMMIFERO IN COLTURE IN VITRO] Annual Report, 1 Nov. 1965–30 Oct. 1966**
Brussels EURATOM Mar. 1968 24 p refs
(Contract EURATOM-036-64-6-BIOI)
(EUR-3906.I) CFSTI: HC $3.00/MF $0.65

During the research group's second year of work on the combined effects of ionizing (X-rays) and non-ionizing (ultraviolet rays) radiation in *in vitro* cultures of mammal cells, experimental activity was principally devoted to furthering the following investigations: (1) relations between exposure doses and cell survival at various wavelengths, extending the investigation to wavelengths of 2520 Å and 3010 Å; and (2) relative efficiency of the four wavelengths under study with equal exposure doses in producing changes in the duration of the various phases of the cell cycle, and in inducing chromosomal aberrations during the various phases of the cell cycle, as well as during a whole cell cycle. Experiments continued on the action of 8-methoxypsoralene activated by UV light (3650 Å), with particular reference to: (1) the effects in inducing chromosomal aberrations in various cell strains (Chinese hamster human amnion); and (2) release between irradiated cell-cycle phases and sensitivity to the induction of chromosomal aberrations.
*Author*

**N68-24515#** Royal Aircraft Establishment, Farnborough (England).
**THE REPRODUCTION OF A SET RHYTHM OF EYE MOVEMENTS FROM MEMORY [VOSPROIZVEDENIE ZADANNOGO RITMA DVIZHENIYA GLAZ PO PAMYATI]**
E. Yu. Artem'eva and E. D. Khomskaya Feb. 1968 13 p refs Transl. into ENGLISH from Vopr. Psikhologii (Moscow), no. 6, 1965 p 110–114
(RAE-LIB-TRANS-1288) CFSTI: HC $3.00/MF $0.65

Horizontal eye movements of 30° amplitude were investigated in 11 normal subjects by means of a photo-electric technique. After 60 seconds of tracking a light spot, subjects had to reproduce the same sine-wave eye movements from memory. Target frequency ranged from 0.32 to 1.44 cycles/second. Reproduction was seen to take the form of alternation between cycles of fairly good waveform and cycles which were clearly inadequate. Reproduction accuracy depended on target frequency, and showed large differences between individual subjects. The ability was, to a point, amenable to training. The introduction of a sound cue permitted better timing of the reproduced eye movements. Author

**N68-24521#** Rockford Research Inst., Inc., Cambridge, Mass.
**INDUCTIVE INFERENCE RESEARCH: STATUS, SPRING 1967 Final Report, May 1966–Jul. 1967**
Raymond J. Solomonoff 1 Jul. 1967 30 p refs
(Contract AF-19(628)-5975)
(RTB-154; AFCRL-67-0462; AD-667810)

Previously, four theories of inductive inference were proposed, and present work is concerned with putting these theories on a firmer theoretical footing. The four theories are now found to be effectively equivalent, at varying levels of rigor. It is shown that for sufficiently long sequences of symbols the theories actually do give the correct probabilities for future symbols. Attempts are made to implement induction theories through a general approach to networks of tasks. Applications of induction theory to man-to-animal communication are considered, and some new approaches to interspecies communication are suggested. It is now shown that the induction theories developed for discrete symbols can be applied to prediction of continuous data. Computer implementation of induction through use of definitions of subsequences of symbols may prove to be a valuable line of effort. Supervisory problems in dealing with very intelligent machines are discussed, parallels are shown to the problem of dealing with ambitious subordinates, and a remedy for the case of the machines is proposed.
Author (TAB)

**N68-24550#** Joint Publications Research Service, Washington, D. C.
**SPACE BIOLOGY AND MEDICINE, VOLUME 2, NUMBER 1**
24 May 1968 137 p refs Transl. into ENGLISH from Kosmich. Biol. i Med. (Moscow), v. 2, no. 1, 1968 p 1–90
(JPRS-45483) CFSTI: HC $3.00/MF $0.65

A Russian-language periodical dealing with space medicine and biology was translated. Articles include studies on animals and humans subjected to space environments, physiological functioning during bed rest, human tolerance to long periods of isolation, and radiobiological data in relation to astronaut shielding. Other studies deal with the otolith functioning during weightlessness, acceleration effects on man, spatial orientation and its disruption, and stability maintenance by man under difficult experimental conditions.
M.W.R.

**N68-24556*#** Scripta Technica, Inc., Washington, D. C.
**CLASSIFICATION OF POSTURAL REFLEXES [KLASSIFIKATSIYA USTANOVOCHNYKH REFLEKSOV]**
G. L. Komendantov NASA May 1968 9 p refs Transl. into ENGLISH from Vorp. Aviats. Med., Normal'n. i Patol. Fiziol., Tsentr. Inst. Usoversh. Vrachey Press, Moscow, 1966 p 130–137
(Contract NASw-1694)
(NASA-TT-F-11616) CSCL 06P

Consideration of various types of postural reflexes and existing classifications of them, notably a classification proposed in 1924 by Magnus, and a classification of labyrinth postural reflexes developed by de Kleyn and Versteegh. An augmented classification is proposed, covering various groups of postural, compensatory, and extensor reflexes both conditioned and unconditioned. Author

**N68-24633** Joint Publications Research Service, Washington, D. C.
**PERCEPTION OF SPACE AND TIME IN OUTER SPACE**
A. A. Leonov and V. I. Lebedev 23 May 1968 16 p Transl. into ENGLISH from the book "Vospriyatiye Prostranstva i Vremeni v Kosmose" USSR, 1968 p 69–74, 99–105
(JPRS-45478) CFSTI: $3.00

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2. COSMIC FLIGHT WATCH-STANDING AND PSYCHO-PHYSIOLOGICAL RHYTHMS A. A. Leonov and V. I. Lebedev p 8–15 (See N68-24635 14-04)

**N68-24634** Joint Publications Research Service, Washington, D. C.
**TRAINING OF COSMONAUTS FOR ORIENTATION IN SPACE**
A. A. Leonov and V. I. Lebedev *In its* Perception of Space and Time in Outer Space 23 May 1968 p 1–17 (See N68-24633 14-05)

An overview is presented on some of the techniques used in conditioning the vestibular apparatus of cosmonauts. These include active and passive exercises to increase resistance to stimulation under various conditions, and to develop plasticity in the functions of the central nervous system. Flight simulation is discussed, along with the importance of bimedical monitoring and psychological observations. The problems of overcoming preflight tensions are considered, and the value of parachute training in developing psychological resistance to extreme and usual situations is stressed. M.G.J.

**N68-24635** Joint Publications Research Service, Washington, D. C.
**COSMIC FLIGHT WATCH-STANDING AND PSYCHO-PHYSIOLOGICAL RHYTHMS**
A. A. Leonov and V. I. Lebedev *In its* Perception of Space and Time in Outer Space 23 May 1968 p 8–15 (See N68-24633 14-05)

The effects that interruptions in the usual circadian rhythm will have on the psycho-physiological functions of cosmonauts are considered in terms of creating new and optimum rhythms for activities on an interplanetary spacecraft. Experimental data are reviewed to show that although the phsyiological processes of man under constant conditions continue to maintain the circadian rhythm for a period of time, orientation without the availability of time pieces is unreal. Although there is no definitive answer as to how long a cosmonaut will be able to carry out watch-standing duties before succuming to fatigue, the consensus is that the most optimum period should be less than four hours. M.G.J.

**N68-24719*#** Techtran Corp., Glen Burnie, Md.
**HEREDITY AND CYTOLOGY OF SEX AS EXAMINED IN FROGS [VERERBUNG UND ZYTOLOGIE DES GESCHLECHTS NACH UNTERSUCHUNGEN AN FROSCHEN]**
E. Witschi Washington NASA May 1968 33 p refs Transl. into ENGLISH from Z. Induktive Abstammungs- und Vererbungslehre, v. 28, no. 1, 1922 p 31–68
(Contract NASw-1695)
(NASA-TT-F-11685) CSCL 06C

Experimental and cytological studies of frogs are used to prove that sex determination by hereditary factors which are unevenly distributed to the gametes are only one of the possible types. Homogametic sex heredity in both sexes also exists. A concise view is presented of the present state of the problem of sex determination in frogs. Author

**N68-24756*#** National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
**FLAMMABLE AND TOXIC MATERIALS IN THE OXYGEN ATMOSPHERE OF MANNED SPACECRAFT**
John H. Kimzey Washington May 1968 30 p refs
(NASA-TN-D-3415) CFSTI: HC $3.00/MF $0.65 CSCL 05E

A preliminary study of the considerations necessary in selecting materials for use in an oxygen-rich atmosphere revealed that a major design effort must be directed toward reducing the toxic and flammable contaminants of the atmosphere. The effect of zero gravity in preventing convection is one aspect of research that deserves considerable effort since heat transfer and flammability are two major fields directly affected. Other research is needed in human tolerances, static electricity, removal of low-molecular-weight gas, fire extinguishment, overall characteristics of materials exposed for long periods in pure oxygen, and in the development of adequate test procedures. Author

**N68-24772*#** Oregon State Univ., Corvallis.
**SYSTEMATIC DESCRIPTION AND KEY TO STREPTOMYCES ISOLANTS FROM CHILE–ATACAMA DESERT, HAWAII, AND OREGON SOILS**
W. B. Bollen and Sumie Nishikawa 25 Apr. 1968 79 p refs Prepared for JPL
(Contracts NAS7-100; JPL-950783)
(NASA-CR-94759) CFSTI: HC $3.00/MF $0.65 CSCL 06M

The characteristics used to differentiate *Streptomyces* are defined as the morphology of the spore surface, the color of matured aerial mycelia, the morphology of the aerial mycelia, and the ability to produce melanin. The eight culture media used for characterizing and identifying the species are listed as tryptone–yeast extract broth, yeast extract–malt extract agar, oatmeal agar, inorganic salts–starch agar, glycerol–asparagine agar, peptone–yeast extract agar, tyrosine agar, and carbon utilization medium. The key to the identification of the *Streptomyces* isolants is listed, and descriptive charts on the laboratory cultures are presented. M.G.J.

**N68-24774#** Oregon State Univ., Corvallis.
**RADIOTRACER STUDIES OF BIOSYNTHETIC AND RESPIRATORY PATHWAYS Final Report, Sep. 1, 1960–Oct. 31, 1967**
C. H. Wang 10 Oct. 1967 12 p refs
(Contract AT(45-1)-1387)
(RLO-1387-8) CFSTI: HC $3.00/MF $0.65

Glucose: metabolism in microorganisms, rats, and tomatoes, use of concurrent pathways for; Carbon-14: yield of carbon dioxide-incorporated, from glucose metabolism; Metabolism: glucose, in mung beans and yeasts, development of radiorespirometer to determine pathways of; Eumycota: Penicillium digitatum, biosynthesis of ethylene in, effects of chloroacrylate on; Organic Acids: biosynthesis of four-carbon, in *Pseudomonas fluorescens* and tomatoes, use of glucose substrate to determine mechanism of; Hexoses: metabolism in yeasts, effects of 2-deoxyglucose on. NSA

**N68-24781#** Pittsburgh Univ., Pa. Dept. of Chemistry.
**BIOLOGICAL APPLICATIONS OF MOESSBAUER SPECTROSCOPY Comprehensive Report, May 1965–Feb. 1968**
L. M. Epstein and Darel K. Straub Feb. 1968 17 p
(Contracts AT(30-1)-3514; AT(30-1)-3859)
(NYO-3859-2) CFSTI: HC $3.00/MF $0.65

Synthetic iron complexes were studied by Moessbauer spectroscopy. Well-defined, reproducible, and readily interpretable spectra were obtainable for the octahedral complexes in which iron (3) or iron (2) is bonded to the 4 nitrogen in a porphyrin ring and further bonded in nitrogen atoms in amino molecules above and below the ring. Most of the pentacoordinate complexes displayed severe relaxation effects. For dithiocarbomate complexes, the influence of the ligand at the apex of the square pyramidal structure was demonstrated. The tris dithiocarbomate compounds displayed a surprisingly wide range of magnetic susceptibilities and their quadrupole splitting was quite sensitive to structural variations remote from the coordinating atoms. NSA

**N68-24788#** Joint Publications Research Service, Washington, D. C.
**NEW PATTERN RECOGNITION TECHNIQUE**
K. Bogdanov 16 May 1968 9 p Transl. into ENGLISH from the book "VDNKH Informatsionyy Byulleten" USSR, no. 3, 1948 p 33–35
(JPRS-45405) CFSTI: HC $3.00/MF $0.65

A technique for the mathematical description and recognition of morphological structures is based on their statistical characteristics and the analysis of the signal obtained when scanning the investigated pattern at the output of an optical density sensor. In effect, the mathematical apparatus of random process theory is used for the analysis, and the integral or differential law of distribution of the random process amplitudes are determined. A correlation analysis is then performed and the periodic components of the complex structure are discovered by using harmonic analysis. The described method may be used to analyze biological structures as well as the structures of metals, rocks, and porous and other materials. Its prospective usefulness in decoding aerial photographs and for the evaluation of complex patterns is noted. M.W.R.

**N68-24859#** Advisory Group for Aerospace Research and Development, Paris (France).

**BEHAVIOURAL PROBLEMS IN AEROSPACE MEDICINE**

Oct. 1967 430 p refs In FRENCH and ENGLISH Papers presented at the 24th Meeting of the AGARD Aerospace Medical Panel, Rhode-Saint-Genese, Belgium, 25–27 Oct. 1967 (AGARD-CP-25) CFSTI: HC $3.00/MF $0.65

Conference papers are presented on behavioral problems emphasizing diurnal rhythms, sleep, and alertness, and also on medical problems relating to space and air warfare. For individual titles, see N68-24860 to N68-24889.

**N68-24860#** Max-Planck-Institut fur Verhaltensphysiologie, Seewiesen uber Starnberg (West Germany).

**DESYNCHRONIZATION AND RESYNCHRONIZATION OF HUMAN CIRCADIAN RHYTHMS**

Juergen Aschoff *In* AGARD Behavioural Probl. in Aerospace Med. Oct. 1967 13 p refs (See N68-24859 14-04)

Circadian rhythms of activity, body temperature, and urine excretion have been measured in human subjects kept in isolation in an underground bunker, either in constant conditions or exposed to artificial light–dark cycles. In constant conditions, free-running rhythms synchronous in all functions have been demonstrated as well as cases with internal desynchronization. Entrainment to a 26.7-hour day resulted in changes of phase-angle differences as to be predicted from oscillation theory, whereas exposure to a 22.7-hour resulted in relative coordination between the circadian rhythms and the light–dark cycle only. A group of four subjects, enclosed together into the bunker, showed synchronous circadian rhythms during the first 10 days, thereafter desynchronization between one subject and the rest of the group. Shifts of the artificial light–dark cycle by 6 hours, simulating 'flights' in either eastward or westward direction, were followed by the activity-cycles of the subjects rather immediately; the rhythms of body temperature, however, did not regain their normal phases until several days (up to 10) had elapsed. Author

**N68-24861#** Aerospace Medical Div. Aeromedical Research Lab. (6571st), Holloman AFB, N. Mex.

**CIRCADIAN RHYTHMS AND MILITARY MAN**

Clyde H. Kratochvil *In* AGARD Behavioral Probl. in Aerospace Med. Oct. 1967 10 p refs (See N68-24859 14-04)

Reviewed are aspects of the problem of circadian rhythm and military man in which an attempt is made to answer questions concerning performance decrement related to the reversal of day–night cycles of combat troops traveling through multiple time zones via high speed transport aircraft. Questions considered are: What kind of performance will be expected while the adjustment to the new time schedule is proceeding? (2) Will there by any increase or decrease in susceptibility to various stressors? (3) How long does it take to adjust? (4) Can anything be done to speed up this process? Discussed are investigations directed toward problems of fatigue, sleep deprivation, and change of work shifts. Studies are cited which indicate that: (1) there is a change in both efficiency and susceptibility to stress as a function of time of day; (2) during adjustment to new time zones, circadian temperature rhythm may quickly adjust to new time; however, renal excretion patterns may lag behind; (3) there is a direct interrelationship between EEG activity, dreams, and variations in plasma steroids; and (4) our understanding of therapeutic drugs does not afford us the tools for inducing normal, physiological sleep. Given the existence of these phenomena and the very real possibility that these factors are of marked operational importance, the following solutions are proposed: (1) either travel to the new time zone well in advance of having to perform at peak efficiency; or (2) preadapt to the home station. S.C.W.

**N68-24862#** Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.

**THE USE OF PERIOD ANALYSIS TO EVALUATE HUMAN PHYSIOLOGICAL AND PSYCHOMOTOR PERFORMANCE**

Michael Mc Cally *In* AGARD Behavioral Probl. in Aerospace Med. Oct. 1967 15 p refs (See N68-24859 14-04)

Time series analysis methods for the assessment of physiologic infradian and ultradian rhythms are reviewed, and preliminary results of recent studies employing a least squares spectrum method are presented. Focused on is the applicability of the least squares spectrum technique which provides a simple and reliable approach to (1) defining significant periods in time series, particularly in data collected at unequal intervals or with gaps; and (2) qualifying each period as to its amplitude and phase in an objective and reproducible fashion. Examples of 3, 7, and 30 day rhythms in urine volume and a spectrum of ultradian rhythms in heart rate, pulmonary ventilation and oxygen consumption are included. Data are presented not as definitive experiments to demonstrate effects of environmental change but rather as a demonstration of a new tool and a new point of view for the environmental physiologist; and to suggest new directions for research. Suggested directions for new research include: (1) detailed mapping of the spectrum of a variety of physiological and performance variables over a wide band, perhaps from one second to one month, at rest and during various levels of environmental stress; (2) the development of meaningful statistical procedures for defining confidence limits for changes in period, amplitude and phase of the observed oscillations; and (3) the definition of the specific physiologic control systems of which the observed oscillations are an expression. S.C.W.

**N68-24863#** Deutsche Versuchsanstalt fur Luft- und Raumfahrt, Bad Godesberg (West Germany). Institut fuer Flugmedizin.

**PERIODIC VARIATIONS IN INDICES OF HUMAN PERFORMANCE, PHYSICAL FITNESS, AND STRESS RESISTANCE**

K. E. Klein, H. M. Wegmann, and H. Bruener *In* AGARD Behavioural Probl. in Aerospace Med. Oct. 1967 21 p refs (See N68-24859 14-04)

In order to estimate the existence and magnitude of rhythmic day–night variations in human performance, physical fitness and stress resistance, the following variables were measured every three hours over a full day–night cycle: the reaction time and its individual constancy, the maximal psychomotor coordination ability, the Schneider index, the predicted $VO_2$max, the cardiovascular responses to tilting, and the time of useful consciousness in simulated altitude. All parameters revealed relative rhythmic oscillations of the circadian type, the ranges of which varied for the group average between 1.4% (temperature) and 68% (17-OH-CS) of the total 24 hour average. Negative extreme values showed up during the night hours for all cardiovascular parameters; consequently the Schneider index and the $VO_2$ max predicted from the heart rate level during submaximal exercise had their positive peaks or best values at this time of the day. While this phenomenon seems to be an artificial effect of the way to figure out physical fitness and probably is not identical with course of fitness itself, true positive

night peaks were found for the altitude tolerance. The significance of the results for the applicability of functional tests and human efficiency during load is discussed. Author

**N68-24864#** Royal Air Force, Farnborough (England). Flight Skills Lab.
**PILOT RESPONSE UNDER GROUND SIMULATION CONDITIONS AND IN FLIGHT**
A. M. Hammerton Fraser, J. M. Rolfe, and E. M. B. Smith *In* AGARD Behavioural Probl. in Aerospace Med. Oct. 1967 20 p refs (See N68-24859 14-04)

The physiological responses of a group of pilots were recorded while at rest and while undertaking a given flight plan under one of three situations, namely: (1) In a fixed-base simulator; (2) In a moving base simulator; and (3) In flight. Experimental objectives were to determine the rank order of the subjects in terms of the magnitude of their physiological responses when resting, and the effect of task performance in this order. Results indicated that there was consistency in rank order between subjects, but the degree of consistency varied with the physiological measure employed. Results also indicated differences in the magnitude of physiological response between resting and performing. The size of the differences was also shown to be dependent upon the situation in which the task was performed and the type of manoeuver being undertaken. A method of combining a subject's different physiological responses is demonstrated and conclusions are drawn as to the value of the results in assessing simulator fidelity. Author

**N68-24865#** Naval Air Development Center, Johnsville, Pa. Aerospace Medical Research Dept.
**METHODS USED AT AMRD IN THE STUDY OF NORMAL SLEEP AND DRUG-INDUCED SLEEP ON A VISUAL ALERTNESS TEST**
R. D. Squires and W. C. Sipple *In* AGARD Behavioural Probl. in Aerospace Med. Oct. 1967 8 p refs (See N68-24859 14-04)

Methods used in an ongoing study of human sleep are briefly described. The ultimate aim of this study is to induce normal, restful sleep by pharmacological means with minimal undesired side effects. The methods used are designed to test the restorative effect of sleep and its relationship to time spent in the various stages or levels of sleep to the restorative effect. Author

**N68-24866#** Naval Air Development Center, Johnsville, Pa. Aerospace Medical Research Dept.
**THE EFFECTS OF NORMAL SLEEP AND DRUG-INDUCED SLEEP ON A VISUAL ALERTNESS TEST**
R. J. Oleynik and R. D. Squires *In* AGARD Behavioural Probl. in Aerospace Med. Oct. 1967 9 p (See N68-24859 14-04)

In view of the need for increased pharmacological knowledge and practice to maximize capabilities of pilots in sustained aerospace missions, a study was undertaken to evaluate various hypnotic sedatives with respect to quality of sleep elicited, arousal characteristics, and psychophysiological performance. Focused on is the relative importance of the two distinct phases of sleep, the rapid eye movement phase (REM) and the nonrapid eye movement phase (REM), in obtaining restful sleep. Human male subjects were exposed to ingestion of various hypnotic-sedative drugs in moderate dosage, after which they were asked to sleep. Drugs used included Chlordiazepoxide, Meprobamate, Methaqualone, Hydroxyzine, and Pentobarbital. The expected result was to select a hypnotic-sedative drug suitable for long term aerospace or other military missions which would fulfill the following desirable criteria: (1) elicit restful sleep, presumably by keeping the normal REM/NREM ratio intact, (2) permit ease of arousal at any time after drug ingestion, and (3) cause no minimal impairment of performance at any time after taking the drug. Results indicated that Pentobarbital decreased REM time markedly over control-placebo levels; however, the other preparations had minimal or equivocal effects. The initiation of experiments using sodium gamma-hydroxybutyrate, a drug which produces a state of environmental detachment much like REM sleep, in addition to having characteristics of rapid recovery and low toxicity, is reported S.C.W.

**N68-24867#** Aerospace Medical Div. Aeromedical Research Lab. (6571st), Holloman AFB, N. Mex.
**NOREPINEPARINE AND SEROTONIN EFFECTS ON SLEEP, ALERTNESS, AND TEMPERATURE REGULATION**
Thomas J. Crowley *In* AGARD Behavioural Probl. in Aerospace Med. Oct. 1967 19 p refs (See N68-24859 14-04)

Research designed to determine the joint pharmacology of sleep and temperature is reported. Emphasized is the possible role of norepinephrine and serotonin in sleep and temperature regulation. Two rhesus monkeys were studied to determine the effects of norepinephrine injections. Results suggested that cerebral norepinephrine decreases REM sleep and temperature in primates, and also that norepinephrine may contribute to wakefulness. A pilot study of the effects of alpha-methyl-paratyrosine (AMPT) was made upon monkeys to determine whether a sedative effect results from the depletion of norepinephrine or of serotonin. Results did not yield enough information to make definite conclusions about AMPT's effect on EEG and temperature; however, the subjects showed dramatic and rather bizarre lethargy and sedation when treated with the norepinephrine depleter, AMPT. The initiation of studies involving the injection of the third ventricle of sleeping monkeys with serotonin is reported. Although results are not finalized, it appears that serotonin changes monkey brain temperature in the same direction as norepinephrine; and initial injections partially suppressed REM sleep. It is suggested on the basis of these findings, there is a possible role for norepinephrine and serotonin in the diurnal regulation of sleep and temperature. S.C.W.

**N68-24868#** Army Aeromedical Research Unit, Fort Rucker, Ala.
**ELECTROCARDIOGRAPHIC SURVEY OF ROUTINE DUTY DAYS IN HELICOPTER PILOTS**
W. P. Schane *In* AGARD Behavioural Probl. in Aerospace Med. Oct. 1967 8 p (See N68-24859 14-04)

A qualitative evaluation of the interaction between man, flying systems, and environment is presented which was designed to (1) determine the responses of the cardiovascular system to flying, and (2) to establish realistic selection and retention standards for U.S. Army helicopter pilots. EKG records of fifty-three helicopter instructor pilots actively engaged in student training were studied to determine the lowest and highest heart rates recorded which were sustained for at least one minute, and the specific activity of each subject during this period. The only significant correlations derived from these studies indicated that persons with high heart rates during any one type activity tended to have high heart rates during all tested activities, and vice versa. Since on the basis of these studies it appears that helicopter flying is no more stressful to the heart than automobile driving, the question is raised as to whether severely restrictive physical standards of cardiac performance are necessary. It is concluded further that although initial examination is essential to exclude applicants with chronic cardiovascular pathology, and yearly examination is advisable to detect change since the last examination, it appears unreasonable to exclude a trained helicopter pilot from flying for trivial and questionable cardiac aberrations. S.C.W.

**N68-24869#** Army Aeromedical Research Unit, Fort Rucker, Ala.
**THE MORBIDITY OF ARMY AVIATORS, A PRELIMINARY STUDY**
R. Bailey *In* AGARD Behavioural Probl. in Aerospace Med. Oct. 1967 7 p ref (See N68-24859 14-04)

Reported is the initiation of a statistical study designed to provide answers to questions such as: (1) Does the Flight Surgeon see different, or unique types of clinical problems among the Army aviation population (non-combat personnel) than the standard population? (2) Does the special training for aviation medical officers and flight surgeons need to be modified to provide the therapy required by the population they are expected to treat? (3) Does this special population present itself for therapy and treatment of medical problems for which sufficient consideration has not been made prior to or during aviation medicine training? Partial results of 9,483 sick call visits over a period of 22 months beginning in June 1964 are given, and compared with a 1943 Navy study. S.C.W.

**N68-24870#** Advisory Group for Aerospace Research and Development, Paris (France).

**STUDY OF THE VIGILANCE AND THE PSYCHOMOTOR REACTIONS ON PRIMATES PLACED IN BALLISTIC FLIGHT [ETUDE DE LA VIGILANCE ET DES REACTIONS PSYCHOMOTRICES SUR DES PRIMATES PLACES EN VOL BALISTIQUE]**

G. Chatelier and Belugou *In its* AGARD Behavioural Probl. in Aerospace Med. Oct. 1967 11 p In FRENCH (See N68-24859 14-04)

It is hypothesized that a gravimetric sensation participates in maintaining cortical alertness; and in this case, weightlessness hazards lead to the lowering of alertness level. Two monkeys, conditioned to carry out a simple psychomotor gesture, were equipped with electrodes to register electrocorticographic, myographic, and vegetative responses during flight. A polygraph transmitted by telemetry permitted the collection of these data. One monkey, in a state of pure weightlessness, exhibited a complete absence of conditioned reflexes and considerable lowering of alertness. The other monkey rested quietly before the flight and exhibited normal psychomotor responses. Transl. by M.W.R.

**N68-24871#** Royal Air Force, Farnborough (England). Inst. of Aviation Medicine.

**RECENT WORK ON OXYGEN RICH FIRES**

D. M. Denison *In* AGARD Behavioural Probl. in Aerospace Med. Oct. 1967 7 p refs (See N68-24859 14-04)

Research on oxygen rich fires which is being undertaken in America and Great Britain is summarized. Examined are studies in the following areas: ignition in oxygen; the spread of fires in oxygen; methods of extinction; problems of hyperbaric oxygen therapy; and codes of practice. S.C.W.

**N68-24872*#** National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

**HUMAN-FACTORS ASPECTS OF ORBITAL OPERATIONS**

A. W. Vogeley *In* AGARD Behavioural Probl. in Aerospace Med. Oct. 1967 24 p (See N68-24859 14-04)

CSCL 05E

This paper presents a comprehensive review of the human-factors aspects of orbital operations required to support a manned orbital laboratory. Based on a detailed operational analysis of what will be demanded of man in such a space system, the paper establishes a reference framework and a set of goals for human-factors research—many of which will require strong bio-medical and biotechnological support. Also, since most space station activities require a combination of several specific manual operations, a matrix of these interrelationships is developed. Finally, this matrix is combined with a best-estimate schedule of station activities (heavily dependent upon progress in physical sciences technology) to yield a priority list for human-factors research. Author

**N68-24873*#** National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

**STATUS REPORT ON RECENT LANGLEY STUDIES OF LUNAR AND SPACE STATION SELF-LOCOMOTION**

Donald E. Hewes *In* AGARD Behavioural Probl. in Aerospace Med. Oct. 1967 16 p refs (See N68-24859 14-04)

CSCL 05H

Reviewed are studies of the self locomotive capabilities of astronauts both on the lunar surface and in rotating space stations. The lunar locomotion studies are being carried out both by in-house effort and by contract with aerospace industries using an inclined-plane technique developed for simulating lunar gravity. Initial in-house studies showed that there were significant differences between earth and lunar locomotive gait characteristics and that in general a gravity level equal to that of the moon had a favorable effect on these locomotive capabilities. Space station studies utilize a simulator capable of rotation which together with the inclined plane technique provides weightless and rotational conditions. It was observed that subjects could initiate and sustain a walk at gravity levels below 0.2 times earth's gravity. In addition to walking, space soaring could be employed under these conditions. The most significant comments relative to these two on-going projects is that there seem to be significant differences between self locomotion, involving rectilinear motion, as typified by walking on the moon or in a space station with flat floors; and self locomotion involving curvilinear motion as in the case of the space station with floors curved about the axis of rotation. It is therefore surmised that care should be exercised when attempting to speculate on the problems of locomotion in one medium on the basis of experience in the other. S.C.W.

**N68-24874#** Naval Submarine Medical Center, Groton, Conn. Submarine Medical Research Lab.

**AREAS OF COINCIDENCE IN AEROSPACE AND SUBMARINE MEDICAL RESEARCH**

Charles F. Gell *In* AGARD Behavioural Probl. in Aerospace Med. Oct. 1967 9 p (See N68-24859 14-04)

The following discussion identifies the bio-medical problems existing in aerospace and submarine diving activities that have similarity in their physical aspects and the psychophysiological response of man thereto. These problems are identified in three, time/altitude and time/ocean depth relationships. The physical stressors in both aerospace and ocean environments are related to: lack of breathing oxygen, toxic gases, bends, cold, explosive decompression, atmospheric ionization, circadian rhythm alterations, disorientation, vertigo and respiratory response to rare gases. Psychological problems of similarity are stated as human factors engineering, selection of personnel, reaction to confinement, isolation, training and simulation methods. Author

**N68-24875#** Centre d'Enseignement et de Recherches de Medecine Aeronautique, Paris (France).

**STUDY OF BIOLOGICAL ACTION OF COSMIC RAYS BY MEANS OF SOUNDING BALLOONS [ETUDE DE L'ACTION BIOLOGIQUE DES RAYONS COSMIQUES—AU MOYEN DE BALLONS SONDES]**

A. Pfister, G. Deltour, H. Atlan, R. Kaiser, and L. Miro *In* AGARD Behavioural Probl. in Aerospace Med. Oct. 1967 10 p In FRENCH Prepared in cooperation with Centre de Rech. Nucl., Strasbourg (See N68-24859 14-04)

Biological effects due to the heavy ions in primary cosmic rays were studied over a three year period with the aid of sounding balloons at 30,000 meters. Experiments of two types, both using recoverable containers, were performed. Black mice were used in one group of studies to determine anatomical-pathological lesions to the skin by the passage or disintegration of heavy ions as well as the modifications in protein anabolism. Autioradiographic methods were used for these determinations. For the other studies

bacteriological preparations were used to find evidence of mutagenic effects, and relative biological effectiveness coefficients for the heavy ions were determined. Sensitivity of such tests are dependent upon the use of concentrated cultures and better references of the particle traces in the cultures. Transl. by M.W.R.

**N68-24876#** Air Force Systems Command, Brooks AFB, Tex.
**THE RADIOBIOLOGICAL HIATUS IN SPACE**
E. R. Ballinger *In* AGARD Behavioural Probl. in Aerospace Med. Oct. 1967 7 p (See N68-24859 14-04)

Problems concerned with the incidence of radiation induced lethality from space energy protons or electrons are discussed. On the basis of animal studies and clinical radiotherapeutic studies of humans the following generalities are made: (1) the incidence of radiation induced lethality in space will be remote as compared with the incidence of tissue damage to the skin, eyes, and other superficially located organs; (2) following a single sizable exposure, a second mission should not be undertaken with the assumption of a recovery expressed commonly as for instance 10 to 20% per day of the recoverable fraction; (3) as mission durations increase, life support equipment will also increase, making a contribution to shielding; and as flights become heavily shielded the radiation of concern will become predominantly gamma, bremsstrahlung, and neutrons rather than protons and electrons; (4) for prolonged flights where possible a rigorous adherence to exposure criteria will be carried out during the early stages; and (5) the more serious problems may be psychological due to prolonged isolation and confinement on, for instance, a three year flight to a distant planet. S.C.W.

**N68-24877#** Air Force Systems Command, Los Angeles, Calif. Aerospace Medical Div.
**SLEEP REQUIREMENTS DURING MANNED SPACE FLIGHT**
Louis F. Johnson, Jr. *In* AGARD Behavioural Probl. in Aerospace Med. Oct. 1967 4 p refs (See N68-24859 14-04)

Sleep requirements for astronauts during manned space flight are discussed in an attempt to answer the following questions: (1) How much sleep is necessary? (2) What quality or depth of sleep is necessary? (3) What periodicity of the wakefulness/sleep cycle is satisfactory for good performance? It is concluded that astronauts on prolonged space flights should have eight hours of continuous sleep at their normal depth of sleep out of each twenty-four hours if possible; and if the preceeding is not possible, a different wakefulness/rest ratio must be used, for example, twelve hours work/six hours rest plus another two hour rest period in each twenty-four hour period. S.C.W.

**N68-24878#** Army Research Inst. of Environmental Medicine, Natick, Mass. Military Ergonomics Lab.
**SYSTEMATIC EVALUATION OF THERMAL ASPECTS OF AIR CREW PROTECTIVE SYSTEMS**
Ralph E. Goldman *In* AGARD Behavioural Probl. in Aerospace Med. Oct. 1967 20 p refs (See N68-24859 14-04)

The systematic study of a proposed uniform begins with an analysis of the insulation (clo) and evaporative transfer ($i_m$) properties of the basic fabrics, individually and subsequently as the composite layers in the uniform system. These initial fabric investigations are carried out both on a dry, and a wetted, heated flat plate. The uniform items are then evaluated on an anthropomorphic heated and sweating manikin so that the insulation and evaporative properties of the uniform, as worn, can be evaluated. A computer model for human thermal balance is then programmed with these values and the tolerance range for wear of such a uniform is calculated as a function of wearer workload, ambient temperature, vapor pressure, wind velocity and solar load. The results are plotted on a psychrometric chart. Finally an environmental chamber evaluation of the ensemble may be carried out with volunteer subjects, at one of the critical points suggested by the computer prediction, to confirm the predicted stress level and investigate other human factors aspects. Our experience has been that the stress level found in such an evaluation is almost always in agreement with that predicted from the clo and $i_m$ indices. Author

**N68-24879#** Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.
**AIR CREW PROTECTIVE TECHNIQUES FOR HOT HUMID ENVIRONMENTS**
R. Gaudio, M. McCally, W. C. Kaufman, and N. Abramson *In* AGARD Behavioural Probl. in Aerospace Med. Oct. 1967 10 p refs (See N68-24859 14-04)

Cockpit temperatures of 54°C with 40–50% Relative Humidity are not unusual in Southeast Asia. In an attempt to minimize the physiologic changes that occur during exposure to such an environment three simple protective devices were studied: (1) a water cooled vest, (2) the effect of breathing cool-dehumidified air and (3) the administration of the steroid blocking agent—metapyrone (R). In evaluation of each device, five subjects were exposed to heated environments similar to those encountered in Southeast Asia both with and without the addition of each of the protective devices. It is demonstrated that the water cooled vest significantly improves both thermal tolerance and the physiologic responses to a hot humid environment. Breathing cool dehumidified air significantly reduces the ventilatory response to heat stress but is not protective otherwise. Metapyrone administration reduces the excretion rate of sweat Na in response to heat stress but it also is not thermally protective. Author

**N68-24880#** Air Force Systems Command, Brooks AFB, Tex. Aerospace Medicine Div.
**RECENT ADVANCES IN THE DEVELOPMENT OF MEDICAL EQUIPMENT AND MATERIEL FOR MILITARY AEROSPACE OPERATIONS**
John E. Murphy and Bruce H. Warren *In* AGARD Behavioural Probl. in Aerospace Med. Oct. 1967 11 p refs (See N68-24859 14-04)

Exploratory and engineering research focusing on the development of facilities needed to provide medical support at remote and logistically isolated bare bases (logistically remote and isolated areas), and the development of medical equipment for use in the movement of patients in the aeromedical evacuation system; is reported. Discussed is the development of a new air transportable self-contained tactical treatment facilities system. The facility embodies the most advanced professional and technical devices ideally positioned for use in the most suitable shelter environment conducive to patient recovery and worker efficiency. The system is designed for easy and rapid transport and positioning and can be deployed in three C-130 aircraft. The facilities are designed primarily as air transportable structures, with ground mobility performance being limited accordingly. Improved equipment for the aeromedical evacuation system includes the development of a functional sphygmomanometer; portable oxygen system; bacterial isolation unit; humidifier-nebulizer; litter support system; patient access unit; and exploratory study of an intensive care unit. S.C.W.

**N68-24881#** Institute of Aviation Medicine, Toronto (Ontario).
**FLASH BLINDNESS—DEVELOPMENT AND TRIALS OF PROTECTIVE SPECTACLES**
Bryan St. L. Liddy and Clement Mc Culloch *In* AGARD Behavioural Probl. in Aerospace Med. Oct. 1967 6 p ref (See N68-24859 14-04)

Tests and flight trials of blinker glasses designed for use in a hypothetical tactical situation involving the exposure of low flying pilots to multi-detonations of small yield weapons within relatively short time periods are discussed. Evaluated is the feasibility

of the assumption that by wearing the blinker type glasses uninterrupted macular and hemiretinal function would be maintained at all times by one eye or the other despite exposure to scotoma producing high intensity light. The blinker glasses were tested for effectiveness against high intensity flash using the following criteria for protection: (1) ability to read 6/18 line on a test chart, and (2) ability to check and correctly read flight instruments in a simulated cockpit. The light source used consisted of N22 aluminum foil bulbs with a peak luminance of 4,200,000 lumens and a duration time of 50 milliseconds. Tested were ten subjects possessing uncorrected visual acuity of 20/20 in each eye. The ten subjects had a uprotected 6/18 recovery time of between 34 to 150 seconds, the average being 43 seconds. The angle of incident light made little difference as long as it subtended more than 10° from central fixation using the 6/18 visual angle criteria. Flight tests showed that: (1) It is feasible to wear blinker type glasses in flight should this be required; and (2) pilot acceptance of this type of protective device will depend on familiarity with the glasses, coupled with a continued unit training program stressing the nature and consequences of flash blindness as well as protective techniques currently available. S.C.W.

**N68-24882#** Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.

**A REVIEW OF SOME RECENT AND CURRENT EXPLORATORY DEVELOPMENT EFFORTS IN PRESSURE SUIT TECHNOLOGY**

Erwin R. Archibald *In* AGARD Behavioural Probl. in Aerospace Med. Oct. 1967 27 p refs (See N68-24859 14-04)

Fundamental physiological and environmental problems affecting the design of full pressure suits are discussed and research and development efforts leading to the conceptual design of a hybrid second generation extravehicular space suit, and the Boyle's law partial pressure suit are reviewed. Main characteristics of major types of pressure suit joints and biomedical requirements that pressure suits must satisfy are briefly considered. S.C.W.

**N68-24883#** Belgian Air Force, Brussels. Centre de Medecine Aeronautique.

**STUDY OF THE NORMAL VALUES OF THE VITAL CAPACITY AND MAXIMUM/SECOND EXPIRING VOLUME IN THE NAVIGATORS IN THE BELGIAN AIR FORCE [ETUDE DES VALEURS NORMALES DE LA CAPACITE VITALE ET DU VOLUME EXPIRATOIRE MAXIMUM/SECONDE CHEZ LE PERSONNEL NAVIGANT DE LA FORCE AERIENNE BELGE]**

J. Bande *In* AGARD Behavioural Probl. in Aerospace Med. Oct. 1967 30 p refs In FRENCH (See N68-24859 14-04)

Following a brief description of the technique used to determine vital capacity and "maximum second" expiration volume, the sensitive factors that influence the measurements were analyzed. A population of normal subjects was used to determine the measurements as a function of size and age; and a longitudinal study covered data obtained over a five-year period. Results were compared with theoretical expectations, and the influence of habitual smoking on respiration parameters was studied. Transl. by M.W.R.

**N68-24884#** Louvain Univ. (Belgium).

**MATHEMATICAL ANALYSIS OF THE OUTLINE OF THE FORCES EXPIRATION TEST [ANALYSE MATHEMATIQUE DU TRACE DE L'EPREUVE D'EXPIRATION FORCEE]**

J. Clement (Belg. AF, Brussels) and K. Van De Woestyne *In* AGARD Behavioural Probl. in Aerospace Med. Oct. 1967 9 p ref In FRENCH (See N68-24859 14-04)

Three formulas were applied to tracings of forced expiration determined by spirometry and pneumotachography, and analyses were made by a nonlinear regression method on 15 points of the selected curve and at intervals of 2 seconds from the moment of the maximum output. This procedure permitted verification of the validity of the formulas and the reproducibility of the volumes. The method used did not always permit a real solution of the roots of the equation for forced experiation, notably when subjects had bronchial obstructions. Two of the equations were not of value with other subjects for periods between 0.4 to 3 seconds, and the third equation had its limitations. Reproducibility of theoretical volumes at 1 second is comparable to the maximum second expiration volumes, and reproducibility of the general form of the curve as a function of volume is excellent. Transl. by M.W.R.

**N68-24885#** Belgian Air Force, Brussels.

**CRITICAL STUDY AND STATISTICS OF THE VALUE OF DIVERSE ATTENTION TESTS USED FOR THE SELECTION OF PILOTS [ETUDE CRITIQUE ET STATISTIQUE DE LA VALEUR DE DIVERS TESTS D'ATTENTION UTILISES POUR LA SELECTION DES PILOTES]**

Paul Lievens *In* AGARD Behavioural Probl. in Aerospace Med. Oct. 1967 21 p refs In FRENCH (See N68-24859 14-04)

Speed, precision, and maximum time dispersion for range were studied in relation to the performance of 447 Belgian student pilots and their success and failure at different levels in training. Norms established and actually used for Dutch pilots were modified for the Belgian population and the system for correcting tests was reviewed. There were significant differences between subjects who succeeded and those who failed, related more to accuracy at the beginning of training and to other factors at other levels of training. Subjects who obtained the pilot certificate were distinguished from those who failed by a fewer number of omissions during performance at average speed. It is concluded that the most important factor in the testing of attention is the accuracy achieved during performance or the attention to detail. Transl. by M.W.R.

**N68-24886#** Aerospace Medicine Center, Rome (Italy).

**BEHAVIOUR OF PULMONARY VENTILATION AND ALVEOLAR GASES TENSIONS IN ATHLETES, BEFORE, DURING, AND AFTER A FIVE WEEKS STAY AT THE ALTITUDE OF 2250 M**

A. Scano and G. Meineri *In* AGARD Behavioural Probl. in Aerospace Med. Oct. 1967 13 p refs (See N68-24859 14-04)

Respiratory functions of Italian athletes were studied both at rest and during strenuous exercise to determine the feasibility of improving their performance by submitting them to a few weeks of adaptation at altitude. Reported are results of research on the characteristics of pulmonary ventilation and oxygen and carbon dioxide alveolar tensions, recorded under control conditions, and at intervals during adaptation to Mexico City altitudes. Respiratory parameters, i.e., pulmonary ventilation and alveolar respiratory gaseous tension at rest, were studied at sea level, and at simulated altitudes of 2300 and 5500. Results indicated that pulmonary ventilation under experimental conditions was constantly and significantly increased. Values recorded at Mexico City failed to indicate significant differences during successive six day intervals. The relationship of these studies with similar studies of man's adaptation and acclimatization to altitude, and effects of hypoxia, is discussed. S.C.W.

**N68-24887#** Naval Medical Research Inst., Bethesda, Md.

**A THERMAL MODEL FOR RETINAL DAMAGE INDUCED BY PULSED LASERS**

Jude R. Hayes and Myron L. Wolbarsht *In* AGARD Behavioural Probl. in Aerospace Med. Oct. 1967 21 p refs Sponsored in part by DASA (See N68-24859 14-04)

The model of the retina employing the thermal absorption of a slab of the pigment epithelium layer (assumed to be homogeneous) as proposed by Vos has been examined for both long exposure times (for which it was designed) and short exposure

times. The model is sufficient to explain the damage from long exposures but not short exposures. The physical characteristics of the pigment epithelium was examined, particularly with respect to the thermal stability and optical properties of the melanin granules. A new model is proposed which is based on absorption of the incident energy by the one micron diameter pigment granules and thermal conduction from them to nearby essential retinal structures such as the pigment cell membrane and the receptor cell myeloid body and outer segment. This model explains both long and short pulse damage. Such nonlinear effects as ionization from intense electric field gradients, harmonic generation, Brillouin scattering, shock waves, and re-radiation by blackbody emission are shown to make negligible contribution to the initial tissue damage where the lesion is minimal. Shorter event times ($10^{-12}$ seconds) which are possible from mode locked laser operation may require other mechanisms than postulated by this theory. Author

**N68-24888*#** Naval Medical Research Inst., Bethesda, Md.
**MECHANISMS OF INJURY FROM VIBRATION**
D. J. Sass, Jude R. Hayes, and D. E. Goldman *In* AGARD Behavioural Probl. in Aerospace Med. Oct. 1967 12 p refs (See N68-24859 14-04)
(NASA Order R-10) CSCL 06C

Studies were carried out on anesthetized cats immersed in a transparent water-filled tank and vibrated erect along the longitudinal body axis. Gross examinations were performed on all animals immediately after vibration. Autopsy findings showed similarities to blast injury. Mediastinal emphysema and air embolism were found in cats vibrated erect at relatively low levels of acceleration. At higher levels, mediastinal air dissected downward to inflate the peritoneal cavity and retroperitoneal spaces. The presence of intra-abdominal air was associated with rupture of the liver and tearing of both the portal vein and the inferior vena cava. Previous investigations in our laboratory on cats vibrated in the supine position in a water immersion tank had shown lung contusion to be the predominant injury. This was attributed to the heart pounding the lungs against the chest wall. Results of the present study when compared with this earlier work, indicate that body position is a critical factor in the mechanism of vibration injury. Author

**N68-24889#** Institute of Aviation Medicine, Fuerstenfeldbruck (West Germany).
**BALLISTOCARDIOGRAPHIC DETERMINATION OF STROKE VOLUME AND CARDIAC PERFORMANCE**
H. W. Kirchhoff *In* AGARD Behavioural Probl. in Aerospace Med. Oct. 1967 16 p (See N68-24859 14-04)

Principles and applications of ballistocardiographic techniques used in the determination of stroke volume and human heart performance are discussed. S.C.W.

**N68-24914*#** Aerospace Medical Div. Aerospace Medical Research Labs (6570th), Wright-Patterson AFB, Ohio.
**INVESTIGATION OF THE EFFECTS OF VIBRATION ON DIAL READING PERFORMANCE WITH A NASA PROTOTYPE APOLLO HELMET Final Report, Dec. 1965–Mar. 1966**
Richard W. Shoenberger Feb. 1968 14 p refs
(NASA Order R-58)
(NASA-CR-94655; AMRL-TR-67-205) CFSTI: HC $3.00/MF $0.65 CSCL 05H

Dial reading performance was investigated during short duration whole-body sinusoidal vibration. The subjects were in the semisupine position so that the force of gravity acted through the X-axis of the body, with the vibration acting in the X-axis in one experiment and in the Y-axis in another. Dial reading was assessed at 6, 11, and 15 Hz when the helmet was worn either with or without a helmet liner. The vibration intensity was ±1.2G in the X-axis experiment and ±0.9 G in the Y-axis experiment. Static control measurements were also made both with and without the helmet. The results showed significant decrements in dial reading performance during vibration which were differentially related to direction of vibration, frequency of vibration, and to combinations of liner versus no liner with the three frequencies. The results further indicated that the effects of different directions and frequencies of vibration were quite similar to those found under the same conditions using a Mercury helmet without a face plate. The data suggested that performance was somewhat poorer during both vibration and static conditions with the Apollo helmet. This is probably the result of visual interference produced by the curvature of the helmet face plate and by small scratches and blemishes on the face plate. Author

**N68-24915*#** Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.
**DISPERSION AND ATTENUATION OF SMALL ARTIFICIAL PRESSURE WAVES IN THE AORTA**
Max Anliker, Michael B. Histand, and Eric Ogden (NASA. Ames Res. Center) Apr. 1968 9 p refs
(Grant NGR-05-020-223)
(NASA-CR-94696; SU-DAAR-342) CFSTI: HC $3.00/MF $0.65 CSCL 06P

The elastic behavior of large blood vessels was determined in terms of their transmission characteristics for small sinusoidal pressure signals. The method utilizes transient signals of the form of finite trains of sine waves superimposed on the naturally occurring pressure fluctuations. Its application to the thoracic aortae of 18 mature mongrel dogs anesthetized with Nembutal shows that dispersion and attenuation data for frequencies between 40 and 200 cps can be obtained without requiring either Fourier transform computations or resolution of reflection interference. The aorta is only mildly dispersive but exhibits strong attenuation that must be attributed primarily to dissipative mechanisms in the vessel wall. At normal blood pressure levels the wave speed during diastole can have a value between 4 and 6 m/sec. The amplitude ratio of the waves exhibits the same exponential decay pattern with distance measured in wavelengths. A marked increase in wave speed is observed from diastole to systole, associated with an increase in mean flow and with a stiffening of the aortic wall due to the rise in pressure. This phenomenon implies that the aortae should exhibit nonlinear properties with respect to large amplitude pulse waves such as those generated by the heart. Author

**N68-24925*#** Oregon State Univ., Corvallis.
**SYSTEMATIC DESCRIPTION AND KEY TO ISOLANTS FROM ATACAMA DESERT, CHILE**
W. B. Bollen, Fred Au, and Karen M. Byers 7 May 1968 40 p Prepared for JPL
(Contracts NAS7-100; JPL-950783)
(NASA-CR-94758) CFSTI: HC $3.00/MF $0.65 CSCL 06M

The following report identifies 32 isolants from soils of the Chile Atacama Desert. Of the 32 isolants there are 5 moles, 1 yeast, 8 actinomycetes and 18 bacteria representing 15.6%, 3.1%, 25.0% and 56.3% respectively. In this report the yeast and mold isolants are disregarded. The actinomycetes are being studied for identification. The remaining bacterial cultures are identified and presented in this report. A dichotomous key and a list of the isolants and species designations precedes the descriptive charts for each isolant. In addition to the descriptive charts for the viable isolants, photomicrographs of the non-viable isolants are included. Of the 18 bacterial isolants 2 are *Micrococcus* ssp., 4 are *Mycococcus* spp.[2], 2 are "soil diphtheroids" and 10 are *Bacillus* spp., comprising 11.1%, 22.2%, 11.1% and 55.6% respectively. Author

**N68-24968#** National Academy of Sciences–National Research Council, Washington, D. C.
**LASER EYE EFFECTS**
Harry G. Sperling, ed. Apr. 1968 94 p refs
(Contract Nonr-2300(05))
(AD-667494)

Contents: A review of technical characteristics of lasers; Retinal injury from laser and light exposure; Laser functional effect; Personnel protection from lasers and a discussion of eye protective devices; Devices for eye protection; Eye examination standards and treatment. TAB

**N68-24999*#** IIT Research Inst., Chicago, Ill.
**LIFE IN EXTRATERRESTRIAL ENVIRONMENTS Quarterly Status Report, 29 Feb.–15 May 1968**
15 May 1968 12 p
(Contract NASr-22; IITRI Proj. L6023)
(NASA-CR-94790; IITRI-L6023-13) CFSTI: HC $3.00/MF $0.65 CSCL 06C

In examining the effects of incubation temperatures and salt concentrations on the growth response of *Staphylococcus aureus* in a simulated Martian environment, it was found that the *S.* aureus grew with constant 35°C and daily freeze–thaw incubation temperatures. However when 2% sodium chloride was added to the soil, growth did not occur at any incubation temperature. Available moisture ($a_w$) is considered to be the major factor controlling growth; barometric pressure and temperature become increasingly important as the $a_w$ of the environment approaches the limiting value for growth of an organism. Preliminary experiments on the abrasive effect of soil particles on bacteria survival indicate that a positive effect is exerted initially, and that the viable cell population decreases during the first 24 hours with no further reduction. Isolation of salt tolerant bacteria from soil is reported. M.G.J.

**N68-25007** Michigan State Univ., East Lansing.
**HEAT STRESS AND STRAIN IN MEN WEARING IMPERMEABLE CLOTHING**
Adolph Richard Dasler (Ph.D. Thesis) 1966 135 p
Available from Univ. Microfilms: HC $6.40/MF $3.00 Order No. 67-1615

The purpose of this study was to realistically determine the physiological tolerance of man to heat stress while wearing unventilated, impermeable, full body clothing that barred evaporative heat loss. The ambient environmental temperatures ranged from DB 18.3°C and WB 12.2°C (65 and 54°F) to DB 32.2°C and WB 26.6°C (90 and 80°F). Air velocity over the surface of the suit was controlled <50, 250 and 1000 feet per minute. The variable of physical activity was limited to standing at rest, work by stepping up two 6" steps and then stepping back down at a regulated rate of 10 round trips per minute, or a combination of rest and work. A total of 10 combinations of the above variables were investigated. Dissert. Abstr.

**N68-25022** Johns Hopkins Univ., Baltimore, Md.
**A QUANTITATIVE DESCRIPTION OF VOLUNTARY EYE MOVEMENTS IN THE MONKEY**
Albert Frederick Fuchs (Ph.D. Thesis) 1966 161 p
Available from Univ. Microfilms: HC $7.60/MF $3.00 Order No. 67-2995

A technique is described which enables eye movements to be measured in the chronic unanesthetized monkey over a range of ±20° with a sensitivity of 1.5 min of arc. A training procedure is illustrated which conditions the animals to make specific eye movements on command. It is found that no qualitative difference exists between similar human and simian eye movement trajectories. Therefore, a monkey preparation can now be used for neurophysiological studies of the oculomotor system with confidence that the results of such studies have considerable relevance to the human oculomotor system. Dissert. Abstr.

**N68-25060*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
**A PIEZOELECTRIC TRANSDUCER FOR MEASURING CARDIAC AND GROSS MOTOR ACTIVITY OF SMALL ORGANISMS**
Vernon L. Rogallo, Robert S. Jenkins, and Gordon J. Deboo Washington May 1968 11 p refs
(NASA-TN-D-4590) CFSTI: HC $3.00/MF $0.65 CSCL 06B

The transducer system incorporates both mechanical and electrical noise rejection features. The mechanical feature is achieved by a dual arrangement, essentially two transducers, one of which senses the organism activity and noise while the second senses only the noise. Subtraction of the output of the individual transducers results in a cancellation of the environmental noise. The electrical noise rejection is achieved by low-noise preamplifiers with differential input to reject 60 Hz. A low-noise-RC-active filter is used to eliminate frequencies outside the bandwidth of interest. It was found that the rejection features provided sufficient discrimination against environmental noise to allow the transducer to be used in a normal laboratory environment. The instrument is sufficiently sensitive to measure heart rates in insects, reptiles, mammals, and developing chick embryos as young as 3 days. Author

**N68-25068#** Instituto de Energia Atomica, Sao Paulo (Brazil). Servico de Protecao Radiologica e Dosimetria.
**CALIBRATION OF DU PONT FILMS OF TYPE 508 AND 510 BY BETA RADIATION [CALIBRACAO DOS FILMES DUPONT TIPO 508 E 510 PARA A RADIACAO BETA]**
Gian Maria A. A. Sordi and Dirceu M. Vizeu Apr. 1967 25 p refs In PORTUGUESE; ENGLISH summary
(IEA-141) CFSTI: HC $3.00/MF $0.65

The question of determining the beta exposure from different energies that in general occurs simultaneously with gamma radiation, is important mainly for people involved with chemical processing, radiobiology, medicine, etc. The main difficulty in the calibration of the film is the calculation of exposure from beta sources, because the existing analytical expressions are not applicable directly in most of the exposure conditions. After a brief discussion concerning the election of the analytical expression used, a program for the IBM-1620 II computer is shown. The selection of the radioisotopes, the experimental arrangement and the results are discussed. Some considerations on the minimum energy that can be detected are also made. The comparison of the response curve for beta with that of gamma radiation from Co-60 shows that it is possible to find out the exposition, to know if it came from gamma or beta plus gamma radiation and also to give an approximate value for the average effective energy of the incident radiation. Author

**N68-25095*#** University of Southern Calif., Los Angeles. Dept. of Physiology.
**INVESTIGATION TO DETERMINE THE EFFECTS OF LONG TERM BED REST ON G-TOLERANCE AND ON PSYCHOMOTOR PERFORMANCE Final Report**
John P. Meehan, James P. Henry, Shannon Brunjes, and Herbert de Vries 19 Sep. 1966 54 p refs
(Contract NAS9-3500)
(NASA-CR-62073) CFSTI: HC $3.00/MF $0.65 CSCL 06S

Fourteen young men were confined to bed for 28 days. They were randomly divided into three subject groups of 5, 5 and 4 individuals. One group exercised, another did pressure breathing and the third did both. Each subject was exposed to a re-entry acceleration profile in the −Gx position while performing a three dimensional tracking task prior to the bed rest and at the conclusion of the bed rest. Tilt table tolerance and blood volumes were determined in a similar sequence. Cardiovascular deconditioning manifested by plasma volume decrements of 20% and decreased tolerance to passive tilting resulted in all subjects and was not differentially affected by the exercise, pressure breathing or the

combination maneuvers. Performance on the tracking task during acceleration was not affected by the cardiovascular deconditioning. Author

**N68-25119#** Cekmece Nuclear Research Center, Istanbul (Turkey).
**MEASURING THE DURATION OF VERY LOW FREQUENCIES, PARTICULARLY THE INSTANTANEOUS HUMAN RESPIRATION FREQUENCIES [DAUERMESSUNG SEHR NIEDRIGER FREQUENZEN, INSBESONDERE DER MOMENTANEN MENSCHLICHEN ATMUNGSFREQUENZ]**
Umur Buektas and Engin Ekonomi Feb. 1968 37 p refs In GERMAN; ENGLISH summary
(CNAEM-50) CFSTI: HC $3.00/MF $0.65

During clinical and biophysical examinations in which fast changes of the respiration rate are of interest, the instantaneous respiration frequency must be recorded instead of the average value. The authors report of two electronic devices by means of which the instantaneous frequency of successive pulses can be continuously recorded in the range of 1 Hz to 0.02 Hz. The first device incorporates an analog and the second one a digital display of the measured values. Both have an accuracy of ±0.002 Hz. The digital version can be connected to a computer through an interface. Author

**N68-25143*#** Massachusetts Inst. of Tech., Cambridge. Man-Vehicle Control Lab.
**BIOPHYSICAL EVALUATION OF THE HUMAN VESTIBULAR SYSTEM Semiannual Status Report**
J. L. Meiry and L. R. Young Jan. 1968 14 p refs
(Grant NGR-22-009-156)
(NASA-CR-94779; MV-68-1; SASR-4) CFSTI: HC $3.00/MF $0.65 CSCL 06P

This research was conducted to evaluate the dynamic characteristics of the human semicircular canals by a detailed examination of their physical properties and to correlate them with physiological and behavioral data. Properties of viscosity, thermal coefficient of viscosity, density, and thermal coefficient of expansion were measured for endolymph and perilymph and were used to evaluate the coefficients of the equations of the dynamic response of the semicircular canals. The influences of the inertia and viscous drag of the cupula and of the flexible membranous canalicular duct have resulted in a new dynamic model for the response of the semicircular canals to angular and linear acceleration. Canalicular response to thermal stimulation was found to produce the physiological equivalent of an angular acceleration. R.N.A.

**N68-25178#** Naval Medical School, Bethesda, Md.
**ELECTRON STIMULATION OF BIOPOLYMERS**
S. V. Konev Feb. 1968 251 p Transl. into ENGLISH of the publ. "Elektronno-Vozbushdennye Gostoianiia Biopolimerov" Minsk, Nauka i Tekhnika, 1965 p 1–186 *Its* Transl. No. 1236
(AD-667499)

The report represents the first attempt to compile and organize works relative to the discovery and studies of the nature of electron-stimulated states of the two principal classes of biopolymers: proteins and nucleic acids. Particular attention is given to the biological role of the electron-stimulated states, the mechanism of their appearance, migration and prolonged concentration of energy. Problems are reviewed in reciprocal spectral luminescence characteristics of biopolymers with their secondary, tertiary and quaternary structures, potential application of photoluminescence of the biopolymers, as a source of information on the physico-chemical and structural organization of the vital cells on the molecular and supramolecular levels. Author (TAB)

**N68-25249** Ohio State Univ., Columbus.
**METABOLIC CHANGES IN ANIMALS EXPOSED TO A HELIUM-OXYGEN ENVIRONMENT**
Rodney Allen Rhoades (Ph.D. Thesis) 1966 141 p
Available from Univ. Microfilms: HC $6.80/MF $3.00 Order No. 67-2523

Chicks, mice, and rats were exposed acutely (one to three hours) and chronically (ten days) to a 79 percent helium and 21 percent oxygen mixture. In the chronic exposures animals were maintained in a sealed polyvinyl isolator in which oxygen was kept at 20 to 22 percent, carbon dioxide below 0.5 percent, nitrogen under 2 percent, ambient temperature between 25 degrees and 30 degrees centigrade, and relative humidity between 50 and 70 percent. The controls were kept in an identical isolator filled with air. Rectal temperature, subcutaneous temperature, tail temperature, heart rate, and respiration rate were measured simultaneously with oxygen consumption on 54 acutely and 18 chronically exposed rats at different ambient temperatures (23 degrees, 28 degrees, 33 degrees, centrigrade). Each rat, whether acute or chronic, was tested both in helium and oxygen and air. It was concluded that the physiological effects of helium in the intact homeotherms were a function of its six and one-half fold higher heat conductivity by comparison with nitrogen. In addition to previous observations, a 10 percent depression in metabolism was found upon the transfer of rats from helium and oxygen to air. Dissert. Abstr.

**N68-25263#** Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.
**INDUCED RADIONUCLIDES IN ASTRONAUTS Quarterly Activity Report, 1 Jul.–1 Oct. 1967**
R. W. Perkins 8 Oct. 1967 21 p refs
(Contract AT(45-1)-1830)
(BNWL-531-1) CFSTI: HC $3.00/MF $0.65

An estimate of radionuclides that would be produced in an astronaut during a two-day orbital flight is tabulated. The calculations were based on spallation or capture reactions for protons with energies from 100 to 600 MeV. A list is presented of methods of production by cosmic radiation of radioisotopes of Ar, Be, Cl, Cu, K, Mg, Mn, Na, Rb, S, and Si. Tissue equivalent solutions that contained O, C, H, N, Ca, P, S, K, Na, Cl, Mg, Fe, Rb, Cu, and Mn at the concentrations present in a standard man were prepared by using chelating agents. The tissue equivalent solutions were bombarded with 14 MeV neutrons, 4 MeV neutrons, thermal neutrons, and natural cosmic radiation at 60,000 to 63,000 ft and provided a qualitative picture of the radiosotopes produced by the various neutron capture and spallation reactions. The data are tabulated. NSA

**N68-25276*#** National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.
**A COMPARISON OF HUMAN RESPONSE MODELING IN THE TIME AND FREQUENCY DOMAINS**
Lawrence W. Taylor, Jr. [1967] 41 p refs Presented at the USC-NASA Conf. on Manual Control, Los Angeles, 1–3 Mar. 1967
(NASA-TM-X-59750) H-464) CFSTI: $3.00/MF $0.65 CSCL 05H

A review is made of frequency and time domain methods of analyzing human control response while performing compensatory tracking tasks. Sample linear model results are compared and discussed. The frequency domain consists of smoothing with respect to frequency, where the constraint for the time domain model is more natural and meaningful in that it consists simply of limiting the memory of the pilot model. The linear models by both methods were almost identical. The time domain method of analysis enables the determination of a nonlinear pilot model. The inclusion of a cubic as well as a linear term accounted for only a small additional part of the pilot's remnant, and indicated that only a small portion techniques from graph theory it was possible to show that the degree of CO observed is greater than chance, and that CO is highly correlated with category recall. One theoretical conclusion of special interest was that hierarchical models of retrieval are inadequate as an explanation of these data. Author (TAB)

**N68-25336*#** National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
**PILOT RESPONSE IN COMBINED CONTROL TASKS**
Hugh P. Bergeron 28 Sep. 1967 18 p refs Presented at Human Factors Soc. 11th Ann. Meeting, Boston, 25–28 Sep. 1967
(NASA-TM-X-60499; L-5759) CFSTI: HC $3.00/MF $0.65 CSCL 05H

Pilot response in a multi-task simulation, which consisted of a primary control task combined with one or two secondary or side control tasks, was investigated. A general description of the response characteristics of each of these tasks was obtained and this information was used to determine the workload requirements of the tasks. Two different control tasks were used as the primary control task, either a fixed-base simulation of a lunar letdown or a simplified multi-loop tracking task which was similar to the end portion of the lunar letdown. The simplified tracking task was used in lieu of the more complicated lunar letdown because it could be represented and reproduced analytically. The secondary or side tasks consisted of a system failures task and a motor response task. The system failures task was incorporated from those systems present in a vehicle known as the Mercury Procedures Trainer. The motor response task was similar to that presented by the late Dr. Fitts of the University of Michigan. The task consisted of using a pencil-like device to make impacts on two separated, restricted columns. Author

**N68-25339*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
**PILOTED SIMULATOR DISPLAY SYSTEM EVALUATION: EFFECTIVE RESOLUTION AND PILOT PERFORMANCE IN THE LANDING APPROACH**
Wendell D. Chase [1967] 24 p refs Presented at USC-NASA Conf. on Manual Control, Los Angeles, 1–3 Mar. 1967
(NASA-TM-X-59806) CFSTI: HC $3.00/MF $0.65 CSCL 05H

Results are reported from a study conducted to investigate the quality of a visual display in a fixed cockpit piloted simulator and ways of measuring pilot-vehicle performance. The effective resolution characteristics of the simulator display system are presented for several pilots and compared with those for the real world. The pilot's ability to estimate range and altitude with a simulator display was determined, and his ability to control the vehicle in the approach and landing was measured. A correlation analysis between the various measures of altitude-range estimates, and pilot-vehicle performance showed that (1) the touchdown error depends on the pilot's ability to judge altitude in the landing approach, and (2) the touchdown error is highly correlated with the integrated altitude error. The correlation indicates difficulty in estimating the correct altitude to decrease the rate of descent and to initiate the flare. It also stated that the absence of motion feedback, ground effect dynamic forces, and vestibular and kinesthetic cues may be partially responsible for these errors. B.S.D.

**N68-25340*#** Naval Medical Research Inst., Bethesda, Md.
**EFFECT OF PARABAROSIS (ALTERED BAROMETRIC PRESSURE AND ATMOSPHERIC COMPOSITION) ON SUSCEPTIBILITY TO INFECTION**
[1967] 6 p Round Tables Notes Presented at Colonnade South, Hotel Taft, 2 May 1967
(NASA Order L-97464; NASA Order R-21-010-010)
(NASA-CR-84683) CFSTI: HC $3.00/MF $0.65 CSCL 06M

The term parabarosis is used to signify any natural or artificial alteration, beyond physiologically normal limits, in the gaseous environment, with respect to content and/or pressure. Abstracts are presented on various experimental studies concerned primarily with effects of parabarosis on infection. Various types of parabaric conditions are identified and the effects of parabarosis on microorganisms, hosts, and environment are described. B.S.D.

**N68-25357#** United Kingdom Atomic Energy Authority, Harwell (England). Research Group.
**HEALTH PHYSICS AND MEDICAL DIVISION PROGRESS REPORT, JANUARY–DECEMBER 1967**
J. E. Johnston, Ed. Feb. 1968 62 p refs
(AERE-PR/HPM-12; HL68/925) HMSO: 12s

Studies dealing with aerosols, radiation physics, metabolism, and human biology and biological research are reviewed. Researches on aerosols deal with mondisperse polystyrene particles, atmospheric pollution, and the physical and chemical aspects of aerosols. Neutron dosimetry and radiophysics were considered; as were personnel dosimetry, radiation spectrometry and computer processing, and fallout. Metabolic studies were concerned with the measurement of plutonium; retention of alkaline earths; the actinides, cesium, and potassium; neutron activation in vivo, iron absorption, and absorption of beta particles in the bone. Inhalation, tritium, and asbestos studies were also undertaken; and a symposium on bioassay methods is reported along with clinical pathology and radiology efforts and an ischaemic heart disease survey. M.W.R.

**N68-25365*#** TRW Systems, Redondo Beach, Calif.
**MEASUREMENTS REPORT: THERMAL PROPERTY MEASUREMENTS OF MANNED SPACECRAFT CENTER SPACESUIT MATERIALS**
F. J. Turnbow May 1968 3 p ref
(Contract NAS9-3670)
(NASA-CR-92133; Rept.-68-3346.11ja-34) CFSTI: $3.00 CSCL 06Q

Near-normal emittance measurements from space suit materials were made with an infrared reflectometer. While the measurements are of limited absolute accuracy, their relative accuracy is generally ±0.02; and therefore the measurements in conjunction with calorimetric or other accurate absolute methods are considered extremely useful for scanning large quantities of similar materials. Results are included for quarter-mil aluminized Kapton space suit material, as well as for sun visor and protective visor taken at two-inch intervals in both a lateral and vertical direction. M.W.R.

**N68-25382*#** Naval Aerospace Medical Inst., Pensacola, Fla.
**PUBLIC HEALTH ASPECTS OF GALACTIC RADIATION EXPOSURE IN SUPERSONIC TRANSPORT**
Hermann J. Schaefer 19 Mar. 1968 13 p refs
(NASA Order R-75)
(NASA-CR-94760; NAMI-1033) CFSTI: HC $3.00/MF $0.65 CSCL 06R

The prospect of large-scale commercial passenger transportation at SST altitudes in the lower stratosphere calls for an accurate assessment of the galactic radiation exposure. Highest radiation levels prevail at high latitudes (polar region) and solar minimum and reach about 1 millirem/hour at 65,000 feet. The accumulated dose of 0.6 rem/year which an SST crew member spending 600 hours/year at altitude would receive exceeds the Maximum Permissible Dose (MPD) for "Members of the Public" and would classify crew members as "Radiation Workers" in terms of official recommendations. The assumption of 50 SST each exposing 200 passengers to 1000 hours/year at SST altitude would lead to a population dose about equal to the contribution from industrial radiation workers, with both exposures ranking well below the two largest man-made additions to the natural background, medical use of X-rays and fallout. The heavy flux is attenuated to 3 percent or less at 65,000 feet, depending on the nuclear species; yet, only 0.1 percent of this residual flux accounts for maximum ionization hits. That means the microbeam hazard of heavy nuclei is insignificant at SST altitudes. Author

**N68-25428#** Joint Publications Research Service, Washington, D. C.
**BIONIC ASPECTS OF AUTOMETRY**
K. B. Karandeyev, V. N. Okhotskaya, B. I. Puchkin, and M. P. Tsapenko 21 May 1968 14 p refs Transl. into ENGLISH from Avtometriya (USSR), Sep.–Oct. 1967 p 119–128
(JPRS-45444) CFSTI: HC $3.00/MF $0.65

Structures of biological models for gathering and processing of information are discussed, and the analyzers in the living organism are realized through the use of very complex structures consisting of a great number of elements. It is felt that the utilization of the functional and structural features of biological analyzers to find new ways to create information measuring systems (IMS) may essentially change the characteristics of modern measuring technology. Research is needed in designing new elements, means of creating methods in the areas of designing new elements, actual creating of methods and means of measurement, and synthesizing the systems in which the gathering and processing of IMS's is accomplished. The peripheral section of the biological analyzer system (BAS), including modeling methods, must be studied, along with the BAS neuron networks and the orienting reactions of the BAS. M.W.R.

**N68-25429*#** National Aeronautics and Space Administration, Washington, D. C.
**NASA ASTRONAUTS**
Oct. 1967 42 p
(NASA-EP-34) GPO: HC $0.35; CFSTI: MF $0.65 CSCL 05H

A review of the NASA manned space flight programs is presented, and a brief discussion of astronaut training is followed by biographical sketches of all astronauts. K.W.

**N68-25462** Florida State Univ., Tallahassee.
**A STUDY OF CUTANEOUS THERMAL SENSITIVITY UNDER CONDITIONS OF INDUCED VASOMOTOR STATES IN THE SKIN**
Donald Marcel Scott (Ph.D. Thesis) 1966 46 p
Available from Univ. Microfilms: HC $3.00/MF $3.00 Order No. 67-312

Although a specific temperature receptor has not been identified in the human skin, several theories have been proposed to account for the phenomenon of cutaneous thermal sensation. One of these, the Quantitative Theory, attributes the receptor function to the cutaneous blood vessels. To test this suggestion, vasoconstriction was induced in the skin of human subjects by ice ingestion and by iontophoresis of epinephrine, and vasodilation was obtained by exercise to raise body temperature and by methacholine iontophoresis. In addition, Musterole was applied to obtain vasodilation by rubefacient drug. Thermal thresholds were measured by the psychophysical method of limits under normal "control" and experimental conditions. Relative cutaneous vasodilation was confirmed using photoelectric plethysmographic measures of the volume pulse size under all experimental conditions. Both means of vasoconstriction produced increase in warm sensitivity at cool adapting temperatures and decrease in cool sensitivity at warm adapting temperatures. Dissert. Abstr.

**N68-25521*#** National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
**LIFE SUPPORT SYSTEMS INTEGRATION**
Warren D. Hypes 18 Aug. 1967 41 p refs Presented at Va. Polytech. Inst. Conf. on Bioastronautics, Blacksburg, Va., 14–18 Aug. 1967
(NASA-TM-X-60421) CFSTI: HC $3.00/MF $0.65 CSCL 06K

Achieving an optimized design of regenerative Environmental Control and Life Support (EC/LS) systems requires integration at three levels: (1) sub-system; (2) system; and (3) total spacecraft. Two types of subsystem level integration are desirable: process integration which interfaces mass transfer, reaction rate control, and phase separation techniques; and operational mode integration which interfaces selected techniques and design schemes for producing system operational flexibility. System level integration is paced by thermal balance considerations involving the techniques of supplying heat to the endothermic processes and coolant to the system hardware and cabin environment. At the total spacecraft level, integration occurs most intimately between the EC/LS system, the power system, and the thermal control system. The common denominator for these three systems is energy in the form of heat. Tests were conducted on a full-scale, research model integrated system. The tests indicated that the regenerative processes are feasible, but extensive development of subsystems hardware is necessary before regenerative systems can be applied to flight vehicles. Author

**N68-25600*#** National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
**APPLICATION OF HUMAN TRANSFER FUNCTIONS TO A DESIGN PROBLEM**
James J. Adams [1967] 22 p ref Presented at the USC-NASA Conf. on Manual Control, Los Angeles, Calif., 1–3 Mar. 1967
(NASA-TM-X-59607) CFSTI: HC $3.00/MF $0.65 CSCL 05H

An analytical design study was made of a proposed full-scale, manually controlled lunar landing simulator using analytical transfer functions for the pilot control response along with the analytical representation for the mechanisms. The simulator reproduced the lunar environment by supporting five-sixths of the weight of the test vehicle with an overhead cable. The cable was kept directly over the test vehicle by the automatic control of the longitudinal drive mechanism of the simulator. The results showed that the dynamic characteristics of the simulator that could be expected in the actual system were in a range that would influence the response of the manually controlled systems which were to be tested. When the simulator was put in operation, the results of the analytical study were checked. The simulator was operated with the gain of the longitudinal drive set as high as was feasible with the actual mechanism and with a low gain to determine if this change would affect the pilot's response. The pilots reported that the degraded system was more difficult to control, and the records clearly showed a decrease in system damping with the degraded system. Author

**N68-25604#** Louisville Univ., Ky.
**TRANSFORMATIONAL PROCESSES AND REMEMBERING. ORGANIZATIONAL PROCESSES IN MULTITRIAL FREE RECALL Final Report**
John A. Robinson 1 Feb. 1968 10 p refs
(Grant AF-AFOSR-1008-66)
(AFOSR-68-0528; AD-666686)

Two types of problems were investigated: (1) The role of encoding and decoding rule learning and rule interference in what is, ostensibly, a nonsense--anagram list learning experiment; (2) the nature and role of organizational processes in multitrial free recall. The materials used in these experiments were codeable trigrams (e.g. RJA; JAR) and categorizeable words (e.g. flute, trumpet; week, day, etc.). The results of seven experiments on coding produced the following conclusions: (1) Subjects do learn and use both encoding and decoding rules. (2) Intralist encoding or decoding rule interference is a significant determinant of performance. (3) Sufficient structure can be built into these anagram materials to completely offset what have been assumed to be the detrimental effects of coding. The results of the experiments in free recall document the occurrence of intercategory organization (CO) as well as the more familiar intracategory organization. Using techniques from graph theory it was possible to show that the degree of CO observed is greater than chance, and that CO is

highly correlated with category recall. One theoretical conclusion of special interest was that hierarchical models of retrieval are inadequate as an explanation of these data. Author (TAB)

**N68-25611*#** Illinois Univ., Urbana. Biological Computer Lab.
**STRUCTURAL AND DYNAMIC ASPECTS OF SPEECH SIGNALS Interim Scientific Report**
Ian B. Thomas (Mass. Univ.) 15 Apr. 1968 13 p refs
(Grant NGR-14-005-111; Contract AF 33(615)-3890; Grants AF-AFOSR-7-66; AF-AFOSR-7-67)
(NASA-CR-94706; BCL-7.3) CFSTI: HC $3.00/MF $0.65 CSCL 06D

It has been shown that distorted natural speech, in which all formant information except the second formant frequency has been suppressed, yields articulation scores as high as 92% for monosyllabic English words out of context. Whistled speech, in which the period of a multi-vibrator is controlled by a second formant tracker, yields articulation scores near zero. If a random noise source, or a source with period equal to the glottal rate is used to vary the zero-axis crossing times of the whistled speech, the sounds become speech-like and articulation scores increase. The spectrograms for these three approximations to speech are virtually indistinguishable. It appears that the gross formant structure (dynamic information) conveys the word-based cues necessary for distinguishing among different sounds, whereas the excitation (structural information) conveys the cue that the sound is indeed a speech sound. Author

**N68-25623*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
**MORPHOLOGICAL STUDIES OF LAMINAR LESIONS**
Webb Haymaker [1967] 16 p refs Presented at AEC Biomed. Advisory Comm. Meeting, Berkeley, Calif., 10–11 Mar. 1967
(NASA-TM-X-59783) CFSTI: HC $3.00/MF $0.65 CSCL 06C

Briefly reviewed are studies on dose-tissue volume factors in the pathogenesis of laminar lesions of the cerebral cortex as observed through contributions made by the various laminae to cortical electrical activity. A laminar preparation in which only the upper part of the cortex is damaged is most widely used to evaluate the edematous process of radiation injury and the observed increased glycogen content. G.G.

**N68-25626#** Los Alamos Scientific Lab., N. Mex.
**PROBABILISTIC SCHEME FOR PREDICTING AND EVALUATING HAZARDS RESULTING FROM RADIOACTIVE EMISSIONS TO THE ATMOSPHERE**
Robert U. Fultyn [1968] 23 p refs Presented at the Health Phys. Soc. Midyear Topical Symp., Environ. Surveilance in Vicinity of Nuclear Facilities, Augusta, Ga., 25 Jan. 1968
(Contract W-7405-ENG-36)
(LA-DC-9094; CONF-680108-5) CFSTI: HC $3.00/MF $0.65

A probabilistic analysis scheme for predicting and evaluating hazards resulting from radioactive emissions to the atmosphere is presented which will allow a greater number of variables to be included in the evaluation. Therefore, it is believed to be a more accurate method than the present system based on limited samplings of fission products. NSA

**N68-25639*#** National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
**MAN, HIS ENVIRONMENT AND MICROBIOLOGICAL PROBLEMS OF LONG-TERM SPACE FLIGHT**
Judd R. Wilkins [1967] 27 p refs Presented at the Conf. on Bioastronautics, Blacksburg, Va., 14–18 Aug. 1967
(NASA-TM-X-60422) CFSTI: HC $3.00/MF $0.65 CSCL 06M

Research focusing on studies of a wide spectrum of possible environmental and microbiological problems associated with placing man in a closed environment for long periods of time, as for example, during prolonged space flight; is reported. Reviewed are studies of life support requirements; microbiological studies to determine the effect of space flight conditions on man and experimental animals; and studies focusing on the development of life support subsystems. S.C.W.

# IAA ENTRIES

**A68-27915** #
IN-FLIGHT MEASUREMENT OF HUMAN RESPONSE CHARACTERISTICS.
Fred D. Newell (Cornell Aeronautical Laboratory, Inc., Flight Research Dept., Buffalo, N.Y.) and Paul E. Pietrzak (USAF, Systems Command, Research and Technology Div., Flight Dynamics Laboratory, Flight Control Div., Wright-Patterson AFB, Ohio).
(American Institute of Aeronautics and Astronautics, Flight Test, Simulation and Support Conference, Cocoa Beach, Fla., Feb. 6-8, 1967, Paper 67-240.)
Journal of Aircraft, vol. 5, May-June 1968, p. 277-284. 19 refs.
[For abstract see issue 07, page 1136, Accession no. A67-20061]

**A68-27921** #
PERSONNEL THERMOPROTECTIVE SYSTEMS. II.
Kenneth N. Tinklepaugh (U.S. Navy, Naval Missile Center, Systems Test Div., Point Mugu, Calif.).
(American Institute of Aeronautics and Astronautics, Annual Meeting and Technical Display, 4th, Anaheim, Calif., Oct. 23-27, 1967, Paper 67-967.)
Journal of Aircraft, vol. 5, May-June 1968, p. 317-319. 7 refs.
[For abstract see issue 24, page 4117, Accession no. A67-43045]

**A68-28333** *
MELANOCYTE-STIMULATING HORMONE - ACTIVITY IN THERMAL POLYMERS OF ALPHA-AMINO ACIDS.
Sidney W. Fox and Ching-Tso Wang (Miami, University, School of Environmental and Planetary Sciences, Institute of Molecular Evolution and Biochemistry Dept., Coral Gables, Fla.).
Science, vol. 160, May 3, 1968, p. 547, 548. 16 refs.
Grant No. NsG-689.

Study of the melanocyte-stimulating activity of thermal polymers of arginine, glutamic acid, glycine, histidine, phenylalanine, and tryptophan. The fact that similar polymers lack such activity indicates that the effect is related to the specific amino acid residues. The active polymers are discussed as a model of an evolutionary precursor of contemporary melanocyte-stimulating hormone. P.v.T.

**A68-28347** #
SOME RESULTS OF MEDICOBIOLOGICAL INVESTIGATIONS PERFORMED IN CONJUNCTION WITH THE MERCURY AND GEMINI PROGRAMS [NEKOTORYE REZUL'TATY MEDIKO-BIOLOGICHESKIKH ISSLEDOVANII, VYPOLNENNYKH PO PROGRAMMAM "MERKURII" I "DZHEMINI"].
O. G. Gazenko, D. G. Maksimov, and Iu. B. Eliseenkov.
Akademiia Nauk SSSR, Izvestiia, Seriia Biologicheskaia, Mar.-Apr. 1968, p. 204-217. 29 refs. In Russian.

Review of the principal results obtained in the U.S. concerning the effect of space-flight factors on the human organism. Tests performed with apes during an early stage of the investigations showed that physiological functions and behavioral processes are hardly influenced by space factors. Mercury flights lasting up to 36 hr, and Gemini flights lasting 4, 8, and 14 days also showed that the bodies and functional abilities of astronauts were not affected, regardless of the duration of the flight. This applies also to experiments where an astronaut conducted a "space-walk." At its conclusion, the Gemini program had not succeeded in fully clarifying some medico-biological problems associated with a prolonged exposure to space-flight factors - particularly the effects of irregular and inadequate sleep, insufficient water consumption, disorder of the routine defecation regimen, hypostatic hypotony, and certain hematological and biochemical changes observed in the human organism, although these changes remained within completely admissible limits. V.P.

**A68-28564** *
NUTRITIONAL AND HORMONAL FACTORS CONCERNED WITH THE REGULATION OF LIVER PROTEIN SYNTHESIS DURING ACUTE CENTRIFUGATION STRESS.
H. A. Leon and M. J. Chackerian (NASA, Ames Research Center, Biotechnology Div., Moffett Field, Calif.).
Endocrinology, vol. 82, Mar. 1968, p. 429-435. 16 refs.

Description of experiments for determining the requirements for the stimulation of the amino-acid incorporation seen in liver preparations from intact, adrenalectomized, and hypophysectomized fasted rats following 3 hr of centrifugation at 4.7 g. In preparations from fed rats, incorporation of valine-1-$^{14}$C into cell-sap protein decreased 42 and 27% in intact and hypophysectomized rats, respectively, following centrifugation. Microsomal incorporation rates were similarly affected but to a lesser extent. However, no change in incorporation rate was observed in similarly obtained preparations from fed adrenalectomized rats. Preparations from both fed and fasted diabetic rats showed significant decreases in incorporation following centrifugation. In the fed group, cell-sap incorporation decreased 42%, whereas in the fasted diabetic rats it decreased 67%. In fasted diabetic rats this decrease could be alleviated or prevented by the injection of insulin just prior to centrifugation. The extent to which control levels of incorporation were restored depended on the amount of insulin injected. A fatal hypoglycemia in these fasted diabetic rats resulting from the insulin injection was prevented by the hyperglycemia-inducing action of centrifugation per se. Increases in plasma glucose were observed in the fasted groups that previously showed a stimulation of incorporation following centrifugation. It is noted that, in consideration of previous results, fasting appears to be a precondition for the stimulation of incorporation. It is suggested that insulin normally released during hyperglycemia is mainly responsible for the stimulation, although the concomitant rise in blood sugar may, in itself, be a requirement. M.M.

**A68-28628**
HUMAN VISION - A REMARKABLE ADAPTIVE CONTROL SYSTEM.
George Biernson (Sylvania Electric Products, Inc., Sylvania Electronic Systems Div., Applied Research Laboratory, Waltham, Mass.).
IN: INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, ANNUAL SOUTHWESTERN CONFERENCE AND EXHIBITION, 20TH, HOUSTON, TEX., APRIL 17-19, 1968, RECORD. [A68-28609 13-10] New York, Institute of Electrical and Electronics Engineers, Inc., 1968, p. 11D1-11D9.

Study of the complex feedback-control processes occurring in the retina of the eye. The performance characteristics, feedback process, and physiological aspects of vision are discussed, and the need for a model of vision is considered. A model of vision is proposed, and the function of the temporal and spatial adaptation processes is described. For simplicity, only the achromatic portions of the model of vision are considered. B.B.

**A68-28636**
A SYSTEM FOR THE AUTOMATIC MEASUREMENT AND DIGITAL DISPLAY OF SYSTOLIC AND DIASTOLIC BLOOD PRESSURES.
A. E. Schulze, L. S. Meharg, and F. B. Vogt (Texas, University, Graduate School of Biomedical Sciences, Dept. of Biomedical Engineering, Houston, Tex.).
IN: INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, ANNUAL SOUTHWESTERN CONFERENCE AND EXHIBITION, 20TH, HOUSTON, TEX., APRIL 17-19, 1968, RECORD. [A68-28609 13-10] New York, Institute of Electrical and Electronics Engineers, Inc., 1968, p. 17F1-17F5.

A system providing automatic, real-time digital display of systolic and diastolic blood pressures, as determined by the occluding cuff technique, has been developed. Design parameters were established from experimental data that included intraarterial and cuff measurements. The system serves to reliably measure blood pressure by minimizing errors due to noise and patient condition and to reduce interobserver variations. (Author)

**A68-28672**
SPACE BIOLOGY; NORTH ATLANTIC TREATY ORGANIZATION, SUMMER SCHOOL ON BIOLOGY IN SPACE, CAMBRIDGE, ENGLAND, JULY 10-21, 1967, PAPERS.
British Interplanetary Society, Journal, vol. 21, Mar. 1968. 113 p.

CONTENTS:



**A68-28674** *#
SYNTHESIS OF ORGANIC MOLECULES BY PHYSICAL AGENCIES.
J. Oró (Houston, University, Dept. of Chemistry and Dept. of Biophysical Sciences, Houston, Tex.).
(North Atlantic Treaty Organization, Summer School on Biology in Space, Cambridge, England, July 10-21, 1967.)
British Interplanetary Society, Journal, vol. 21, Mar. 1968, p. 12-25. 33 refs.
Grant No. NsG-257.

Brief investigation of a simplified scheme of chemical and organic evolution, and assessment of the present state of knowledge concerning the nature and distribution of organic molecules in the solar system. Some of the work done in recent years on the laboratory synthesis of organic molecules by physical agencies is also considered. R.B.S.

**A68-28675** #
UNIQUENESS OF BIOLOGICAL MATERIALS.
A. E. Needham (Oxford University, Dept. of Zoology, Oxford, England).
(North Atlantic Treaty Organization, Summer School on Biology in Space, Cambridge, England, July 10-21, 1967.)
British Interplanetary Society, Journal, vol. 21, Mar. 1968, p. 26-37. 61 refs.

Review of the properties of the various biological materials which were instrumental in the formation and evolution of tellurian life. An attempt is made to ascertain whether tellurian life could survive if transplanted elsewhere, and whether there is life, of the same or of a different type, elsewhere in the universe. It is shown that most of the elements in the tellurian biological system perform a unique function, indicating that tellurian organisms could not live off the land if transferred to any other environment. R.B.S.

**A68-28676** #
THE ROLE OF METHANE IN LIFE PROCESSES.
P. M. Molton (London, University, Queen Elizabeth College, Dept. of Microbiology, London, England).
(North Atlantic Treaty Organization, Summer School on Biology in Space, Cambridge, England, July 10-21, 1967.)
British Interplanetary Society, Journal, vol. 21, Mar. 1968, p. 38-47. 33 refs.
Research supported by Shell.

Investigation concerning the role played by ammonia, water, and methane in the formation and evolution of life on earth, with emphasis on the role of methane. Methane compounds produced under simulated primitive earth conditions are outlined, and reference is made to work by Oró (1963), in which it was shown that the effect of radiant energy on methane/ammonia/water mixtures in the solid phase is similar to that in the gas phase and leads to the formation of purines and pyrimidines. R.B.S.

**A68-28677** #
POSSIBLE FORMS OF LIFE.
Anthony Allison (Medical Research Council, National Institute for Medical Research, London, England).
(North Atlantic Treaty Organization, Summer School on Biology in Space, Cambridge, England, July 10-21, 1967.)
British Interplanetary Society, Journal, vol. 21, Mar. 1968, p. 48-51. 9 refs.

Brief discussion of the chemical compounds that might provide the structural basis of living systems. Reasons for the special suitability of hydrogen, carbon, oxygen, and nitrogen with respect to the formation of life are discussed, and the importance of silicon in this formation is investigated. The role played by antimatter in cosmology is also considered. R.B.S.

**A68-28678** *#
ORIGIN, DEVELOPMENT, AND DIAGENESIS OF BIOGEOCHEMICAL COMPOUNDS.
Egon T. Degens and Johann Matheja (Woods Hole Oceanographic Institution, Dept. of Chemistry, Woods Hole, Mass.).
(North Atlantic Treaty Organization, Summer School on Biology in Space, Cambridge, England, July 10-21, 1967.)
British Interplanetary Society, Journal, vol. 21, Mar. 1968, p. 52-82. 43 refs.
Research supported by the Petroleum Research Fund and NASA.

Enumeration and discussion of some interactions in organic-inorganic systems as they relate to the origin, development, and diagenesis of biogeochemical matter. The synthesis and development of abiotic polymers are discussed, and a means of synthesis is proposed in which silicates operate as a concentration agent, ion exchanger, and polymerization template. Silicates are studied for their adsorption and polymerization efficiency, and information is presented on the development of abiotic residues which will lead to the origin of coacervates and eventually to organized cell structures. The diagenetic fate of bio-residues in sediments is then considered. R.B.S.

**A68-28680** #
OBSERVATIONS ON FOSSIL-LIKE OBJECTS IN THE ORGUEIL METEORITE.
Gerhard O. W. Kremp (Arizona, University, Dept. of Geochronology, Tucson, Ariz.).
(North Atlantic Treaty Organization, Summer School on Biology in Space, Cambridge, England, July 10-21, 1967.)
British Interplanetary Society, Journal, vol. 21, Mar. 1968, p. 99-112. 12 refs.

Brief inquiry into the nature of the fossil-like objects which have been found in the Orgueil meteorite. It is known that these objects are not the result of a contamination and that they are not similar to any known terrestrial organism. It is pointed out that the objects may be mineral growths, although a petrification experiment with blue-green algae indicates that an algae cyst could have assumed a shape similar to that of the fossil-like objects under study. The suggestion is made that a prelife form, a co-

acervate, which coagulated into a cyst similar to that of the blue-green algae, may have provided the organic matter preserved in the objects. R.B.S.

**A68-28726**
VALIDITY OF UROPEPSIN EXCRETIONS AS AN OBJECTIVE TEST OF FATIGUE IN AEROSPACE MEDICINE [VALIDITE DES EXCRETIONS D'UROPEPSINE COMME TEST OBJECTIF DE LA FATIGUE EN MEDECINE AEROSPATIALE].
H. Ducros.
Revue de Médecine Aéronautique et Spatiale, vol. 7, 1st Quarter, 1968, p. 5-9. 24 refs. In French.

Experimental investigation of uropepsin and its elimination in order to verify differences in previous studies. The tests were made on subjects engaged in their normal daily activity in an office or laboratory. The results of excretions of uropepsin and catecholamines are tabulated. The results showed that excretions of catecholamines have no correlation with uropepsin exretions, although the latter undergo extreme variations. The causes of these changes are discussed. M.M.

**A68-28727**
CONSEQUENCES OF HEAD TRAUMAS IN FLYING PERSONNEL [AVENIR DES TRAUMATISMES DU CRANE DANS LE PERSONNEL NAVIGANT].
A. Salvagniac and E. Damey.
Revue de Médecine Aéronautique et Spatiale, vol. 7, 1st Quarter, 1968, p. 11-29. 13 refs. In French.

Statistical survey of 80 cases of head injuries in flying personnel. The decisions taken in each instance regarding the sequelae that were found are described. The survey spans a period of 5 to 15 years. A detailed report of the observations is tabulated.. M.M.

**A68-28728**
FATIGUE AND ADAPTATION DURING GLIDING. I [FATIGUE ET ADAPTATION AU COURS DU VOL A VOILE. I].
M. Boulangé, P. Paysant, J.-P. Deschamps, G. Callement, and M. Rombach.
Revue de Médecine Aéronautique et Spatiale, vol. 7, 1st Quarter, 1968, p. 31-37. 16 refs. In French.

Investigation of fatigue and adaptation problems in licensed glider pilots. A biochemical and endocrine investigation of the pilots' behavior was made as a function of the chronological development of the advanced training. All the humoral investigations were made on the urine. It was found that, with the exception of a subject who presented an intercurrent pathological state, no fatigue condition was found either in the instructors or in the advanced trainees. M.M.

**A68-28729**
FATIGUE AND ADAPTATION DURING GLIDING. II [FATIGUE ET ADAPTATION AU COURS DU VOL A VOILE. II].
J.-P. Deschamps, J. Menou, F. Rombach, J.-M. Bertheau, and M. Boulangé.
Revue de Médecine Aéronautique et Spatiale, vol. 7, 1st Quarter, 1968, p. 38, 39. In French.

Investigation of functional tests to determine cardiovascular behavior both at rest and during flight, in gliding pilots. It was found that the changes observed following flights or during advanced training were of small amplitude. No chronic fatigue existed. It is concluded that an investigation of the cardiovascular consequences of gliding contributes less knowledge than the corresponding endocrine study of this activity. M.M.

**A68-28730**
FATIGUE AND ADAPTATION DURING GLIDING. IV [FATIGUE ET ADAPTATION AU COURS DU VOL A VOILE. IV].
M. Boulangé, R. Shalow, J. Menou, J.-P. Crance, and J. Comoy.
Revue de Médecine Aéronautique et Spatiale, vol. 7, 1st Quarter, 1968, p. 43-46. 9 refs. In French.

Discussion of the necessity of suitable qualitative and quantitative feeding of glider pilots to enable them to overcome the stresses connected with their activity. The results of investigations showed the 12-hr glycemic rate to be low in French glider pilots and to reach dangerous levels in the event of complete lack of the noon meal. The solution recommended is the adoption of proteinic foods in accordance with Anglo-Saxon habits. M.M.

**A68-28731**
EYE INJURIES FOLLOWING EJECTION [LESIONS OCULAIRES APRES EJECTION].
A. Salvagniac (Centre Principal d'Expertise Médicale du Personnel Navigant de l'Aéronautique, Paris, France), G. Perdriel, J. Chevaleraud (Centre Principal d'Expertise Médicale du Personnel Navigant de l'Aéronautique, Service d'Ophtalmologie, Paris, France), and J.-C. Doleans (Hôpital des Armées, Bourges, France).
Revue de Médecine Aéronautique et Spatiale, vol. 7, 1st Quarter, 1968, p. 47, 48. In French.

Investigation of eye injuries in pilots following ejection. Two cases were studied. In the first case, involving a fighter pilot, superficial injuries with a traumatic etiology required a topical anti-inflammatory and antibiotic treatment. In the second case, the injuries were of a predominantly traumatic type. The development of conjunctival hemorrhages caused by ejection was perhaps made easier by the intense cold prevailing at the altitude of ejection. M.M.

**A68-28732**
GASEOUS INERTANCE AND BAROMETRIC PRESSURE [INERTANCE GAZEUSE ET PRESSION BAROMETRIQUE].
Ch. Jacquemin and P. Varene (Centre d'Essais en Vol, Laboratoire de Médecine Aérospatiale, Brétigny-sur-Orge, France).
Revue de Médecine Aéronautique et Spatiale, vol. 7, 1st Quarter, 1968, p. 49-57. 54 refs. In French.

Discussion of the importance of gaseous inertance in the mechanics of pulmonary ventilation in man. A plethysmographic method for measuring gaseous inertance is described, and modifications of gaseous inertance as a function of barometric pressure are discussed. It is pointed out that total body plethysmography with constant volume, under certain particular conditions of ventilation, can constitute a means for the specific measurement of the gaseous inertance in man's pulmonary ventilation system. M.M.

**A68-28733**
FATIGUE AND ADAPTATION DURING GLIDING. III [FATIGUE ET ADAPTATION AU COURS DU VOL A VOILE. III].
J.-P. Deschamps, F. Rombach, J. Menou, J. Cuillier, and M. Boulangé.
Revue de Médecine Aéronautique et Spatiale, vol. 7, 1st Quarter, 1968, p. 40-42. 5 refs. In French.

Experimental investigation of fatigue and adaptation in glider pilots by checking their motor and psychomotor behavior. Following long and difficult gliding flights, tests were made (using previously described methods) to determine endocrine and cardiovascular responses. Particularly treated is the "tap test." M.M.

**A68-28945**
ON THE ORIGIN OF LIFE.
Cyril Ponnamperuma.
IN: INFECTIOUS DISEASES.
Edited by Aidan Cockburn.
Springfield, Ill., Charles C. Thomas, 1967, p. 1-9. 11 refs.

Description of experiments simulating conditions on the primitive earth for the beginning of living forms. The electron beam from a linear accelerator is found to be a convenient source of electrons simulating radioactivity. It is concluded that the Oparin-Haldane hypothesis, which states that life is only a special property of matter, and that basically there may be no difference between a living organism and lifeless matter, is being gradually accepted at the present time. B.B.

**A68-29055 ***
DIAGNOSTIC CRITERIA FOR GRADING THE SEVERITY OF ACUTE MOTION SICKNESS.
Ashton Graybiel, Charles D. Wood, Earl F. Miller, and Dewey B. Cramer (U. S. Naval Aviation Medical Center, Aerospace Medical Institute, Pensacola, Fla.).
Aerospace Medicine, vol. 39, May 1968, p. 453-455. 8 refs.
NASA-sponsored research.

New diagnostic criteria are presented for grading the severity of acute motion sickness. They are more suited to clinical application as empirical evaluations than for precise measurement of physiological functions. The new criteria differ from the old in two important respects: (1) "moderate malaise," previously defined on an exclusion basis, has been divided into two categories and precisely defined, and (2) numerical scoring is optional. By holding fast to the definition of endpoints in the "old" criteria with proven reliability and validity, the change does not seriously affect the findings in experiments where the old criteria were used. (Author)

**A68-29056**
HUMAN FACTORS IN THE CONCORDE S. S. T.
A. N. Hepburn (British Overseas Airways Corp. and British European Airways Corp., Air Corporations Joint Medical Service, London Airport, Hounslow, Middx., England).
Aerospace Medicine, vol. 39, May 1968, p. 455-457. 9 refs.

Review of some of the human factors involved in the Concorde SST, the first prototype of which is expected to fly early in 1968. The problem of possible decompression and our philosophy regarding the use of conventional oxygen equipment are discussed. In view of high engine compressor temperatures, ozone contamination is not expected to be a serious problem. A brief description of the air-conditioning systems and cabin temperature control follows. The levels of galactic radiation are expected to be acceptable, and the question of forecasting increasing levels from giant solar cosmic events is discussed. Noise levels in the aircraft will be as good as in subsonic jets, but the solution to the sonic boom problem is not yet at hand. An outline of some of the internal human engineering problems is given. (Author)

**A68-29057**
SIMULATION OF THE IMPEDANCE OF THE HUMAN RESPIRATORY SYSTEM IN DYNAMIC TESTING OF AIRCRAFT BREATHING EQUIPMENT.
K. R. Maslen and G. F. Rowlands (Ministry of Technology, Royal Aircraft Establishment, Human Engineering Div., Farnborough, Hants., England).
(Aerospace Medical Association, Annual Scientific Meeting, Washington, D.C., Apr. 10-13, 1967.)
Aerospace Medicine, vol. 39, May 1968, p. 458-462. 6 refs.
[For abstract see issue 24, page 4114, Accession no. A67-41782]

**A68-29058**
HYPERVENTILATION IN AIRCRAFT PILOTS.
T. M. Murphy and W. A. Young (St. Paul's Clinical Investigation Unit, Vancouver, Canada).
Aerospace Medicine, vol. 39, May 1968, p. 463-466. 9 refs.
Defence Research Board of Canada Grant No. 9310-109.

Minute ventilations of 18 amateur and seven professional pilots were measured during 58 flights in light aircraft. The values were highest around takeoff, falling during level flight and sometimes rising to a lesser extent during approach and landing. Amateurs had higher ventilations than professionals and noncurrent pilots higher than current fliers, and the first flight of the day stimulated higher ventilations than subsequent flights. These findings suggest a relationship to anxiety, but nine out of 10 pilots on whom end-tidal $pCO_2$ measurements were made, developed no hypocapnia. The explanation appears to be the production of increased static muscle tension with a corresponding increase in $O_2$ consumption and $CO_2$ production. One pilot lowered his alveolar $pCO_2$ to 27 mm Hg during climb. It is postulated that he might have been unduly vulnerable to some additional respiratory stimulus. (Author)

**A68-29059**
PREDICTING TRAINING SUCCESS IN NON-PILOT AVIATION SPECIALTIES.
Richard F. Booth, Floyd E. Peterson, Rosalie K. Ambler (U. S. Naval Aviation Medical Center, Aerospace Medical Institute, Pensacola, Fla.), and Norman E. Lane (Ohio State University, Columbus, Ohio).
Aerospace Medicine, vol. 39, May 1968, p. 466, 467.

Four initial selection tests and six performance measures were evaluated as multiple predictors of success or failure in Naval Flight Officer training. The selection of two measures from each category resulted in a multiple correlation coefficient of 0.459 with the pass/attrite criterion. Decision-making regarding the retention of students in academic difficulty should be improved by use of the prediction formula generated in the study. (Author)

**A68-29060 #**
ELECTRORETINOGRAM DURING 100 PERCENT $+G_Z$ GRADIENT ACCELERATION IN DOGS.
Brian Ward (City University, London, England).
Aerospace Medicine, vol. 39, May 1968, p. 468-474. 29 refs.
Contract No. AF 33(615)-2922.

Six anesthetized beagles were exposed to graded $+G_Z$ stress on a short radius centrifuge. The ERG (response to a strobe flash) was recorded with an intracorneal electrode. ERG, ECG, and aortic blood pressures (BP) were telemetered to a recorder. The ERG a-wave decreased only at the higher $G_Z$ levels. Amplitude of the b-wave fell by 40 to 100% at 1.5 to 3.0 g. Transient increases were noted in b-waves during early stages of acceleration stress and attributed to the effects of anoxia. Mean BP fell as low as 40% of control with later compensatory recovery. Heart rates increased up to 40% above control. ERG recovery was frequently incomplete 10 to 15 min after 3 to 4 min runs at the higher g levels. The amplitude of the b-wave provides a useful physiological index of $+G_Z$ acceleration stress, due to retinal ischemia. Application in human studies requires further evaluation of the relationship between retinal and cerebral ischemia in $+G_Z$ stress. (Author)

**A68-29061**
THERMAL MODEL FOR RETINAL DAMAGE INDUCED BY PULSED LASERS.
Jude R. Hayes and Myron L. Wolbarsht (National Naval Medical Center, Naval Medical Research Institute, Bureau of Medicine and Surgery, Bethesda, Md.).
Aerospace Medicine, vol. 39, May 1968, p. 474-480. 18 refs.
Navy-supported research; DASA Contract No. MIPR 535-67.

The model of the retina employing the thermal absorption of a slab of the pigment epithelium layer (assumed to be homogeneous) as proposed by Vos (1962) has been examined in detail for both long exposure times (for which it was designed) and short exposure times. This model is sufficient to explain the damage from long exposures but not short exposures. We have examined the physical characteristics of the pigment epithelium, particularly with respect to the thermal stability and optical properties of the melanin granules. A new model is proposed which is based on absorption of the incident energy by the 1-$\mu$ diam pigment granules and thermal conduction from them to nearby essential retinal structures such as the pigment cell membrane and the receptor cell myeloid body and outer segment. The new model explains both long and short pulse effects. Such nonlinear effects as ionization from intense electric field gradients, harmonic generation, Brillouin scattering, shock waves, and re-radiation by blackbody emission are shown to make negligible contribution to the initial tissue damage where the lesion is minimal. Shorter event times ($10^{-12}$ sec) which are possible from mode-locked laser operation may require other mechanisms than postulated by this theory. (Author)

**A68-29062**
PHYSICAL EFFECTS OF SEATED AND SUPINE EXERCISE WITH AND WITHOUT SUBATMOSPHERIC PRESSURE APPLIED TO THE LOWER BODY.

Kenneth H. Cooper (USAF, Systems Command, Aerospace Medical Div., Aerospace Medical Laboratory, Lackland AFB, Tex.) and John W. Ord (USAF, Systems Command, Aerospace Medical Div., Brooks AFB, Tex.).
Aerospace Medicine, vol. 39, May 1968, p. 481-484. 19 refs.

Eight subjects were evaluated on a bicycle ergometer once a week for four weeks in both the upright and the supine position, with and without the addition of -30 mm Hg lower body negative pressure (LBNP). Upright ergometry without negative pressure was associated with the highest maximum oxygen consumption, whereas upright exercise with negative pressure and supine exercise with and without negative pressure were remarkably comparable. The cardiovascular response during submaximal upright exercise with negative pressure resembled that seen after physical deconditioning. This difference was not as apparent at maximum performance. These results indicate that in an earth environment the integration of LBNP with upright exercise provides an overload phenomenon that may be used to accelerate a cardiovascular conditioning response. In space, the mechanics of exercise might be facilitated, a good cardiovascular conditioning device could be provided, and a means of orthostatic stress testing would be available. (Author)

**A68-29063 ***
APPLICATION OF CONDUCTIVE COOLING FOR WORKING MEN IN A THERMALLY ISOLATED ENVIRONMENT.
James M. Waligora and Edward L. Michel (NASA, Manned Spacecraft Center, Biomedical Research Office, Houston, Tex.).
Aerospace Medicine, vol. 39, May 1968, p. 485-487.

The effectiveness of liquid-cooled undergarments in dissipating high levels of metabolic heat was demonstrated in a series of tests. Subjects walked on a treadmill at a rate of 200 to 500 kcal/hr wearing a liquid-cooled undergarment under either a pressure suit with an insulated cover or an arctic clothing assembly. The liquid-cooled undergarment limited sweat production of men working at 500 kcal/hr to less than 100 g/hr. Maximum and minimum work rates compatible with comfort were determined at inlet water temperatures of 6.7 and 15.5°C. The average temperature in the cooling tubes was found to be the determining factor in heat loss at flow rates of 28 to 77 kg/hr. Under the test conditions, 500 kcal/hr appears to approach the maximum rate of metabolic heat production compatible with thermal balance. At this level, subjects reported discomfort due to internal heating and external chilling. (Author)

**A68-29065**
HEMATOLOGICAL CHANGES RESULTING FROM HYPERBARIC OXYGENATION IN DIVERS AND NON-DIVERS.
Mark E. Bradley and James Vorosmarti (U.S. Navy, Deep Submergence Systems Project Technical Office, San Diego, Calif.).
Aerospace Medicine, vol. 39, May 1968, p. 493-497. 23 refs.

Forty-four U.S. Navy diving school candidates breathed 100% oxygen for 30 min at 41.42 psia. Venous blood samples were obtained immediately before exposure, 48 hr after exposure, and seven days after exposure. Hematocrit, hemoglobin, reticulocyte count, bilirubin, and erythrocyte morphology determinations were performed on all samples. A small deficit of red blood cell mass and slight reticulocytosis were found in the seven-day postexposure period. Eighteen experienced U.S. Navy divers were evenly divided into three groups. One group breathed 100% oxygen for 30 min at 28.06 psia, another for 30 min at 41.42 psia, and a third for 90 min at 41.42 psia. Determinations of hematocrit, hemoglobin, reticulocyte count, bilirubin, erythrocyte morphology, and osmotic fragility were made on blood samples obtained before exposure, 48 hr and seven days after exposure. No significant hematological changes were found in any of the three groups of divers. Possible mechanisms responsible for these findings are discussed. (Author)

**A68-29066**
SECRETION OF 17-HYDROXYCORTICOSTEROIDS (17-OHCS) IN MILITARY AVIATORS AS AN INDEX OF RESPONSE TO STRESS - A REVIEW.
Robert G. Miller (U.S. Navy, Washington, D.C.).
Aerospace Medicine, vol. 39, May 1968, p. 498-501. 40 refs.

Changes in plasma, urinary and parotid fluid 17-hydroxycorticosteroid (17-OHCS) concentrations have been shown to be a useful index for the evaluation of stress. With the development of increasingly effective methods of biomedically monitoring pilots in combat, and the refinement of techniques of analyzing plasma and urinary 17-OHCS, a rapidly accumulating series of studies permits several generalizations regarding the expected physiologic response to stress in combat pilots. Increased adrenal corticosteroid secretion occurs in response to flight factors such as danger, duration of exposure, degree of responsibility, and lack of adaptation (experience level). The Vietnam conflict provides a current test situation to further these studies. (Author)

**A68-29067 ***
REACH EFFECTIVENESS IN A ROTATING ENVIRONMENT.
T. W. O'Laughlin, J. F. Brady, and B. D. Newsom (General Dynamics Corp., Convair Div., San Diego, Calif.).
(AEROSPACE MEDICAL ASSOCIATION, 1967 ANNUAL SCIENTIFIC MEETING, WASHINGTON, D.C., APRIL 10-13, 1967, PREPRINTS OF SCIENTIFIC PROGRAM, p. 244, 245.)
Aerospace Medicine, vol. 39, May 1968, p. 505-508. 6 refs.
Contract No. NAS 9-5232.
[For abstract see issue 23, page 3956, Accession no. A67-41630]

**A68-29068**
SPECIFIC FEATURES OF ADAPTATION OF A HUMAN ORGANISM TO PROLONGED STAY IN SEALED CHAMBERS.
Fyodor Kosmolinsky and Boris Dushkov.
Aerospace Medicine, vol. 39, May 1968, p. 508-511. 8 refs.

Experimental study of the functional condition of the human organism during prolonged containment in small-volume sealed chambers with some simulation of space-flight factors. Containment in a sealed chamber under conditions of relative social isolation and sensory deprivation is shown to affect the nervous, emotional, and physical performance of the subjects tested. The experiments demonstrated a correlation of many physiological indices, thus indicating a necessity for using complex techniques to evaluate the condition of the subjects during the experiment. It is shown that hypodynamia is one of the chief environmental factors affecting the organism and that close attention should be devoted to the physiology of activity. The variation in psychophysiological functions with changing circadian work-rest regimes indicates the importance of taking into account the problems associated with biorhythmology. T.M.

**A68-29069**
CIRCADIAN RHYTHM IN INDICES OF HUMAN PERFORMANCE, PHYSICAL FITNESS AND STRESS RESISTANCE.
K. E. Klein, H. M. Wegmann, and H. Brüner (Deutsche Versuchsanstalt für Luft- und Raumfahrt, Institut für Flugmedizin, Bad Godesberg, West Germany).
(NATO-AGARD, Aerospace Medical Panel Meeting, 24th, Brussels, Belgium, Oct. 25-27, 1967.)
Aerospace Medicine, vol. 39, May 1968, p. 512-518. 42 refs.

Estimation of the magnitude of rhythmic day-night variations in human performance, physical fitness, and stress resistance. The following variables were measured every three hours over a full day-night cycle: reaction time and its individual constancy, the maximal psychomotor coordination ability, the Schneider index, the predicted $VO_2$ max, cardiovascular responses to tilting, and the "time of useful consciousness" at simulated altitude. All parameters revealed relative rhythmic oscillations of the circadian type, the ranges of which varied for the group average between 1.4% (temperature) and 68% from the total 24-hr average. Negative extreme values were shown during the night hours for all cardiovascular parameters. The significance of the results for the applicability of functional tests and human efficiency during stress is discussed. R.B.S.

**A68-29070**
AN OUTBREAK OF GASTRO-ENTERITIS IN AIRCREW.
F. S. Preston (Air Corporations Joint Medical Service, London, England).
(International Congress of Aviation and Space Medicine, 16th, Lisbon, Portugal, Sept. 1967.)
Aerospace Medicine, vol. 39, May 1968, p. 519-521. 6 refs.

An outbreak of gastro-enteritis among aircrew members is described following the eating of polluted oysters many hours and many thousands of miles from their natural habitat. The question of the routine bacteriological examination of oysters and shell-fish is discussed, and possible standards are illustrated. The ability of the oyster to take up and concentrate dangerous viruses is briefly mentioned. It is concluded that oysters and shell-fish should not be offered to passengers of the aircrew for inflight meals at any time. The possibility of aircrew members eating leftover passenger meals must always be borne in mind. (Author)

**A68-29071**
PHYSICAL DEFECTS OF CIVILIAN PILOTS RELATED TO AIRCRAFT ACCIDENTS - A NEW LOOK AT AN OLD PROBLEM.
C. R. Harper (United Air Lines, Inc., Medical Dept., Denver, Colo.) and John D. Dougherty.
(International Congress of Aviation and Space Medicine, 16th, Lisbon, Portugal, Sept. 1967.)
Aerospace Medicine, vol. 39, May 1968, p. 521-527. 8 refs.

Study of the relationship between the prevalence of physical defects of aircraft pilots and the risk of accident. Results from this computerized study show that the relative risk for defects in general is 2.24. A range of minimum relative risks from 1.78 to 4.65 was found for various types of physical defects. The relative risk of fatal accident was found to be 2.41 with increasing risks for multiple defects. Pilots with three or more defects showed a minimum relative risk of 3.70. Data for the year 1965 show that the risk of accident was the same for all age groups. R.B.S.

**A68-29072**
EFFECT OF PROGRAMMED EXERCISE ON NON-SPECIFIC T WAVE ABNORMALITIES.
J. Eldrid Smith and George J. Kidera (United Air Lines, Inc., Medical Dept., Chicago, Ill.).
Aerospace Medicine, vol. 39, May 1968, p. 528-532. 6 refs.

Fifty asymptomatic persons with nonspecific T wave changes were placed on a progressive exercise stress program. Six cases showed no essential change in the resting electrocardiogram or exercise test after a period of programed exercise. Five of these cases were under 35 years of age, and the changes were probably due to old, healed myocarditis-pericarditis from a previous infection. One case in a 45-year-old male also showed no changes on exercise. Forty-four cases showed rapid changes in the T waves, returning to normal within one to three months. Rapid progression of exercise stress was well tolerated, and no untoward symptoms developed. It is probable that the abnormal T wave changes in the group over 35 were due to early myocardial ischemia and hypokinetic disease and emotional reactivity. The use of progressive exercise stress seems to benefit all of these factors, and the return of the electrocardiogram to normal is an indication of these benefits. (Author)

**A68-29120** #
RELIABILITY ANALYSIS TECHNIQUE FOR MAN-MACHINE SYSTEMS.
Ronald R. Shoquist (Honeywell, Inc., Aerospace and Defense Group, Aerospace Div., Minneapolis, Minn.).
IN: INSTITUTE OF NAVIGATION, NATIONAL SPACE MEETING ON SIMPLIFIED MANNED GUIDANCE, NAVIGATION AND CONTROL, COCOA BEACH, FLA., FEBRUARY 19-21, 1968, PROCEEDINGS. [A68-29101 13-21]
Washington, D.C., Institute of Navigation, 1968, p. 480-506.
Contracts No. AF 33(657)-7601; No. AF 33(615)-1866.

A technique called Pilot-Controller Integration (PCI) has been developed to integrate numerical values of pilot reliability, pilot work-load, and hardware reliability into quantitative expressions of survival probability and mission success reliability. This data integration is accomplished by means of a truth table process, utilizing a digital computer for the data reduction. Pilot work-load measurement techniques were applied which were originated during Project Mercury and X-15 flight control developments. A procedure was developed for implementing PCI during the normal design process. This procedure enables man vs machine tradeoffs to be made to arrive at a system configuration which complies with previously established requirements for probability of survival and mission success reliability. To accomplish the data integration, PCI utilizes existing engineering technologies in the areas of systems, reliability, and human factors engineering. Application of the PCI procedure to an advanced space vehicle mission phase and subsequently to a V/STOL research vehicle verified the practicality of applying the technique to a man-machine system design. This technique is not restricted to aerospace vehicle flight control systems, but can be applied to nearly all manned vehicles. (Author)

**A68-29122**
THE EFFECT OF ENVIRONMENT ON CYSTINE DISRUPTION BY ULTRAVIOLET LIGHT.
Sergio Risi, Klaus Dose, T. K. Rathinasamy, and Leroy Augenstein (Michigan State University, Biophysics Dept., East Lansing, Mich.).
Photochemistry and Photobiology, vol. 6, 1967, p. 423-436. 42 refs.
NIH Grant No. CA-6634.

Discussion of the effect of environment on cystine disruption, a prominent step in the inactivation of disulfide enzymes by UV light. When cystine is irradiated at pH 1 by 254-nm UV light, the following yields are observed: 4 cystines → 5.2 cysteines + 2.8 $NH_3$. The yields for cystine and glutathione destruction are essentially the same at pH 1. B.B.

**A68-29129**
THEORETICAL ASPECTS OF THE U.V. INACTIVATION OF PROTEINS CONTAINING DISULFIDE BONDS.
Klaus Dose (Max-Planck-Institut für Biophysik, Frankfurt am Main, West Germany).
Photochemistry and Photobiology, vol. 6, 1967, p. 437-443. 49 refs.

Equations are proposed for the estimation of quantum yields for cystine destruction and disulfide protein inactivation during UV irradiation in acidic and neutral solutions. The formulas permit a discussion of energy transfer from excited aromatic amino acids to cystines and/or of chemical reactions between excited tryptophans or tyrosines and cystines. The results are discussed with regard to general aspects of the photo-biochemistry of enzymes. (Author)

**A68-29143**
LIFE SCIENCES.
R. L. Batterton (McDonnell Douglas Corp., Douglas Aircraft Co., Missile and Space Systems Div., Man-Systems Integration Branch, Santa Monica, Calif.).
IN: SPACE SYSTEMS TECHNOLOGY.
Edited by R. D. Heitchue, Jr.
New York, Reinhold Book Corp., 1968, p. 139-170. 49 refs.

Discussion of life support requirements, environmental effects, and human-engineering considerations for successful manned space flights. Oxygen-pressure effects and oxygen toxicity as a function of time and oxygen-partial pressure are treated. Tests in which men have been exposed to synthetic oxygen-nitrogen atmospheres at a total pressure of 7.0 psia and oxygen partial pressure of 3.5 psia have uniformly demonstrated tolerance. The design envelope for a rotating vehicle and the boundary conditions for the vehicle are given. This type of vehicle could be used to offset the adverse effects of zero-gravity exposure. A suggested radiation exposure guide based on the immediate and delayed biological effects is presented. Various problems of crew locomotion and restraint are treated, together with possible psychological effects. Selection and training of crews is briefly discussed. M.G.

**A68-29144**
LIFE SUPPORT SYSTEMS.
M. M. Yakut (McDonnell Douglas Corp., Douglas Aircraft Co., Missile and Space Systems Div., Life and Environmental Systems Branch, Santa Monica, Calif.).
IN: SPACE SYSTEMS TECHNOLOGY.
Edited by R. D. Heitchue, Jr.
New York, Reinhold Book Corp., 1968, p. 171-209. 20 refs.

Description of several life support subsystems for initial long-term manned missions. The systems provide atmospheric supply and pressurization; atmospheric control and purification; thermo-conditioning; and water, food, and waste management. A schematic diagram of a typical subcritical storage and supply system and a pressure-enthalpy diagram of the fluid withdrawal process are shown. The Bosch, Sabatier, solid electrolyte, and molten carbonate processes of $CO_2$ reduction are described. The major toxicants expected in the cabin atmosphere and the recommended threshold values for these gases are listed. The Apollo portable life-support system is shown schematically. It includes a brushless dc motor/centrifugal fan unit which produces a constant flow of 6 $ft^3$/min and is powered by a 200 watts/hr silver/zinc battery. A vapor pyrolysis water-recovery system and a typical electrodialysis water-recovery unit are discussed. M.G.

**A68-29537**
PRODUCTION OF ELEMENTAL NITROGEN BY CERTAIN MAMMALS INCLUDING MAN.
Giovanni Costa, Ludwig Ullrich, Ferenc Kantor, and James F. Holland (New York State Department of Health, Roswell Park Memorial Institute, Dept. of Medicine A; New York, State University, Dept. of Medicine, Buffalo, N. Y.).
Nature, vol. 218, May 11, 1968, p. 546-551. 26 refs.
PHS-supported research.

Account of experiments involving man and other mammals showing that some food nitrogen can be converted to nitrogen gas in sufficient quantities to balance the nitrogen equation. In the first experimental approach, the appearance of nitrogen gas enriched with $^{15}N$ was studied in the atmosphere surrounding mice which were prefed glycine with 95% $^{15}N$. The results indicated that the M/e ratio, 29:28, was increased. The second approach consisted of maintaining animals in a closed system, flushing out with a nitrogen-free atmosphere all the nitrogen originally present in the system, and then studying the reappearance of nitrogen gas. P.v.T.

**A68-29566**
THE SATURATION OF ROD RECEPTORS.
Paul Gaunt (Sheffield, University, Dept. of Physics, Sheffield, England).
Optica Acta, vol. 15, May-June 1968, p. 287-293. 11 refs.

Investigation of two possible modes of excitation of optical tissue associated with rod receptors. In the first mode, analogous to a Geiger counter of dead time $\tau$, where $\tau$ is the refractory period of the excitable tissue, it is assumed that quanta absorbed during the refractory period delay recovery for a further time $\tau$, leading to a situation in which an increase in stimulus reduces the output of the rod beyond saturation. In the second mode, where the dead time is not prolonged by absorption during the refractory period, the output approaches asymptotically to the limit of $1/\tau$ as the stimulus is increased. It is pointed out that psychophysical increment threshold curves cannot distinguish between the two models, but it is shown that electroretinogram results in monkey and man can be fitted by using the invariant-refractory-period model if equilibrium bleaching is taken into account. R.B.S.

**A68-29622**
BIOLOGICAL EFFECTS OF HIGH-ENERGY PROTONS: ESTIMATION OF THE RADIATION HAZARD OF SPACE FLIGHTS [BIOLOGICHESKOE DEISTVIE PROTONOV VYSOKIKH ENERGII: K OTSENKE RADIATSIONNOI OPASNOSTI KOSMICHESKIKH POLETOV].
Edited by Iu. G. Grigor'ev.
Moscow, Atomizdat, 1967. 508 p. In Russian.

This book contains recently obtained information concerning the biological effects of high-energy protons from the viewpoint of spacecraft radiation protection. The biological fundamentals of radiation safety during space flight are outlined in terms of factors characterizing radiobiological effects, combined effects of radiation and space flight, and permissible doses of radiation in long- and short-term flights. Studies simulating the action of high-energy protons are discussed, and detailed descriptions are given of particular effects observed in various organisms. Attention is given to the morphological changes in mammals and birds, including effects on tissue, the nervous system, the brain, and other parts of the body. Radiation-induced changes in plants and seeds are similarly examined, together with effects observed in human beings working with accelerators. Preventive measures and therapy are analyzed, and techniques of protective shielding in space are studied. T.M.

**A68-29627 ***
REVERSAL OF PREFERENCE UNDER PROGRESSIVE-RATIO SCHEDULES BY PUNISHMENT.
J. F. Dardano (Maryland, University, Space Research Laboratory, College Park, Md.).
Journal of the Experimental Analysis of Behavior, vol. 11, Mar. 1968, p. 133-146. 14 refs.
Grants No. NsG-189-61; No. NsG-21-002-004.

Description of the programing on one key of a progressive-ratio reinforcement schedule, in which successive reinforcements required an additional 50 responses by pigeons. A response on a second key reset the progressive ratio schedule to the first step. Before punishment, all pigeons consistently reset the schedule after reinforcement on the first step, thereby minimizing the number of responses required for reinforcement. Punishment was a brief electric shock contingent upon each response on the reset key. When the punishment contingency was removed, the major features of pre-punishment performance were recovered. B.B.

**A68-29664**
DETECTION OF TIME-VARYING LIGHT SIGNALS AS MEASURED BY THE PUPILLARY RESPONSE.
A. Troelstra (Illinois, University, Bioengineering Group; Presbyterian-St. Luke's Hospital, Biomedical Engineering Dept., Chicago, Ill.).
Optical Society of America, Journal, vol. 58, May 1968, p. 685-690. 15 refs.
Research supported by the Presbyterian-St. Luke's Hospital; NSF Grant No. GK-885; NIH Grant No. NB-06197.

Measurement of time-varying light signals by means of pupillary response. The apparent brightness with which a light stimulus is perceived is determined not only by the average luminance of the stimulus, but also by its temporal properties. For instance, if the luminance is modulated periodically below the flicker-fusion frequency, the observed brightness appears, in general, to be higher than the observed brightness of an equal-average constant luminance. The pupillary response of the human eye, which seems to be well correlated with the observed brightness, has been analyzed quantitatively as a function of the modulation index and frequency for sinusoidal modulation. Under certain quite general assumptions, it is possible to predict the presence of a peripheral linear low-pass filter in the visual system. It is shown how the characteristics of this linear filter can be determined from the experimental data. The break frequency turns out to be around 9 cps, and the high-frequency cutoff has a slope of 18 db/octave. M.M.

**A68-29682 #**
VARIATIONS IN THE EXTERNAL RESPIRATION, THE OXYGEN TRANSPORT FUNCTION OF THE BLOOD, AND THE OXYGEN-REGIME PARAMETERS OF YOUTHFUL ORGANISMS DURING HYPOXIAL HYPOXIA [ZMINI ZOVNISHN'OGO DIKHANNIA, KISEN'TRANSPORTNOI FUNKTSII KROVI I PARAMETRIV KISNEVOGO REZHIMU IUNATS'KOGO ORGANIZMU PRI GIPOKSICHNII GIPOKSII].

V. S. Mishchenko (Akademiia Nauk Ukrains'koi RSR, Institut Fiziologii, Viddil Vikovoi Fiziologii, Kiev, Ukrainian SSR).
Fiziologichnii Zhurnal, vol. 14, Mar.-Apr. 1968, p. 211-221. 46 refs. In Ukrainian.

Experimental study of the effects of sports training on various respiration functions in 138 youths (aged 12 to 16) and adults. Pulmonary ventilation, frequency and depth of respiration, alveolar ventilation, oxygen content of blood, frequency of cardiac contractions, circulating blood volume, and several parameters of the oxygen regime were measured under conditions of dormancy and hypoxial respiration, using atmospheres with various oxygen contents. The training is found to have several beneficial effects, including more rapid development of the physiological systems involved in the regulation of the oxygen regime, an earlier increase in the efficiency and economy of the oxygen regime, and a more effective utilization of oxygen. R.A.F.

**A68-29779** *

XENON-METMYOGLOBIN EQUILIBRIUM.
Sigfredo Maestas and Gordon J. Ewing (New Mexico State University, Dept. of Chemistry, Las Cruces, N. Mex.).
Currents in Modern Biology, vol. 1, May 1967, p. 148-150. 7 refs.
Grant No. NGR-32-003-027.

Determination of the solubility of xenon in metmyoglobin. The results, which contrast to previous solubility studies and agree with X-ray studies, indicate that xenon and horse metmyoglobin interact in a 1:1 mole ratio. R.A.F.

**A68-29796** #

LIFE SUPPORT FOR MANNED PLANETARY MISSIONS.
John L. Mason (Garrett Corp., AiResearch Manufacturing Co., Los Angeles, Calif.).
IN: AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS, TECHNOLOGY FOR MANNED PLANETARY MISSIONS MEETING, NEW ORLEANS, LA., MARCH 4-6, 1968, PROCEEDINGS. SUPPLEMENT. [A68-29790 14-30]
New York, American Institute of Aeronautics and Astronautics, Inc., 1968, p. 78-86.

Assessment of the present status of life-support system (LSS) technology, in terms of our ability to carry out a manned planetary mission. A reference planetary mission is used as a basis for LSS definition and evaluation. Critical loop-closure elements are examined. It is concluded that the water loop and $CO_2$ sorbent loops should be closed and that the food loop should be open for any planetary mission. Assuming that electric power is available at a reasonable weight penalty, the $O_2$ loop should be closed in order to effect an overall weight saving. Conservative methods of loop closure are described and tentatively recommended. R.A.F.

**A68-29797** #

MAN-MACHINE SYSTEMS AND EXTRAVEHICULAR ACTIVITY - TECHNOLOGY REPORT FOR MANNED PLANETARY MISSIONS.
J. A. Green and J. G. Wells (North American Rockwell Corp., Aerospace and Systems Group, Space Div., Downey, Calif.).
IN: AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS, TECHNOLOGY FOR MANNED PLANETARY MISSIONS MEETING, NEW ORLEANS, LA., MARCH 4-6, 1968, PROCEEDINGS. SUPPLEMENT. [A68-29790 14-30]
New York, American Institute of Aeronautics and Astronautics, Inc., 1968, p. 87-95. 49 refs.

Man-machine relationships and extravehicular activity (EVA) are discussed with relation to past testing and simulation, including data from zero-g flights in high-performance aircraft, to the present state of knowledge from the Mercury (MA) and Gemini (GT) Flight Programs. The requirements for physiological and psychological provisions relative to crew operations, comfort, health, and safety for manned planetary missions are discussed. Further, the EVA preparation area and the support equipment requirements are presented in view of the above parameters. It is concluded that a considerable advance in technology is required in the areas of support equipment and definition of the capabilities and limitations of man. The conceptual design of the man-machine systems and crew-manned planetary compartments for vehicles will evolve as additional data are obtained on the interaction and consequent reaction of man with the environment of space. (Author)

**A68-29808**

HUMAN ECOLOGY IN SPACE FLIGHT. VOLUME 2 - PROCEEDINGS OF THE SECOND INTERNATIONAL INTERDISCIPLINARY CONFERENCE, PRINCETON, N. J., OCTOBER 11-14, 1964.
Conference sponsored by the Office of Naval Research of the U. S. Navy and NASA.
Edited by D. H. Calloway (California, University, Dept. of Nutritional Sciences, Berkeley, Calif.).
New York, N. Y. Academy of Sciences, 1967. 295 p.
$7.00.

CONTENTS:



**A68-29809** •

RESPONSE TO THE SPACE ENVIRONMENT AND ITS SIMULATION BY BEDREST.
Siegfried J. Gerathewohl (NASA, In-Flight Science Branch, Washington, D. C.) and Pauline B. Mack (Texas Woman's University, Denton, Tex.).
IN: HUMAN ECOLOGY IN SPACE FLIGHT. VOLUME 2 - PROCEEDINGS OF THE SECOND INTERNATIONAL INTERDISCIPLINARY CONFERENCE, PRINCETON, N. J., OCTOBER 11-14, 1964. [A68-29808 14-04]
Conference sponsored by the Office of Naval Research of the U. S. Navy and NASA.
Edited by D. H. Calloway.
New York, N. Y. Academy of Sciences, 1967, p. 13-81.

Group discussion of the human response to the space environment and the simulation of this environment by bedrest, including a comparison of U. S. and USSR methods of treating the problem of manned space exploration. Advantages to be realized by combining physics and biology are outlined. Observed responses to space flight are considered with reference to problems of weightlessness, muscular work and posture, and response to long-term bedrest. F. R. L.

**A68-29810**

PSYCHOLOGICAL AND NEUROMUSCULAR PROBLEMS ARISING FROM PROLONGED INACTIVITY.
Robert B. Livingston (National Institutes of Health, Div. of Research Facilities and Resources, Bethesda, Md.).

IN: HUMAN ECOLOGY IN SPACE FLIGHT. VOLUME 2 - PROCEEDINGS OF THE SECOND INTERNATIONAL INTERDISCIPLINARY CONFERENCE, PRINCETON, N. J., OCTOBER 11-14, 1964.
[A68-29808 14-04]
Conference sponsored by the Office of Naval Research of the U.S. Navy and NASA.
Edited by D. H. Calloway.
New York, N.Y. Academy of Sciences, 1967, p. 82-108.

Round-table discussion of problems arising from prolonged inactivity (as in some planned space missions), where an altered feedback may yield a complexly altered system-as-a-whole. Adaptations to novel environments, adaptation and readaptation, and learning and memory are considered. The history of our present understanding of the central nervous system is examined. F.R.L.

**A68-29811**
BONE-BODY FLUID CONTINUUM AS INFLUENCED BY PROLONGED INACTIVITY.
Marshall R. Urist (California, University, Medical Center, Dept. of Surgery, Los Angeles, Calif.).
IN: HUMAN ECOLOGY IN SPACE FLIGHT. VOLUME 2 - PROCEEDINGS OF THE SECOND INTERNATIONAL INTERDISCIPLINARY CONFERENCE, PRINCETON, N. J., OCTOBER 11-14, 1964.
[A68-29808 14-04]
Conference sponsored by the Office of Naval Research of the U.S. Navy and NASA.
Edited by D. H. Calloway.
New York, N.Y. Academy of Sciences, 1967, p. 109-223.
AEC Contract No. AT (04-1)-GEN-12; PHS Contract No. DI 194-193MD-2556; Contract No. NR-104-575.

Round-table consideration of endocrine factors - beginning with the evolution of the bone-body fluid continuum, followed by description of its responses to prolonged inactivity, and concluding with its reactions to endocrine factors. Bone and calcium homeostasis, internal remodeling of bone, the effects of stress and strain on remodeling, the organization of bone matrix, factors affecting differentiation of pluripotent cells, neural elements in bone, the effects of blood flow and pH on bone resorption, the piezoelectric properties of bone, the endocrine influences on response to inactivity, and factors in human osteoporosis are extensively discussed. F.R.L.

**A68-29812**
ENERGY RESERVES, WATER AND TEMPERATURE CONTROL IN MINIMAL ENVIRONMENT.
David Schwarz (Schwarz Bio-Research, Inc., Orangeburg, N.Y.) and Sheldon Margen (California, University, Dept. of Nutritional Sciences, Berkeley, Calif.).
IN: HUMAN ECOLOGY IN SPACE FLIGHT. VOLUME 2 - PROCEEDINGS OF THE SECOND INTERNATIONAL INTERDISCIPLINARY CONFERENCE, PRINCETON, N. J., OCTOBER 11-14, 1964.
[A68-29808 14-04]
Conference sponsored by the Office of Naval Research of the U.S. Navy and NASA.
Edited by D. H. Calloway.
New York, N.Y. Academy of Sciences, 1967, p. 224-262.

Joint discussion of the elements determining the most effective operating range in which a human subject can maneuver his various interlocking homeostatic processes to preserve operating efficiency in a minimal environment. Studies of endogenous vs exogenous energy storage, fat deterioration in an oxygen-rich atmosphere, the effects of fasting, the need for in-flight experimentation, shifts in body fluid, procedures for counteracting the effects of weightlessness, and preconditioning to improve tolerance are reviewed. F.R.L.

**A68-29830**
EFFECTS OF LASERS ON THE HUMAN EYE.
W. L. Makous (Washington, University, Dept. of Psychology, Seattle, Wash.) and J. D. Gould (International Business Machines Corp., Thomas J. Watson Research Center, Yorktown Heights, N.Y.).
IBM Journal of Research and Development, vol. 12, May 1968, p. 257-271. 66 refs.

In dealing with the relationship between human vision and lasers the largely theoretical paper places particular emphasis on the use of lasers within the normal operating range of the visual system and on the mechanisms by which laser radiation can cause threshold damage to the eye. Some fundamentals of laser radiation, of the relevant aspects of the visual system, and of unit systems for the specification of laser output are presented. A new approach to understanding laser radiation damage to the eye is developed by means of a model limited to conditions existing only at the threshold of damage. It is shown that such threshold damage to the visual system is primarily due to the effects of heat alone, but that photochemical effects and acoustic shock waves can potentially be a cause of the threshold damage that cannot be entirely rejected under all conditions. A theoretical estimate of retinal irradiance for threshold damage is made and shown to be consistent with empirical findings. A survey of empirically determined damage thresholds is presented. A valid method of computing retinal irradiance from a laser is given, and the direction and magnitude of errors in earlier formulations are pointed out. (Author)

**A68-30300** #
MATHEMATICAL MODELS OF CLOSED-LOOP ECOLOGICAL SYSTEMS [O MATEMATICHESKOM MODELIROVANII ZAKRYTYKH EKOLOGICHESKIKH SISTEM].
A. B. Rubin and A. S. Fokht.
Kosmicheskie Issledovaniia, vol. 6, Mar.-Apr. 1968, p. 286-298. 9 refs. In Russian.

Discussion of the characteristics of several mathematical models of energy- and mass-transfer processes in closed-loop multicomponent life-support systems for astronauts. An analysis of these models and the corresponding equations shows that the energy- and mass-transfer processes are of a steady oscillatory nature. V.P.

**A68-30301** #
INFLUENCE OF A SPACE FLIGHT ON BOARD THE COSMOS 110 SATELLITE ON TRADESCANTIA PALUDOSA MICROSPORES [VLIIANIE KOSMICHESKOGO POLETA NA KORABLE-SPUTNIKE "KOSMOS-110" NA MIKROSPORY TRADESCANTIA PALUDOSA].
N. L. Delone, A. S. Trusova, E. M. Morozova, V. V. Antipov, and G. P. Parfenov.
Kosmicheskie Issledovaniia, vol. 6, Mar.-Apr. 1968, p. 299-303. In Russian.

Cytological analysis of Tradescantia paludosa microspores after exposure to a satellite environment. The following three changes in the plant are noted: a rearrangement of the chromosomes, a disturbance of the mitosis, and a disorder of the growth processes in the cells. On the other hand, the plant retained its turgor and the dark green color of the leaves, and blossomed in the normal fashion. No signs of etiolation were observed. The plant experienced an unusual increase in growth and its normally straight stem began to bend. V.P.

**A68-30399** #
ADAPTIVE CHANGES IN THE CEREBELLUM AND MOTOR STRUCTURES OF THE SPINAL CORD UNDER VARIOUS HYPOXIA CONDITIONS [OB ADAPTATSIONNYKH IZMENIIAKH V MOZZHECHKE I DVIGATEL'NYKH STRUKTURAKH SPINNOGO MOZGA PRI RAZNYKH REZHIMAKH GIPOKSII].
O. G. Gazenko, N. N. Demin, V. B. Malkin, and L. Z. Pevzner.
Akademiia Nauk SSSR, Doklady, vol. 179, Apr. 1, 1968, p. 997-1000. 17 refs. In Russian.

Investigation of certain adaptation mechanisms of animals to life in an oxygen-poor gaseous environment. The experiments were conducted with rats in a barometric chamber simulating short-term ascents to an altitude of 8700 m, stepwise daily ascents to altitudes increasing from 3000 to 7000 m, and a 21-day stay at an altitude of 5500 m. The results obtained with a cytospectrophotometer indicate

that the observed changes in RNA content in the cells of the nervous system constitute a peculiar "metabolic reflex" directed toward protecting the structure against changes. V.P.

**A68-30411 ***
THE USE OF SINGLE PLANE ANGIOCARDIOGRAMS FOR THE CALCULATION OF LEFT VENTRICULAR VOLUME IN MAN.
Harold Sandler (NASA, Ames Research Center, Biomedical Research Branch, Moffett Field, Calif.) and Harold T. Dodge (Alabama, University, School of Medicine, Div. of Cardiology, Birmingham, Ala.).
American Heart Journal, vol. 75, Mar. 1968, p. 325-334. 15 refs.
PHS Grant No. HE-03391-08.

Description of a method for calculating left ventricular volume (LVV) from films taken in a single anteroposterior (A-P) projection. This method is based on the assumption that the left ventricular (LV) chamber can be represented by an ellipsoid of revolution (prolate spheroid) reference figure. LV volumes were calculated from measurements made on biplane films taken in the A-P and left lateral chest projections. The biplane studies demonstrated that the A-P and lateral diameters of the ventricular chamber were very closely related. Volumes calculated from measurements made only on A-P films closely agreed with biplane circulations of volume. The use of single-plane techniques did not result in significant errors for the calculation of absolute end-systolic volume or for calculation of stroke volume. P. v. T.

**A68-30412 ***
THE DIAGNOSIS OF EXPERIMENTAL PULMONARY AERO-EMBOLI FOLLOWING DECOMPRESSION BY RADIO-ISOTOPIC LUNG SCANNING.
A. T. K. Cockett, Ned L. Mangelson, L. E. Swanson, and R. T. Kado (Harbor General Hospital, Dept. of Surgery/Urology, Torrance; California, University, School of Medicine, Los Angeles, Calif.).
American Surgeon, vol. 34, Feb. 1968, p. 109-113. 11 refs.
Grants No. NsG-237-62; No. NsG-05-007-003; Contract No. NR-00014-66-C0295.

Outline of a method for the production of experimental dysbarism and description of the mechanisms operating in dysbarism. It was found that dextran infusion in replacement therapy appears to be beneficial and that recompression is the treatment of choice. However, plasma volume replacement using colloidal expanders is clearly indicated. Radioisotopic lung scanning is a useful diagnostic procedure as it marks the areas of involvement. P.v.T.

**A68-30425 ***
ADAPTIVE FINITE-STATE MODELS OF MANUAL CONTROL SYSTEMS.
E. S. Angel and G. A. Bekey (Southern California, University, Dept. of Electrical Engineering, Los Angeles, Calif.).
IEEE Transactions on Man-Machine Systems, vol. MMS-9, Mar. 1968, p. 15-20. 14 refs.
Grants No. NGR-05-018-022; No. AF AFOSR 1018-66.

A model of human operator behavior is presented based on the following assumptions: that the input and output are quantized into a limited number of states and that data processing is performed on asynchronous samples of this coarsely quantized input - i.e., that the human operator behaves as a finite-state machine. A hybrid element or hybrid actuator is used to achieve a continuous variation of output position. (Author)

**A68-30432 ***
EFFECT OF CYANIDE INTOXICATION ON THE METACHROMATIC MATERIAL FOUND IN THE CENTRAL NERVOUS SYSTEM.
M. Z. M. Ibrahim and Seymour Levine (New York Medical College, Dept. of Pathology and Center for Chronic Disease, Bird S. Coler Hospital Div., Welfare Island, N.Y.; NASA, Ames Research Center, Moffett Field, Calif.).
Journal of Neurology, Neurosurgery and Psychiatry, vol. 30, 1967, p. 545-555. 42 refs.
PHS Grant No. MH-11698-01.

Study of the brain of normal adult rats using fixation of the tissue in formalin alcohol which results in the artifactual appearance of metachromatically staining bodies in the white matter. It is believed that these bodies are caused by the solution and subsequent precipitation of some myelin component by the fixative. They consist of a cerebroside, part of which is sulphated (sulphatide); somewhat similar metachromatic bodies were seen in adult brains fixed for long periods in formalin alone. These latter bodies consist of chondroitin sulphate B (dermatan sulphate) and possibly also a small amount of heparin sulphate. The chemical identification of this second class of bodies represents a direct histochemical demonstration of the presence of an acid mucopolysaccharide in white matter which arises probably from the myelin sheaths. In brains having cyanide-induced lesions, both types of metachromatic body were replaced by more numerous and smaller bodies in relation to areas of oligodendroglial proliferation; they disappeared from necrotic and established demyelinating lesions. It was concluded that oligodendroglial proliferation and hypertrophy are closely related in time to the earliest detectable light microscopic changes in the myelin, exemplified by the metachromatic bodies. P.v.T.

**A68-30434 ***
MACROMOLECULAR DATA PROCESSING IN THE CENTRAL NERVOUS SYSTEM [MAKROMOLEKULARE DATENVERARBEITUNG IM ZENTRALNERVENSYSTEM].
Francis O. Schmitt (Massachusetts Institute of Technology, Dept. of Biology, Cambridge, Mass.).
(Gesellschaft Deutscher Naturforscher und Ärzte, Versammlung, 104th, Vienna, Austria, 1966.)
Klinische Wochenschrift, vol. 45, Sept. 1967, p. 863-868. 46 refs. In German.
Grants No. NsG-462; No. NsG-22-009-018.

Discussion of various fields of brain research in which the investigation of macromolecules, or aggregates of them, plays an important part. These areas of study are suggested as fruitful avenues of research for physicists and chemists. The importance of an interdisciplinary approach to neuroresearch is stressed. R.A.F.

**A68-30443**
LIFE IN SPACE.
W. F. Libby (California, University, Dept. of Chemistry and Institute of Geophysics and Planetary Physics, Los Angeles, Calif.).
Space Life Sciences, vol. 1, Mar. 1968, p. 5-9.

Discussion of the probability that higher forms of life exist on the planets with atmospheres (Mars, Venus, Saturn, and Jupiter) and that bacterial life exists even in space (on meteoritic matter). At the present time it is known that the simple Miller-Urey synthesis - electric discharge through the primeval reducing gas mixtures $H_2$, $H_2O$, $CH_4$, and $NH_3$ - gives many of the essential amino acids, and that ultraviolet-light-induced reactions under reasonable conditions also lead to the formation of many of the molecules found in living organisms. P. v. T.

**A68-30444 ***
BIOCHEMICAL DIMENSIONS OF SPACE BIOLOGY.
Joseph F. Saunders (NASA, Office of Space Science and Applications, Washington, D.C.).
Space Life Sciences, vol. 1, Mar. 1968, p. 10-22. 38 refs.

Investigation of the unique environmental factors to which living earth systems are exposed in space. The space environment has the potential for producing complex physiological changes because of active or subtle stresses, some of which are imposed by decreased gravity or weightlessness. Preliminary information on the dogs in Cosmos 110 indicated essential changes after 22 days, including sharp atrophy of muscle, diminution of motion coordination, transient cardiovascular changes after return to 1 g, and some changes in water-salt and protein exchange. In the case of man, it may not be easy to solve the metabolic and functional mysteries even by a concerted biochemical, morphological, and physiological approach. P.v.T.

**A68-30445 ***
SPACE BIOMAGNETICS.
Douglas E. Busby (Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex.).
Space Life Sciences, vol. 1, Mar. 1968, p. 23-63. 148 refs.
Contract No. NASr-115.

Investigation of the effect of intermittent exposure of human and subhuman organisms to high-intensity, relatively low-gradient magnetic fields during space missions. From past experience with personnel who enter high-intensity magnetic fields for brief periods of time in their work, it is concluded that exposure to magnetic fields while servicing activated magnetohydrodynamic engines should not be hazardous to astronauts. It is apparent that past exposures of man and subhuman systems to high-intensity magnetic fields do not indicate whether astronauts exposed for up to several days to currently estimated magnetic field intensities associated with pure magnetic or plasma-radiation shielding could suffer impairment of their health or performance. Further studies will be necessary. P. v. T.

**A68-30446 ***
CURRENT STATUS OF CHEMICAL STUDIES ON THE ORIGIN OF LIFE.
Cyril Ponnamperuma and Norman W. Gabel (NASA, Ames Research Center, Exobiology Div., Moffett Field, Calif.).
Space Life Sciences, vol. 1, Mar. 1968, p. 64-96. 169 refs.

Critical review of the basis for some studies on the origin of life, the experiments that have been performed, and the results obtained. Of paramount importance, because it bridges the gap between chemical evolution and biological evolution, is the problem of precellular organization. In essence the problem is to envision how the now biologically important chemicals spontaneously organized themselves into a three-dimensional matrix, which would eventually acquire the characteristics of a readily agreed-upon life form. The heart of the matter is the definition of life itself. Chemical evolution may not have necessarily led to biological evolution. It is difficult to believe that life is a chance occurrence which is characteristic only of this planet. P. v. T.

**A68-30447 ***
A PROGRAM FOR THE STUDY OF LONG-TERM ADAPTATION TO A WEIGHTLESS ENVIRONMENT PROVIDING THREE-DIMENSIONAL FREEDOM OF MOVEMENT.
J. P. Meehan and J. P. Henry (Southern California, University, Dept. of Physiology, Los Angeles, Calif.).
Space Life Sciences, vol. 1, Mar. 1968, p. 97-112. 19 refs.
NASA-supported research; Contract No. AF 29(600)-67-C-0010.

The mechanical details of a working model of a proposed small-animal space station which is currently undergoing bench tests are briefly described together with supporting evidence pointing to the feasibility of the program. The 1/3-$m^3$ canister weighs less than 250 kg when loaded for a 9-month period. It would transmit by slow-scan television data regarding mice which would be born in the weightless state. Observation of their silhouettes would indicate their growth rates and study of the picture sequence their activity patterns. For example, their use and defense of the feeding and nesting areas and their care of their young. The device would also be used to determine whether the weightless state affected the development of a circadian rhythm or the periodicity of any rhythm that was observed. Recovery of the animals' special living compartment by rendezvous in orbit would permit testing of those born in the device in the earth's gravity field by familiar methods such as those that have been used for the assessment of negative geotactic responses and for the evaluation of rodents living in vertical, as opposed to horizontal mazes. (Author)

**A68-30448 ***
THE RESPONSE OF SPORE-FORMING VS NONSPORE-FORMING BACTERIA TO DIURNAL FREEZING AND THAWING.
R. S. Young, P. H. Deal, and O. Whitfield (NASA, Ames Research Center, Exobiology Div., Moffett Field, Calif.).
Space Life Sciences, vol. 1, Mar. 1968, p. 113-117. 6 refs.

Evaluation of experiments performed in an attempt to determine whether or not there is differential survival of microorganisms under diurnal freeze-thaw conditions, in order to assess the possibilities of contamination of a planet (for instance, Mars) with viable organisms from earth. The results clearly indicate that spore-forming organisms can, under some conditions, grow in a Martian freeze-thaw environment. P. v. T.

**A68-30449 ***
SURVIVAL OF MICRO-ORGANISMS IN SPACE.
Peter R. Lorenz (Union University, Dudley Observatory; New York State, Dept. of Health, Div. of Laboratories and Research, Albany, N.Y.), John Hotchin (New York State, Dept. of Health, Div. of Laboratories and Research, Special Projects Research Laboratory; Albany Medical College, Albany, N.Y.), Aletha S. Markusen (New York, State University, Albany, N.Y.), Gert B. Orlob (Toronto, University, Dept. of Botany, Toronto, Canada), Curtis L. Hemenway (Union University, Dudley Observatory; New York, State University, Albany, N.Y.), and Douglas S. Hallgren (Union University, Dudley Observatory, Albany, N.Y.).
Space Life Sciences, vol. 1, Mar. 1968, p. 118-130. 8 refs.
Grant No. NsG-155-61; Contract No. NAS 9-5637.

Dried suspensions of Penicillium roqueforti Thom, Coliphage T-1, Bacillus subtilis, and tobacco mosaic virus were exposed to space on board the Gemini 9 and 12 spacecraft and the Gemini 8 target vehicle. All microorganisms tested survived the direct exposure during the Gemini 9 experiment. In the Gemini 12 experiment only the T-1 phage survived the direct exposure. The survival was influenced by the suspending medium and depended on the species of the microorganism. After four months of space flight on the Gemini 8 target vehicle surviving fractions between $2 \times 10^{-3}$ and 1.0 were found in the unopened flight container. However, microorganisms exposed on the cover of the container during this period were completely inactivated. Shielding against solar ultraviolet radiation during flight resulted in survival of microorganisms exceeding that of the transport controls, and the survival was considered complete. Sterile methylcellulose collection surfaces were exposed to space on board the Gemini 9 and 12 spacecraft in an attempt to collect viable microorganisms in space. None of the collection surfaces yielded viable microorganisms. (Author)

**A68-30450 ***
BIOCHEMICAL ACTIVITY AND WATER - THE ACTIVITY OF HEME ENZYMES IN NON-AQUEOUS MEDIA.
S. M. Siegel (Hawaii, University, Dept. of Botany, Honolulu, Hawaii) and Karen Roberts (Duke University, Dept. of Botany, Durham, N.C.).
Space Life Sciences, vol. 1, Mar. 1968, p. 131-134. 7 refs.
NASA-supported research.

Study of two enzymes (peroxidase and catalase) in order to determine their possible survival in nonaqueous media. On the basis of the experimental data obtained, it was concluded that some enzymes of biochemical significance can remain operational in states quite modified from the usual. Further experimentation with enzymes, enzyme systems, and even metabolically important subcellular particles is suggested. P. v. T.

**A68-30451**
A MULTI-STAGE DECISION MODEL FOR MISSION NON-CONTAMINATION REQUIREMENTS.
C. A. Trauth, Jr. (Sandia Corp., Sandia Laboratory, Albuquerque, N. Mex.).
Space Life Sciences, vol. 1, Mar. 1968, p. 135-149. 13 refs.

A model is developed which makes possible the derivation of mission noncontamination requirements without a priori knowledge of either the time period in which planetary quarantine is to be observed or the total number of missions to be used in exploring the planet being quarantined. On the basis of this model, some general observations are made about the need for carefully defining "contamination." (Author)

**A68-30452** *
ON LOGARITHMIC EXTRAPOLATION OF MICROBIAL SURVIVOR CURVES FOR PLANETARY QUARANTINE REQUIREMENTS.
J. P. Brannen (Sandia Corp., Sandia Laboratory, Planetary Quarantine Dept., Albuquerque, N. Mex.).
Space Life Sciences, vol. 1, Mar. 1968, p. 150-152. 6 refs.
AEC-supported research; NASA Contract No. R-09-019-040.

Description of a model based on chemical reaction kinetics in which nonlogarithmic survival is inherent in the microbial organism. The results obtained with the aid of this model are compared to data for Bacillus coagulans, taken from Davies and Horowitz (1966).
P. v. T.

**A68-30497** #
THE EFFECT OF PSYCHOLOGICAL STRESS ON DECISION PROCESSES IN A TRACKING TASK.
C. B. Gibbs (National Research Council, Div. of Mechanical Engineering, Control Systems Laboratory, Ottawa, Canada).
Canada, National Research Council, Division of Mechanical Engineering and National Aeronautical Establishment, Quarterly Bulletin, no. 4, 1967, p. 1-26. 7 refs.

Description of the stressalyzer, an instrument designed to provide a rapid and simple test of a person's ability to control a machine. A handwheel and a pointer are used to track a target that appears equally frequently, at two-second intervals, at one of five different positions. The handwheel and the pointer move in opposite directions, thus causing the operator to make an appreciable number of tracking errors. The effects of sleep deprivation, disturbed sleep, fatigue, and alcohol on the skill of car operators are discussed and analyzed.
P.v.T.

**A68-30632** *
A REMOTE CONTROL BRAIN TELESTIMULATOR WITH SOLAR CELL POWER SUPPLY.
Harold Warner (Emory University, Yerkes Regional Primate Research Center, Atlanta, Ga.), Bryan W. Robinson (Emory University, Emory Rehabilitation Center, Atlanta, Ga.), H. E. Rosvold (National Institutes of Health, National Institute of Mental Health, Laboratory of Psychology, Bethesda, Md.), Lawrence D. Wechsler (General Electric Co., Aerospace Group, Electronic Systems Div., Electronic Laboratory, Syracuse, N. Y.), and J. J. Zampini (General Electric Co., Aerospace Group, Electronic Systems Div., Electronic Laboratory, Advanced Circuits Subsection, Syracuse, N.Y.).
IEEE Transactions on Bio-Medical Engineering, vol. BME-15, Apr. 1968, p. 94-101.
NIH Grant No. FR-00165; Grant No. NGR-11-001-012.

A brain telestimulator system is described which can be used with primates weighing 3.0 kg or more. The 3 x 6 x 7-cm, 200-g head-mounted receiver employs solar cells to maintain the charge on its battery, thereby permitting experiments to continue undisturbed for many months. The head unit develops across its output a cathodal, monophasic pulse whose duration, rate, and constant current are remotely controlled from the transmitter. Subject to a duty cycle of 0.1, these parameters are continuously and remotely variable; pulse repetion rate, 0 to 200 pulses per second; pulse duration, 0.1 to 3.0 msec; pulse current intensity, 0 to 1.0 ma with less than ±3% variance for loads between 2500 to 10,000 ohms. Output pulse rise time is 30 μsec. Any one of 12 electrode channels can be selected for stimulation by remote control activation of an electromechanical stepping switch in the head unit. Utilization of crystal control in the frequency-modulated transmitter and head units permits multi-animal operation by providing separate bands in the 138 MHz region for independent stimulation of up to four animals. The sensitivity of the receiver has purposely been designed low (-35 dbm). Thus, with the present transmitter the system has a range of about 0.2 mile, which extends beyond the normal visual limits of observation of primate groups.
(Author)

**A68-30633**
CHEMICAL CONTROL IN THE RESPIRATORY SYSTEM.
James D. Horgan (Marquette University, Dept. of Electrical Engineering and School of Medicine, Div. of Medicine, Milwaukee, Wis.) and Ramon L. Lange (Marquette University, School of Medicine, Div. of Medicine, Cardiovascular Section, Milwaukee, Wis.).
IEEE Transactions on Bio-Medical Engineering, vol. BME-15, Apr. 1968, p. 119-127. 34 refs.
PHS Grant No. HE-08456.

Some of the more recent advances in understanding the control of the human respiratory system are discussed, particularly as they relate to mathematical modeling of the system. A brief review of the anatomy and physiology is followed by a discussion of a number of tests used to elicit information about the system dynamics. Mathematical modeling of the respiratory control system is discussed, beginning with the classic work of Grodins (1954). Some dynamic tests which have been successfully simulated are presented. Several specific points which have been clarified as a result of model studies are discussed.
(Author)

**A68-30643**
RELIABILITY PROBLEMS IN THE MAN-MACHINE INTERFACE IN MODERN TECHNOLOGICAL SYSTEMS [ZUVERLÄSSIGKEITS-PROBLEME BEIM ZUSAMMENWIRKEN VON MENSCH UND MASCHINE IN MODERNEN TECHNISCHEN SYSTEMEN].
U. Theile (Honeywell GmbH, Dörnigheim am Main, West Germany).
IN: TECHNICAL RELIABILITY IN INDIVIDUAL PRESENTATIONS. NUMBER 10 [TECHNISCHE ZUVERLÄSSIGKEIT IN EINZELDARSTELLUNGEN. NUMBER 10].
Edited by Adalbert Etzrodt.
Munich, R. Oldenbourg Verlag, 1967, p. 18-35. 16 refs. In German.

General review of the problem of man as a part of a technological system. The relationship of the human being to factors of both his objective environment (e.g., the atmosphere, temperature, acceleration, vibration) and his subjective environment (e.g., thought, instinct, feeling, nourishment, health, acclimatization) is considered.
R.A.F.

**A68-30655**
LUNAR ASTRONAUTS TO USE NEW OXYGEN PACK.
William J. Normyle.
Aviation Week and Space Technology, vol. 88, June 3, 1968, p. 76, 77, 81, 83, 86, 87.

Description of a portable life-support system (PLSS) which will permit 4 hr of mobility on the moon, and will be tested by the first Saturn V flight. The PLSS contains five major subsystems - water transport loop, primary oxygen supply, oxygen ventilating circuit, feed water loop, and space suit communications. In addition, the emergency oxygen system is available as an alternate emergency source of air.
B.B.

**A68-30809** *
EFFECTS OF SALTS ON THE HALOPHILIC ALGA DUNALIELLA VIRIDIS.
Mary K. Johnson, Emmett J. Johnson, Robert D. MacElroy, Henry L. Speer, and Barbara S. Bruff (NASA, Ames Research Center, Exobiology Div., Moffett Field, Calif.).
(American Society for Microbiology, Annual Meeting, New York, N.Y., Apr. 30-May 4, 1967.)
Journal of Bacteriology, vol. 95, Apr. 1968, p. 1461-1468. 21 refs.

Determinations of the salt sensitivity of enzymes extracted from the halophilic alga Dunaliella viridis, revealing that pentose phosphate isomerase, ribulose diphosphate carboxylase, glucose-6-phosphate isomerase, and phosphohexose isomerase were inhibited by NaCl concentrations far lower than that in the growth medium (3.75 m). The inhibition was reversible and was not prevented by preparing the extracts in the presence of salt. Potassium, lithium, and cesium chlorides were equally inhibitory. In contrast, whole cells require rather high levels of NaCl for optimal growth, whereas growth is inhibited by flow levels of the other cations. The results suggest a specific mechanism for the exclusion of sodium from the interior of the cell.
P.v.T.

# LC ENTRIES

**A68-81199**
**A CASE OF "AUTOSTASIS" OR REVERSE AUTOKINESIS.**
Michael Wertheimer (Colo., U., Boulder).
*Perceptual and Motor Skills*, vol. 26, Apr. 1968, p. 417–418.
Contract AF 49(643)-274.

Three of five observers of a light in the night sky that was actually moving continuously along a linear course reported it as stationary as long as the light was on. This phenomenon, "autostasis," seems to be opposite to the well-known phenomenon of autokinesis, or apparent motion of an actually stationary light in an undifferentiated field.

**A68-81200**
**PERCEPTION BIBLIOGRAPHY: LIV. PSYCHOLOGICAL ABSTRACTS, 1938, VOLUME 12, FIRST HALF.**
R. B. Ammons and C. H. Ammons (Mont., U., Missoula).
*Perceptual and Motor Skills*, vol. 26, Apr. 1968, p. 443–446.
103 refs.

One-hundred-three references to work on perceptual phenomena are listed alphabetically.

**A68-81201**
**A PORTABLE ROD-AND-FRAME APPARATUS.**
Philip K. Oltman (N. Y., State U., Downstate Med. Center, Brooklyn).
*Perceptual and Motor Skills*, vol. 26, Apr. 1968, p. 503–506.
Grant NIH M-628.

A portable rod-and-frame test is described. Scores on the portable apparatus correlated .89 ($n = 163$) with scores obtained on Witkin's original rod-and-frame test.

**A68-81202**
**PERCEPTION BIBLIOGRAPHY: LV. PSYCHOLOGICAL ABSTRACTS, 1938, VOLUME 12, SECOND HALF.**
C. H. Ammons and R. B. Ammons (Mont., U., Missoula).
*Perceptual and Motor Skills*, vol. 26, Apr. 1968, p. 535–538.
102 refs.

One-hundred-two items on perceptual phenomena are listed below alphabetically.

**A68-81203**
**ADAPTATION TO DISPLACED VISION AFTER EXPERIENCE WITH LESSER DISPLACEMENTS.**
Gerald Lazar and John Van Laer (State U. Coll., New Paltz, N. Y. and N. Y., City U., Hunter Coll., New York).
*Perceptual and Motor Skills*, vol. 26, Apr. 1968, p. 579–582.

Adaptation to vision displaced by a 30 diopter prism was greatest after prior experience with a 30 diopter prism, less after experience with 20 diopter prism, and least after experience with prisms of 10 and 20 diopters. This order was reversed when aftereffects were observed under normal vision, i.e., undistorted by prisms.

**A68-81204**
**MAGNITUDE ESTIMATION OF LINE PATTERN COMPLEXITY: PRELIMINARY REPORT.**
Patrick A. Cabe (Goodyear Aerospace Corp., Akron. Ohio).
*Perceptual and Motor Skills*, vol. 26, Apr. 1968, p. 614.

Results are presented of a study of the use of the magnitude estimation rating technique to obtain subjective estimates of perceived complexity in a restricted set of line patterns, when a parameter (number of line segments in the pattern) was held constant. An incidental sample of 38 college students rated ten line patterns, all on a single mimeographed sheet. The patterns were built by connecting horizontally, vertically, and diagonally adjacent points by a 5-by-5 point matrix. A repeated measures analysis of variance using log transformations of ratings gave an F of 7.53 ($p < .001$) for differences in rated complexity among patterns. A Newman–Keuls Test for individual comparisons showed significant differences ($p < .01$) for all but eight pairs (45). These results indicate that differences in perceived complexity in line patterns are independent of information content of the patterns. The magnitude estimation technique used seems to offer a sound approach to rating subjective complexity.

**A68-81205**
**XENON 133 MYOCARDIAL BLOOD FLOW DETERMINATION: A SIMPLE NEW BALLOON TECHNIQUE.**
Ronald H. Dietzman, E. David Nordberg, Merle K. Loken, and Richard C. Lillehei (Minn., U., Med. School, Depts. of Surg. and Radiol., Minneapolis).
*Journal of Applied Physiology*, vol. 24, Jun. 1968, p. 840–843.
Grants PHS HE 02941 and PHS 0900-4069-08; Minn. Heart Assn. supported research.

A new balloon cannula technique for the xenon 133 measurement of myocardial blood flow is described. The myocardial blood flow measurements obtained compare well with values obtained by injection via a selective coronary artery catheter and are reproducible. This method has the advantage of simplicity and can be performed without fluoroscopy and experience in selective coronary artery catheterization.

**A68-81206**
**EFFECT OF BACKGROUND WAVELENGTH ON STEREOSCOPIC ACUITY AT SCOTOPIC AND PHOTOPIC ILLUMINATION LEVELS.**
Alfred Lit, William O. Dwyer, and Anthony J. Morandi (Southern Ill. U., Carbondale).
*(Am. Acad. of Optometry, Ann. Meeting, Chicago, Dec. 9, 1967). American Journal of Optometry and Archives of American Academy of Optometry*, vol. 45, Mar. 1968, p. 195–203. 16 refs.
Grant NSF GB 2553.

Equidistance settings were made for a pair of black vertical rods viewed against several colored backgrounds presented over a wide range of scotopic and photopic retinal illuminance levels. The data were found to be consistent with expectations based on the duplicity theory of vision and on the scotopic luminosity function of the human eye. When matched for brightness, background wavelength has no effect on equidistance settings at photopic (cone) levels.

**A68-81207**
**VISION WITHOUT CONTOURS: STUDY OF VISUAL INFORMATION FROM ORDINAL STIMULATION.**
Gunnar Johansson (Center for Advan. Study in the Behavioral Sci., Stanford, Calif. and Uppsala U., Sweden).
*Perceptual and Motor Skills*, vol. 26, Apr. 1968, p. 335–351.
23 refs. Swed. Council for Social Sci. Res. supported research.

Continuous change of illuminance over retinal area in accordance with the sinusoidal function was studied as a stimulus for the human visual system. Its efficiency in controlling pursuit eye movements was compared with that of a stepwise luminance function (square wave). Such distributions of luminance were generated on a cathode ray screen (wavelength at the 9° and 3#)

and were given a small translatory motion (2°–12'). Subjects were instructed to follow the moving pattern with pursuit eye movements. There is no difference in performance between the two types of brightness distributions. A simulus motion of 24' was sufficient to produce full evidence of eye tracking in all subjects also from the contour-free sinusoidal pattern. This means that the brightness change in every point of the CRT screen was far below the retinal sensitivity threshold at the luminance level used. Thus a summation effect occurs. This was taken as a support for an hypothesis about "ordinal" stimulation. Arguments from modern neurophysiology are introduced and yield further support for the conclusion.

**A68-81208**
**TEMPERATURE ADAPTATION OF CELLS OF MARINE AND FRESHWATER ALGAE.**
M. I. Lyutova, I. G. Zavadskaya, A. F. Luknitskaya, and N. L. Feldman (USSR, Acad. of Sci., Komarov Botan. Inst. and Inst. of Cytol., Leningrad).
IN: THE CELL AND ENVIRONMENTAL TEMPERATURE.
*(International Series of Monographs in Pure and Applied Biology, Division: Zoology, vol. 34).*
Oxford, Pergamon Press, 1967, p. 166–172. 24 refs.

Littoral and sublittoral marine algae and freshwater algae were used to investigate their capacity to endure shifts in cellular heat resistance. Data regarding the heat resistance level of algae in relation to cultivation temperatures, heat resistance level alterations after transferring the algae from low to high or high to low temperatures and shifts in heat resistance recorded under natural conditions were collected. From the results obtained and from a review of the literature it was concluded that the heat resistance of algae shows a considerable lability so that: (1) changes in the resistance of algae are due to certain influences of temperature, (2) the alterations are found in natural conditions and can be induced by artificial cultivation, and (3) the degree of lability of heat resistance for the whole organic world depends on the level of organization.

**A68-81209**
**THE COMPARATIVE RESISTANCE OF TISSUES OF SOME HIBERNATING AND NON-HIBERNATING RODENTS TO COOLING AND SUPERCOOLING.**
L. G. Volfenson, N. V. Kesemanly, V. A. Filov, E. V. Andreyeva, and F. L. Losina-Losinskaya (USSR, Acad. of Sci., Inst. of Cytol., Lab. of Space Biol., Leningrad).
IN: THE CELL AND ENVIRONMENTAL TEMPERATURE.
*(International Series of Monographs in Pure and Applied Biology, Division: Zoology, vol. 34).*
Oxford, Pergamon Press, 1967, p. 118–124. 10 refs.

The resistance of some isolated cells and tissues of the ground squirrel *Citellus pyomaeus* Pall, and the hamster, *Cricetus auratus* Waterhaus, to cooling in the range from 5° to 0°C. and supercooling at −4°C. was compared to the resistance of similar tissues in rats. By applying the indices of survival time, character of excitability changes and rate of hemolysis, it was concluded that some tissues of hibernating ground squirrels and hamsters are more resistant to cooling and supercooling than the same tissue of non-hibernating rats. It was also shown that the tissue resistance of heterothermal rodents changes with season, and that ground squirrels are more resistant then hamsters.

**A68-81210**
***THE CELL AND ENVIRONMENTAL TEMPERATURE*: PROCEEDINGS OF THE INTERNATIONAL SYMPOSIUM ON CYTOECOLOGY, LENINGRAD, U.S.S.R., MAY 31–JUNE 5, 1963.**
Edited by A. S. Troshin.
*(International Series of Monographs in Pure and Applied Biology, Division: Zoology, vol. 34).*
Oxford, Pergamon Press, 1967, x+462 p. Many refs. USSR, Acad. of Sci. and UNESCO supported research. $21.50

Presentations given at an international symposium on temperature adaptation at the cellular level of organization were reported. The subject material presented was concerned with both plants and animals and with high and low temperature effects. Discussions of the reports were included.

**A68-81211**
**AN ACTION SPECTRUM FOR NUCLEIC ACID FORMATION IN AN ACHLOROPHYLLOUS MUTANT OF CHLORELLA PYRENOIDOSA.**
H. Senger and N. I. Bishop (Ore. State U., Dept. of Botany, Corvallis).
*Biochimica et Biophysica Acta*, vol. 157, Apr. 22, 1968, p. 417–419. 10 refs. PHS supported research.

An achlorophyllous mutant of *Chlorella pyrenoidosa* was used to investigate the nature of a non-photosynthetic, but light-dependent process of nucleic acid formation. Action spectra for nucleic acid formation were given, but no conclusions were made concerning the light absorbing pigment or the possible transformation of energy gained by the absorption of blue light. It was not known whether or not the effect of light was directly on nucleic acid synthesis or on the synthesis of amino acids or proteins.

**A68-81212**
**CONTINUOUS MONITORING OF AEROSOLS OVER THE 0.001- TO 10-MICRON SPECTRUM.**
Carl M. Peterson and Harold J. Paulus (Minn., U., School of Public Health, Minneapolis).
*American Industrial Hygiene Association Journal*, vol. 29, Mar.–Apr. 1968, p. 111–122. 10 refs.
Grant PHS AP-00453-01.

Three aerosol sizing and counting instruments were combined into a single automatic system capable of continuously providing data pertinent to the physical properties of airborne particulates. Particle sizes are determined by either condensation, light scattering, or electrical phenomena. All three methods are required to measure broad-size aerosol spectrums, as each individual method possesses accurate sizing characteristics over a limited size range. The instruments, combined into a unitized system, provide data on particles within various interval widths and group the respective size particles according to the interval midpoint. An appropriate electrical signal, indicative of the number of particles present, is recorded by electronic instrumentation, and subsequent calculations result in a complete number-size distribution. This paper describes the union of the condensation nucli counter, the light-scattering counter, and the electrical particle counter with associated data acquisition equipment to produce a workable system. Data reduction, as applied to the determination of a number-size distribution, is also discussed.

**A68-81213**
**REDUCTION OF HYPOXIC PULMONARY VASOCONSTRICTION BY MAGNESIUM CHLORIDE.**
Gerd J. A. Cropp (Colo., U., Med. Center, Dept. of Pediat., Cardiopulmonary Res. Lab., Denver).
*Journal of Applied Physiology*, vol. 24, Jun. 1968, p. 755–760. 19 refs.
Grant NIH HE-35,249-01 and Am. and Colo. Heart Assns. supported research.

Since parenterally administered magnesium salts can relax constricted systemic blood vessels, it was decided to investigate whether intravenous infusions of $MgCl_2$ would reduce hypoxia-induced pulmonary vasoconstriction. Ten anesthetized dogs

developed typical increases in mean pulmonary artery pressure ($\overline{P_{pa}}$) and total pulmonary resistance (TPR) at normal plasma magnesium concentrations $[Mg]_{pl}$ when they breathed 10% oxygen after 100% oxygen. $\overline{P_{pa}}$ rose from 14.4 (±0.70 SE) to 29.6 (±2.39) mm. Hg and TPR from 0.12 (±0.012) to 0.18 (±0.020) mm. Hg/((ml./min.)/kg.); these increases were statistically significant ($P<0.001$). When $[Mg]_{pl}$ was raised in a stepwise manner by infusions of isotonic $MgCl_2$, the increases in $\overline{P_{pa}}$ and TPR in response to hypoxia lessened so that at $[Mg]_{pl}$ of 9–12 meq./liter, the $\overline{P_{pa}}$ rose only 6.9 mm. Hg (compared to 15.2 mm. Hg at normal $[Mg]_{pl}$) and the TPR did not rise at all. Elevations of $[Mg]_{pl}$ to 9–12 meq./liter had no undesirable effects on cardiac output, total systemic resistance, aortic pressure, or pulmonary ventilation. It was concluded that acute increases in total $[Mg]_{pl}$ to 9–12 meq./liter lessened or blocked the hypoxia-induced active pulmonary vasoconstriction without depressing other cardiovascular and ventilatory responses to hypoxia.

**A68-81214**

**AN IMMEDIATE IRRADIATION EFFECT ON RESISTANCE OF RATS TO LOW TEMPERATURE.**

Richard D. Phillips and Donald J. Kimeldorf (U.S. Naval Radiol. Defense Lab., San Francisco, Calif.).

*Journal of Applied Physiology*, vol. 24, Jun. 1968, p. 768–772. 16 refs. Bur. of Med. and Surg. supported research.

A study was made of the effect of whole-body X-irradiation (50–2,000 rad.) on the resistance of male rats exposed to a low environmental temperature (−17.0±1°C.). The animals were subjected to the test environment at 0.5, 4, 8, 16, or 24 hr. after irradiation. A change in resistance was observed after irradiation with doses of 100 rad. or more. Irradiation had a detrimental effect on the survival of rats exposed to low temperature at all times tested. The radiation-induced decrease in cold resistance was greater in groups tested early after irradiation than in groups tested at 16 or 24 hr. postirradiation. The magnitude of the radiation effect was dose dependent. At doses greater than 100 rad., the median survival time of rats in the cold was inversely related to radiation dose.

**A68-81215**

**HEAT REACTIONS OF US STUDENTS DURING A MULTITEMPERATURE TEST.**

C. G. Williams and C. H. Wyndham (Transvaal and Orange Free State Chamber of Mines, Human Sci. Lab., Johannesburg, South Africa).

*Journal of Applied Physiology*, vol. 24, Jun. 1968, p. 800–808. 14 refs.
Grant DA-MD-49-193-G126 and PHS supported research.

Ten US students were studied at effective temperatures (ET) of 25.4, 28.7, 31.0, and 32.2°C. Rectal temperatures, heart rates, and sweat rates were recorded hourly while the men worked continuously for a period of three hr. at a metabaolic rate of five kcal./min. Functional relationships between sweat rate and rectal temperature were examined on both an hourly and a two-hourly basis. Curves fitted to the hourly data had a characteristic nonlinear relationship. The curve for the second hr. fell below that for the first hr., and that for the third hr. fell below that for the second hr. Other points which emerged were: (a) the preliminary "warm up" of 30 min. work at five kcal./min. in comfortable air conditions raised heart rates at rest in the climatic chamber by five beats/min. and rectal temperature at rest by 0.35°C.; (b) oral and tympanic temperatures were similar and lower than rectal temperatures; and (c) an ET of 32.2°C should definitely be included in this heat-stress test because marked differences in responses showed up at this condition which were not apparent in lesser heat-stress conditions.

**A68-81216**

**DYNAMICS OF OXYGEN STORES CHANGES FOLLOWING AN ALTERATION IN VENTILATION.**

Neil S. Cherniack, Guy S. Longobardo, Frank P. Palermo, and Mark Heymann (Ill., U., Dept. of Med., Chicago; IBM, Advan. Systems Develop. Div., Yorktown Heights, N. Y.; and Data Process. Group, White Plains, N. Y.).

*Journal of Applied Physiology*, vol. 24, Jun. 1968, p. 809–816. 41 refs.
Grants PHS HE-09617-02 and PHS KO3-HE-17792; Tuberc. Inst., Chicago supported research.

Arterial oxygen and carbon dioxide tensions during asphyxia were measured in eight dogs paralyzed with succinylcholine. Measurement of cardiac output, oxygen consumption, and carbon dioxide production were also made. The results were compared to those calculated from a compartmented model of carbon dioxide and oxygen stores. Vasoconstriction to muscle together with the anaerobic metabolism of muscles during asphyxia could not explain the discrepancy between measured and calculated results. When the hypothesis that a critical arterial $PO_2$ exists below which oxygen consumption decreases was incorporated into the mathematical model, it successfully predicted the arterial gas tensions observed during asphyxia.

**A68-81217**

**COLORIMETRIC PERSONAL DOSIMETER FOR HYDRAZINE FUEL HANDLERS.**

Charles A. Plantz, Paul W. McConnaughey, and Cecelia C. Jenca (Mine Safety Appliances Co., Pittsburgh, Pa.).

*(Am. Ind. Hyg. Conf., Chicago, May 1–5, 1967).*
*American Industrial Hygiene Association Journal*, vol. 29, Mar.–Apr. 1968, p. 162–164. 10 refs.
(Contract AF 33(615)-2929.

A dosimeter badge was developed which does for hydrazine fuel handlers what a film badge does for handlers of ionizing radiation. On exposure to vapors of hydrazines and other volatile bases the sensitive material contained in the badge develops a color whose intensity is approximately proportional to the integrated concentration-time value to which the badge has been exposed. Color standards are on the badge, so that the color and therefore the concentration times time of exposure can be estimated by fuel handlers in the field. The colorimetric substance is bindone, [1,2-biindan]-1',3,3'-trione, impregnated on thin-layer chromatography material.

**A68-81218**

**BIO-MEDICAL TELEMETRY: SENSING AND TRANSMITTING BIOLOGICAL INFORMATION FROM ANIMALS AND MAN.**

R. Stuart Mackay (Calif., U., Berkeley and Boston U., Med. School, Mass.).

New York, John Wiley and Sons, Inc., 1968, xi+388 p. 144 refs.

A textbook approach to biotelemetry is presented. Introductory electronics are included for the biologists' use, while elementary biomedical material gives the engineers a view of the problems. More advanced chapters deal with modulation, transmission electrodes, sensors and antenna selection, receivers, and calibration. A separate chapter deals with special problems in aquatic mammals.

**A68-81219**

**EYE MOVEMENT: A BIBLIOGRAPHIC SURVEY.**

Robert Grunin and David I. Mostofsky (Boston U., Mass.).

*Perceptual and Motor Skills*, vol. 26, Apr. 1968, p. 623–639. Many refs. Boston U. supported research.

A total of 413 entries and nine reviews are included in this bibliography on eye movements. Standard reference work, texts, journals, and psychological abstracts yielded these citations which cover the period 1950 through 1967. The list includes studies which are concerned with the underlying eye-movement mechanism as well as reports on biomedical aspects and instrumentation. The literature citations include both English and foreign language publications as well as technical reports from governmental agencies.

**A68-81220**
**MOTOR SKILLS BIBLIOGRAPHY: LXXXIX. PSYCHOLOGICAL INDEX NO. 32, 1925.**
R. B. Ammons and C. H. Ammons (Mont., U., Missoula).
*Perceptual and Motor Skills*, vol. 26, Apr. 1968, p. 640–642. 80 refs.

Eighty selected items on motor skills are listed alphabetically.

**A68-81221**
**CONGRUENCY FACTORS RELATED TO VISUAL CONFUSION OF ENGLISH LETTERS.**
Peter Dunn-Rankin, Donald A. Leton, and Velma F. Shelton (Hawaii, U., Honolulu).
*Perceptual and Motor Skills*, vol. 26, Apr. 1968, p. 659–666. 13 refs.

An index was developed to determine the congruency of letter pairs in the lower-case English alphabet in Century Schoolbook print. The index was based on the ratio of common area to independent area. The congruency matrix of the 325 letter pairs was factor analyzed. Five factors indicated major letter groups and illustrated critical features for discrimination within letter groups.

**A68-81222**
**PERSISTENCE OF VISUAL PATTERN DISCRIMINATION IN BINOCULARLY-OCCLUDED ALBINO RATS.**
Stephan L. Chorover and Ronald Chase (Mass. Inst. of Technol., Cambridge).
*Journal of Comparative and Physiological Psychology*, vol. 65, Apr. 1968, p. 238–245. 17 refs.
Grants PHS 5-R01-MH-07923 and PHS 5 T01-GM 01064-5.

Albino rats, with black vinyl plastic corneal contact occluders in both eyes, performed significantly above change on two visual pattern discriminations; hooded rats failed. Strain difference was not due to differential effectiveness of pupillary restriction, but to differences in iris pigmentation. In the hooded rat, photically-evoked electrophysiological responses recorded from the cortex were markedly attenuated by the use of corneal contact occluders and following the administration of miotic drugs, there is no equivalent attenuation in the albino rat. The persistence of visual pattern discrimination in binocularly-occluded albino rats seems to be based on the ability to resolve dioptrically the spatial pattern of light transmitted through the unpigmented iris.

**A68-81223**
**HEART RATE RESPONSE TO SUBMAXIMAL EXERCISE: RELATION TO AGE AND SEX.**
Henry J. Montoye, Park W. Willis, and David A. Cunningham (Mich., U., Med. Center, School of Public Health, Dept. of Epidemiol., Ann Arbor).
*Journal of Gerontology*, vol. 23, Apr. 1968, p. 127–133. 30 refs.
Grants PHS HE-6378 and PHS CD-00246; Mich., U. supported research.

As part of an epidemiologic study of an entire community, Tecumseh, Michigan, a modified Harvard Step Test was administered to 2,764 males and 2,684 females, age 10 to 69 yr. The test entailed stepping onto an eight in. bench at the rate of 24 times/min. for three min. This represents an energy expenditure of about five times the basal metabolic rate. Pre-exercise, exercise and post-exercise heart rates were significantly higher in females than in males. Heart rates were also higher before, during and after exercise in children below age 15 than in subjects over age 15. Between ages 25 to 60 in females and 15 and 60 in males, there was little change in exercise heart rate, including terminal exercise heart rate, but the return to pre-exercise heart rate was clearly delayed with increasing age.

**A68-81224**
**THE PHYSICAL WORKING CAPACITY OF OLDER INDIVIDUALS.**
James W. Daly, Alan J. Barry, and Newton C. Birkhead (Lankenau Hosp., Div. of Res., Aging Res. Clin., Philadelphia, Pa.).
*Journal of Gerontology*, vol. 23, Apr. 1968, p. 134–139. 18 refs.
Pa., Commonwealth supported research.

Twenty-three men (average age, 76 yr.) and 22 women (average age, 74 yr.) performed standard work tests at weekly intervals on a stationary bicycle ergometer with increasing loads until one or more work limiting criteria were reached. The final values for work load, oxygen uptake, pulmonary ventilation, and exercise heart rate were considerably lower than those previously reported, which may be attributed to the heterogeneous nature of the sample and the work limiting criteria imposed. The major work limiting criterion was the appearance of depression of the ST segment and ectopic beats in the exercise electrocardiogram (ECG). Excessively high exercise heart rates and muscular insufficiency played lesser roles in limiting the working capacity of these subjects. The work capacity and related variables of those with and without ECG abnormalities did not differ significantly, nor were differences found between the subjects classified as clinically normal and abnormal. The relatively high work capacity values previously reported for older individuals probably reflect the physical activity habits rather than the clinical status of the subjects.

**A68-81225**
**AGE DIFFERENCES IN MEMORY AS A FUNCTION OF RATE OF PRESENTATION, ORDER OF REPORT, AND STIMULUS ORGANIZATION.**
Harvey A. Taub (N. Y., State U., Upstate Med. Center, Dept. of Psychiat. and Veterans Admin. Hosp., Psychol. Serv., Syracuse).
*Journal of Gerontology*, vol. 23, Apr. 1968, p. 159–164 11 refs.
Grant PHS FR-5402.

Two experiments investigated the effects of order of report, rate of stimulus presentation, number of stimuli and level of stimulus organization upon the first and second half reports of young and old subjects. It was found that age-related differences were present only in the second half reports, and that age did not interact with any of the other variables. The combined results from both experiments were consistent with an interference model and suggest that the major age-related decrements are related to interference during the response phase of the task.

**A68-81226**
**AGE DIFFERENCES IN PAIRED-ASSOCIATE LEARNING.**
Herbert H. Zaretsky and Jacob L. Halberstam (N. Y. U., Med. Center, Goldwater Mem. Hosp., Dept. of Rehabil. Med., Welfare Island, N. Y.).

*Journal of Gerontology*, vol. 23, Apr. 1968, p. 165–168. 12 refs.
Grant VRA RD-1396-P.

The present study investigated the effects of aging and levels of associative strength on paired-associate learning and relearning. Thirty younger subjects 20 to 45 yr. of age, and 30 elderly subjects, 60 to 84 yr. of age, learned lists of paired-associate works of high, medium and low associative strength. The results showed that compared to younger subjects (1) elderly subjects took increasingly more trials to criterion as the associative strength decreased; (2) elderly subjects recalled fewer words and took more trials to criterion during relearning; and (3) elderly subjects were significantly slower in time to respond at each level of associative strength during learning and relearning. The findings supported the contention that paired-associate learning was related to level of associative strength, that there was an age-related learning deficit for elderly subjects and that the age differences in paired-associate learning become more marked at low levels of associative strength.

**A68-81227**
**THE ABSENCE OF GASTRIC UREASE IN GERM-FREE ANIMALS.**

A. M. Delluva, K. Markley, and R. E. Davies (Pa., U., School of Vet. Med., Dept. of Animal Biol., Labs. of Biochem. and School of Med., Dept. of biochem., Philadelphia and NiH, Natl. Inst. of Arthritis and Metab. Diseases, Bethesda, Md.).

*Biochimica et Biophysica Act*, vol. 151, Mar. 25, 1968, p. 646–650. 20 refs.

Measurements were made of the urease (urea amidohydrolase, $EC_{3.5.1.5}$) content of the gastric mucosae of conventional, germ-free, and fetal animals to test whether gastric urease arises from microorganisms or is constitutive. Homogenates of gastric mucosae of conventional sheep, dogs, cats, rats, guinea pigs, and chickens; of germ-free rats, guinea pigs, chickens, dogs, cats, and pigs; and of fetal dogs, cats, rats, sheep, and humans were prepared and analyzed for urease activity. There was no urease in the gastric mucosae of the germ-free or fetal animals, although enzymic activity was usually found in the same tissue from their conventional adult counterparts, which had a wide range of enzymatic activity.

**A68-81228**
**ABSENCE OF SIZE CONSTANCY IN VISUALLY DEPRIVED RATS.**

Donald P. Heller (Yeshiva U., New York, N. Y.).

*Journal of Comparative and Physiological Psychology*, vol. 65, Apr. 1968, p. 336–339. 7 refs.

Effects of visual deprivation on the manifestation of size constancy was investigated in a series of experiments. Normally reared rats possessed size constancy, but visual deprivation from the time of parturition precluded its appearance. Rats reared under visual deprivation learned a size discrimination in terms of retinal image size, and, although possessing adequate depth perception, did not coordinate the two processes in order to achieve size constancy. This coordination was accomplished with approximately ten days of visual experience.

**A68-81229**
**THE EFFECTIVENESS OF NIGHT DRIVING GLASSES UNDER PART-TASK SIMULATION.**

Harold L. Henderson, Theodore Kole, and Herbert J. Sheppard (Drivers Safety Serv., Inc., New York, N. Y.).

*American Journal of Optometry and Archives of American Academy of Optometry*, vol. 45, Mar. 1968, p. 170–187. 21 refs.

Two pilot studies with small samples were reported; a series of part-task simulation experiments with 121 subjects, and a follow-up field study on the effects of wearing night driving glasses. The findings in all cases are controversial, with some individuals demonstrating more effective performance with the glasses and others without, although no group trends were statistically significant. Similarly conflicting data were obtained when subjects were interviewed as to the effects of the glasses. It was concluded that more sophisticated research is needed.

**A68-81230**
**EFFICIENCY AND LIMITATIONS OF LASERS AS WEAPONS.**

Jurgen R. Meyer-Arendt (Pacific U., Coll. of Optometry, Forest Grove, Ore.).

*American Journal of Optometry and Archives of American Academy of Optometry*, vol. 45, Mar. 1968, p. 188–191. 6 refs.

One of the many potentialities of the laser is its use as a weapon. Although details cannot be given, some interesting general deductions can be made. In the most conventional application, ground-to-ground, damage to the eye far outweighs any other effects, but atmospheric turbulence at the same time precludes any long-range transmission. Other configurations such as space-to-space and ground-to-space are still in the realm of the exotic.

**A68-81231**
**NECKER CUBE PERSPECTIVE DOMINANCE AS A FUNCTION OF RETINAL DISPARITY.**

Robert H. Cormack and Ruth Arger (Armstrong State Coll., Savannah, Ga.).

*Perceptual and Motor Skills*, vol. 26, Apr. 1968, p. 367–370. 6 refs.

Necker cube reversal rate and dominance of cube orientation were measured for 60 subjects under three conditions of disparity, both with and without steady fixation. Passive instructions were given. Retinal disparity increased mildly the dominance of the orientation consonant with the disparity. This effect was greater without a fixation point. Retinal disparity affected reversal rate, but the presence or absence of a fixation point did not.

**A68-81232**
**SIZE JUDGMENTS OF DISKS PRESENTED AGAINST THE ZENITH SKY.**

J. Orbach and Nariman Solhkhah (Michael Reese Hosp., Inst. for Psychosomat. and Psychiat. Res. and Training, Chicago, Ill.).

*Perceptual and Motor Skills*, vol. 26, Apr. 1968, p. 371–374.
Grants PHS MH-03830 and IMH 1711.

Under unrestricted binocular conditions, up to 120 ft., size judgments were found in an earlier study to conform to the principle of size constancy. Under similar conditions, but with the stimulus displayed against the zenith sky, size judgments departed from size constancy as distance was increased and moved toward visual angle.

**A68-81233**
**TRENDS OBSERVED IN THE TIME ESTIMATION OF THREE STIMULUS INTERVALS WITHIN AND ACROSS SESSIONS.**
G. S. Emley, C. R. Schuster, and B. R. Lucchesi (Mich., U., Med. School. of Dept. of Pharmacol., Ann Arbor).
*Perceptual and Motor Skills*, vol. 26, Apr. 1968, p. 391–398. 6 refs.
Grant AMA 06708.

Five subjects participated in a six-hr. experiment of which the time estimation procedure was a part. The production method with no feedback was used. Subjects produced 30 trials at each of 5-, 15- and 30-sec. intervals. There were two sessions (A.M. and P.M.) on each of nine experimental days. An increasing gradient over the first 30 trials was observed in the group data for the 5 and 15-sec. intervals. There was a decreasing gradient for the 30-sec. interval. These gradients do not occur on the second 30 trials or in subsequent sessions. A decreasing trend in the estimations over days was observed. Mean A.M. estimations were significantly higher than mean P.M. estimations. The regularity and stability of the data may possibly be attributed to the environmental constancy.

**A68-81234**
**WORK CAPACITY OF LONG-TIME RESIDENTS AND NEWCOMERS TO ALTITUDE.**
J. Kollias, E. R. Buskirk, R. F. Akers, E. K. Prokop, P. T. Baker, and E. Picón-Reátegui (Pa. State U., Dept. of Sociol. and Anthropol. and Inst. for Sci. and Eng., Lab. for Human Performance Res., University Park).
*Journal of Applied Physiology*, vol. 24, Jun. 1968, p. 792–799. 13 refs.
Contracts DA-49-193-MD-2260 and DA-49-193-MD-2709

Six well-conditioned runners, six nonathletes (both newcomers to altitude), and eight Peru Indians (high-altitude residents) participated as subjects in a series of maximal and submaximal work tests. Aerobic capacity, as measured by the maximal oxygen intake, expressed per kg. body weight, was similar in Indians and athletes. Nonathletes had the lowest aerobic capacity. Ventilation rates during maximal work were higher in runners and nonathletes than in the Indians. Thus, the Indians evidenced a relative hypoventilation during exercise. Maximum heart rates were similar among all groups. Maximal bicycle riding times and peak work loads were highest in the runners and lowest in the Indians. At comparable high-level work rates, the Indians had a greater oxygen consumption than runners and nonathletes. No significant differences between the nonatheletes and Indians were observed in the recovery oxygen consumptions measured after submaximal exercise at 900 kpm./min., although the Indians tended to have higher values at 1,080 kpm./min. It appears that the newcomer athlete to high altitude has an oxygen transport system relatively equivalent to the Indian native to high altitude. In contrast, the Indian native to high altitude has an oxygen transport system superior to the unconditioned newcomer to altitude.

**A68-81235**
**VENTRICULAR OUTPUT IN CONSCIOUS DOGS FOLLOWING ACUTE VAGAL BLOCKAGE.**
Hubert L. Stone and Vernon S. Bishop (USAF School of Aerospace Med., Aerospace Med. Div. (AFSC), Biodyn. Branch, Brooks AFB, Tex.).
*Journal of Applied Physiology*, vol. 24, Jun. 1968, p. 782–786. 12 refs.

The effect of vagal blockade on ventricular output, mean right and left atrial pressures, heart rate, stroke volume, and mean arterial pressure has been studied in eight conscious dogs without the use of blocking drugs. A coil was implanted around the right vagus nerve trunk in the neck and the left vagus nerve was isolated and cut. Electromagnetic flow probes or Doppler ultrasonic flow probes were implanted around the root of the aorta and catheters were placed in the right and left atria under sterile surgical conditions. Vagal blockade was accomplished on 24 occasions in the eight animals by pumping cold alcohol through the coil around the vagus nerve trunk. Control measurements were taken prior to and during vagal blockade. When the vagus nerve was cold blocked, the ventricular output rose significantly as did the mean arterial pressure. The right atrial pressure tended not to change while the mean left atrial pressure decreased. As the heart rate increased, it was found that a linear decline in stroke volume occurred and that this decline could be described by the equation for a straight line. The changes in ventricular output and stroke volume are discussed.

**A68-81236**
**EFFECTS OF INERT GASES ON TOLERANCE OF RATS TO HYPOXIA.**
Paul D. Altland, Howard F. Brubach, and Milton G. Parker (NIH, Natl. Inst. of Arthritis and Metab. Diseases, Lab. of Phys. Biol., Bethesda, Md.).
*Journal of Applied Physiology*, vol. 24, Jun. 1968, p. 778–781. 15 refs.

Male rats were exposed four hr. in a small chamber to 20.9, 8.3, 6.6, and 4.9% of $O_2$ in either He, $N_2$, A, or $SF_6$. Each hypoxic mixture induced an early hyperpnea followed by a normal or subnormal breathing rate. In 4.9% $O_2$ slow, deep breathing was found earliest and most frequently in rats in $SF_6$ followed by A, $N_2$, and He. A decline in body temperature of 2.1–8.8°C. was found during exposure to hypoxia; the greatest drop occurring in He. At 8.3 and 20.9% $O_2$ the mean body temperature was highest in A, suggesting that A may have a physiological effect. All rats survived four hr. in 8.3% $O_2$ irrespective of the inert gas used. More rats survived four hr. in He-4.9% $O_2$ than in any of the other gases, and the mean arterial $O_2$ saturation of the rats in He was 17% higher than in $N_2$-4.9% $O_2$. Only one rat in A-4.9% $O_2$ survived four hr., and non survived four hr. in $SF_6$-4.9% $O_2$.

**A68-81237**
**MEASUREMENT OF OXYGEN CONSUMPTION OF RAT BONE MARROW CELLS BY A POLAROGRAPHIC METHOD.**
Raymond M. Gesinski, John H. Morrison, and James R. Toepfer (Kent State U., Dept. of Biol. Sci., Ohio).
*Journal of Applied Physiology*, vol. 24, Jun. 1968, p. 751–754. 16 refs.

Comparison of the respiratory rates of bone marrow was made using the Yellow Springs Instrument Co. oxygen monitor, Kirk micro-respirometer, and the conventional Warburg apparatus. Oxygen uptake values were considerably higher in the oxygen monitor than those obtained by manometric methods for cell concentrations ranging from $0.5 \times 10^7$ to $14 \times 10^7$. Oxygen consumption of bone marrow cells measured by the $O_2$ monitor were remarkably

constant over a 30-min. incubation period. Oxidative response of bone marrow cells in the $O_2$ monitor was significantly greater in serum than in Tyrode solution. Oxygen uptake increased with an increase in $O_2$ partial pressure indicating that marrow cells have a high adaptibility for utilizing available oxygen.

**A68-81238**
**A COMPARATIVE EVALUATION OF THREE AEROSOL SENSING METHODS.**
Parker C. Reist and William A. Burgess (Harvard School of Public Health, Dept. of Ind. Hyg., Boston, Mass.).
*American Industrial Hygiene Association Journal,* vol. 29, Mar.–Apr. 1968, p. 123–128. 12 refs
NASA Grant NGR-22-007-053.

Several direct reading methods for aerosol counting and sizing have been suggested in the literature in recent years. This paper reports on an investigation of three proposed techniques; a piezo-electric crystal sensor, an acoustical sensor, and a hot-wire sensing element; and compares their relative merits with each other. It is concluded that the hog-wire anemometer appears to offer the most promise for further development, particularly because of its ability to discriminate between solid and liquid aerosols.

**A68-81239**
**"EFFICIENCY OF ELECTRICAL ACTIVITY" AS A PHYSIOLOGICAL MEASURE OF THE FUNCTIONAL STATE OF MUSCLE TISSUE.**
Herbert A. deVries (Calif. State Coll., Physiol. of Exercise Res. Lab., Long Beach and Southern Calif., U., Dept. of Physiol., Los Angeles).
*American Journal of Physical Medicine,* vol. 47, Feb. 1968, p. 10–22. 11 refs.
NASA Grant NAS 93500

Czechoslovakian investigators have shown that the rate of increase in electrical activity with increasing levels of isometric tension was lower in the muscles of well-trained than in poorly-trained athletes. It was the purpose of this investigation to evaluate this concept of Efficiency of Electrical Activity (EEA) as a physiological approach to the evaluation of the functional state of muscle tissue. A total of 67 college age subjects in four subgroups were tested. The test-retest reliability coefficient for the EEA procedure was found to be $r=0.92$. Validity of the EEA was determined in three experiments with one group. The correlations found between maximum strength and EEA were found to be $-0.75$, $-0.85$, $-0.90$ for the first, second and third experiments respectively. Using EEA as a measure of "quality" and girth as a measure of "quantity" for the prediction of maximal strength in the right elbow flexor group, a multiple correlation of $R=0.93$ was found. On this basis 86.5% of the total variability in muscle strength was accounted for. When maximum strength was increased significantly by training, the EEA was shown to decrease (improve) significantly while control (unexercised) muscles did not change significantly in either strength or EEA. Disuse atrophy brought about by casting one arm showed the expected increase in EEA, compared with no change in the control arm. The series of experiments reported would seem to justify the wider application of the EEA concept wherever a physiological evaluation of muscle function uncontaminated by behavioral factors, such as motivation, is desired. It is suggested that this approach may be used as an operational definition of muscle tonus.

**A68-81240**
**AN AIR LOCK FOR FEEDING ANIMALS IN A SMALL ENVIRONMENTAL CHAMBER.**
Thomas R. Birdwell and Damon E. Phillips (U.S. Naval Radiol. Defense Lab., Biol. and Med. Sci. Div., San Francisco, Calif.).
*Journal of Applied Physiology,* vol. 24, Jun. 1968, p. 834–835.

In designing and constructing a small environmental chamber for irradiation and chronic exposure of mice to hyper- and hypobaric pressures, it was discovered that a simple means was needed for introducing food and water into the chamber throughout the treatment period. It was found that an inexpensive sliding gate valve worked quite satisfactorily as an air lock. This device has facilitated currently conducted experiments in which 12 mice are placed into the chamber and given X-ray irradiation while subjected to hyper- or hypobaric pressure and maintained in the chamber under pressure for periods of one wk. or longer prior to sacrifice.

**A68-81241**
**CONVERSION OF GLUCOSE PHOSPHATE-$^{14}$C TO GLUCOSE-$^{14}$C IN PASSAGE THROUGH HUMAN BRAIN IN VIVO.**
William Sacks and Shirley Sacks (Rockland State Hosp., Res. Center, Orangeburg, N. Y.).
*Journal of Applied Physiology,* vol. 24, Jun. 1968, p. 817–827. 39 refs.
Grants NIMH MY-3666 and NIMH MH-07292.

Using the arteriovenous technique developed in this laboratory, experiments were done in which glucose 6-phosphate-1-$^{14}$C was injected intravenously into humans. Following a single injection, cerebral $^{14}CO_2$ production exceeded that expected from glucose-$^{14}$C uptake. However, the addition of arteriovenous (A-V) glucose phosphate-$^{14}$C differences to A-V glucose-$^{14}$C differences gave values for net A-V $^{14}$C in accord with $^{14}CO_2$ produced. In short-term (6–10 min.) constant-infusion experiments, arterial blood levels of glucose phosphate-$^{14}$C rose sharply, and there was a significant disappearance of glucose phosphate-$^{14}$C across brain circulation (i.e., A-V glucose phosphate-$^{14}$C differences) and a constant addition of glucose-$^{14}$C to venous blood (i.e., V-A glucose-$^{14}$C differences). Glucose-T added to the injected infusion demonstrated that results with glucose phosphate-$^{14}$C were not caused by incomplete mixing or selective handling of the isotope. Similar results were found with glucose 1-phosphate-U-$^{14}$C except that, as expected, $^{14}CO_2$ produced by brain was greater. The evidence indicates that, in passage through brain, glucose 6-phosphate-1-$^{14}$C and glucose 1-phosphate-U-$^{14}$C were partially converted to glucose -$^{14}$C which was either absorbed and metabolized to $^{14}CO_2$ or added to the venous effluent. (Author's Abstract)

**A68-81242**
**MAN'S RESPONSES TO BREATH-HOLD EXERCISE IN AIR AND IN WATER.**
Albert B. Craig, Jr. and William L. Medd (Rochester, U., School of Med. and Dentistry, Dept. of Physiol., N. Y.).
*Journal of Applied Physiology,* vol. 24, Jun. 1968, p. 773–777. 17 refs.
Grant NHI HE 09676.

The pulse rate responses to exercise with or without breath holding were recorded in ten subjects in air and in water. The tachycardia of exercise was less in water (30°C.) than in air. Although apnea decreased the response to exercise, its effect was different from breath holding without exercise where there is a bradycardia when the subject is in water. Pulse rate responses and pulmonary gas exchanges were also examined in four subjects who performed repetitive periods of exercise with apnea in air and in water. Thirty-sec. periods of exercise were alternated with 30 sec. of rest. The pulse rate was less during the exercise than during

the rest, but there were no significant differences between the experiments in air or in water. Pulmonary gas exchanges were identical in each environment. In contrast to underwater swimming, the $PACO_2$ at the end of the periods of apneic exercise varied with the work load. It is suggested that the low $PACO_2$seen after underwater swims is the result of the hyperventilation preceding the exercise. In man, as contrasted to other diving vertebrates, the cardiovascular responses to apnea do not result in either the conservation of $O_2$ or retention of $CO_2$.

**A68-81243**
**THEORETICAL ANALYSIS OF AIRWAY RESISTANCES ON AN INHOMOGENEOUS LUNG.**
R. Peslin (Nancy, U., Fac. de Méd., Lab. de Méd. Exptl., Chaire de Physio-Pathol. Respirat., France).
*Journal of Applied Physiology*, vol. 24, Jun. 1968, p. 761–767. 22 refs.

In the inhomogeneous lung, alveolar pressure is not the same in all the functional units at any given instant of time. The meaning of airway resistance, as measured from rate of flow and mean alveolar pressure at a given time, is considered theoretically. The system studied is a mechanical analog of two pulmonary pathways connected in parallel, each with its own linear flow-resistance and volume-elastic properties. In such a system "apparent" airway resistance varies with flow distribution. When the two compartments have equal gas volumes, apparent resistance is linearly related to relative ventilation of one compartment. Variations of apparent resistance with time are large, but different according to the temporal pressure pattern applied to the whole system. Although local resistances are viscous and linear, apparent resistance is nonlinear as shown by pressure/flow relationships. This apparent airway resistance does not have the same meaning as the total intrapulmonary resistance measured from graphical analysis of transpulmonary pressure.

**A68-81244**
**STUDIES ON HYPOXIA. VI. CHANGES IN LYMPHOCYTES AND TRANSITIONAL CELLS IN THE MARROW DURING THE INTENSIFICATION OF PRIMARY HYPOXIA AND REBOUND.**
J. M. Yoffey, R. V. Jeffreys, D. G. Osmond, M. S. Turner, S. C. Tahsin, and P. A. R. Niven (Bristol, U., Dept. of Anat., Great Britain).
*Annals of the New York Academy of Sciences*, vol. 149, Mar. 29, 1968, p. 179–192. 47 refs.

The bone marrow of the guinea pig was investigated quantitatively both during primary hypoxia for seven days at a simulated altitude of 17,000 ft. and for an additional seven days during the subsequent period of rebound (post-hypoxic polycythemia). During primary hypoxia the marrow not only showed evidence of increased erythropoiesis, but also of a fall in granulocytes and lymphocytes. During rebound, on the other hand, erythropoiesis was depressed, granulopoiesis returned to normal, while lymphocytes and transitional cells showed a striking increase to well above their normal level. The significance of these findings was discussed. The marrow during rebound provides an admirable experimental model for the study of lymphocytes and transitional cells.

**A68-81245**
**EFFECTS OF TESTOSTERONE, COBALT AND HYPOXIA ON ERYTHROPOIETIN PRODUCTION IN THE ISOLATED PERFUSED DOG KIDNEY. PART III. SITES OF ERYTHROPOIETIN PRODUCTION AND APPEARANCE IN TISSUE FLUIDS AND EXTRACTS.**
James W. Fisher and J. W. Langston (Tenn., U., Med. Units, Memphis).
*Annals of the New York Academy of Sciences*, vol. 149, Mar. 29, 1968, p. 75–87. 23 refs.
Grants PHS AM-02973 and PHS GM-5990.

Isolated dog kidneys were perfused with blood at normal and reduced oxygen tensions and with blood containing testosterone or cobalt. Erythropoietin titers were found to be significantly increased in the blood perfusates from kidneys perfused with blood at lowered oxygen tensions while no change in erythropoietin was seen when kidneys were perfused with blood at a normal oxygen tension. Testosterone produced a slight increase in erythropoietin production in perfused kidneys from dogs pretreated for several days with testosterone before perfusion. Cobalt produced significant increases in erythropoietin levels in the perfusates with normal as well as reduced oxygen tension blood, but its effect was more marked when the kidneys were perfused with hypoxic blood. In studies of the histology of all kidneys perfused, most of the kidneys demonstrated varying degrees of glomerular congestion. No correlation was found between erythropoietin elaboration and renal congestion or other degenerative cellular changes in the kidney. Therefore, it is concluded that increased erythropoietin production in the isolated perfused kidney in response to cobalt, testosterone or hypoxic blood is a direct effect of these stimuli on the kidney rather than a release on erythropoietin from injured and disintegrating cells.

**A68-81246**
**STUDIES ON THE ERYTHROPOIETIC EFFECTS OF HYPERBARIC HYPEROXIA.**
James W. Linman (Mayo Clin. and Mayo Graduate School of Med., Rochester, Minn.) and Robert V. Pierre (Veterans Admin. Res. Hosp. and Northwestern U., Med. School, Chicago, Ill.).
*Annals of the New York Academy of Sciences*, vol. 149, Mar. 29, 1968, p. 25–33. 23 refs.
Grants PHS AM-01991, PHS AM-10079, and PHS AM-0954.

The following observations were made during investigations on mice exposed to varying periods of high pressure air and oxygen. Normal mice exposed to a hyperbaric environment (four atma.) exhibited erythropoietic depression manifested by a sharp curtailment in erythrocytic $^{59}Fe$ uptake, reticulocytopenia and morphologic evidence of decreased erythropoiesis. The erythropoietic effects of hyperbaric hyperoxia were in accord with the concept that tissue oxygen tension exerts homeostatic control over erythropoiesis; it was suggested (but not proved) that this suppressive effect is transmitted to the marrow by the humoral regulatory mechanism. Exogenous erythropoietin evoked a clear-cut increase in the incorporation of $^{59}Fe$ in the hemoglobin of mice conditioned by breathing air under pressure. However, certain adverse effects associated with residence in a hyperbaric chamber must be eliminated before hyperbarism can be recommended as the completely acceptable method to prepare animals for erythropoietin assay.

**A68-81247**
**SIMULTANEOUS RECORDINGS OF MONKEY ELECTRO-CORTICOGRAMS AND ELECTROCARDIOGRAMS.**
Franklin M. Taylor and Chester Wilpizeski (VA Hosp., Wilmington, Del.).
*Delaware Medical Journal*, vol. 40, Apr. 1968, p. 105–108.

A relatively simple and successful technique was described for preparing squirrel monkeys with permanent, indwelling cortical and chest-wall electrodes for use in central nervous system and cardiovascular research. Representative electrocardiographic and electroelectroencephalographic tracings are shown.

**A68-81248**
**ELECTROPHYSIOLOGICAL STUDIES OF CENTRAL NERVOUS PERFORMANCE DURING MONOTONY.**
Hannelore Baumann, Rudolf Baumann, Ch. Gurk, and F. Wolter (German Acad. of Sci., Inst. for Cortico-Visceral Pathol. and Therapy, Berlin-Buch, East Germany).
*(German Soc. of Exptl. Med., 5th Symp., Berlin-Buch, Nov. 14–15, 1966).*
*Electroencephalography and Clinical Neurophysiology*, vol. 24, Mar. 1968, p. 259–273. 34 refs.

Latencies and frequencies of occurrence of evoked responses in the 40 msec. after the stimulus were investigated in order to evaluate the changes of excitability in cortical and midbrain structures specially stressed by monotonous flash-click stimulation. Cats with chronically implanted electrodes were subjected to a two hr. stimulation with combined and separate flashes and clicks at regular and stochastic succession. Two combinations of responses were observed: (1) early negative auditory responses, with three to four msec. latency, in the dorso-lateral mesencephalic reticular formation (RF) (type 1) with simultaneous typical evoked responses in the cortex (18 to 38 msec. latency). The auditory RF responses remained stable during waking, fatigue and deep sleep. The later visual RF responses (type 2), however, with latencies of 20 to 34 msec. as well as secondary response components, disappeared when the animals fatigued or when their vigilance diminished. Cortical responses showed simultaneously a corresponding behavior; (2) in the absence of auditory RF responses (type 1) only the relatively long latency (20 to 34 msec.) visual RF responses (type 2) appeared in the medico-caudal mesencephalic RF. These showed electrophysiological signs of inhibition as the alertness of the animals diminished (fatigue), corresponding with the simultaneous cortical reactivity. The mean value comparison of the latencies showed no significant differences in the cortex between regular and stochastic stimulation. However; a drop in cortical alertness from the first to the second test period occurred with both regular and stochastic stimulation. Phasic fluctuations between facilitation and inhibition existed continuously throughout the experiments. After two hr. of regular stimulation they finally led to recovery with improved cortical performance in 63% of all responses. In contrast, after two hr. of stochastic stimulation, a significant drop in cortical responsiveness, corresponding to an impairment of central nervous performance was found in 60% of all responses. On the other hand, the short latency auditory RF responses (type 1) proved to be stable and quite independent of the duration of stimulation. Moreover, they showed no significant differences of latency and response frequency between regular and stochastic stimulation.

**A68-81249**
**THE RELATIONSHIP OF AGE AND RETENTION-INTERVAL ACTIVITY IN SHORT-TERM MEMORY.**
Romualdas Kriauciunas (Kankakee State Hosp., Ill.).
*Journal of Gerontology*, vol. 23, Apr. 1968, p. 169–173. 38 refs.

The correct serial recall of consonant trigrams were measured as a function of age, retention-interval activity and retention time. The 108 subjects, with equal numbers in each of the four age groups (25 to 34, 35 to 44, 45 to 54, 55 to 64 yr.), consisted of female psychiatric aides. The results indicated that, under the conditions of the present study, the short-term memory of trigrams was not a function of age, was independent of variations in the length of the retention interval from six to 18 sec., but was adversely affected by reading material similar to trigrams. The obtained results were more consistent with the interference hypothesis than the expectations based on trace decay model of forgetting.

**A68-81250**
**PLASMA INSULIN AND GROWTH HORMONE DURING 22-HOUR FASTS AND AFTER GRADED GLUCOSE LOADS IN SIX HEALTHY ADULTS.**
W. M. Hunter, J. M. T. Willoughby (Med. Res. Council, Clin. Endocrinol. Res. Unit, Edinburgh, Great Britain), and J. A. Strong (Western Gen. Hosp., U. Dept. of Med. and Dept. of Endocrine and Metab. Diseases, Edinburgh, Great Britain).
*Journal of Endocrinology*, vol. 40, Mar. 1968, p. 297–311. 35 refs.

Plasma insulin and growth hormone were measured by radioimmunoassay in healthy adults during the latter part of 22 hr. fasts and after graded glucose loads. The insulin concentration was less than 8 $\mu$-u./ml. in all fasting samples and in samples taken after the blood glucose had returned to fasting levels. Insulin levels increased with increasing glucose loads. During fasting, growth hormone showed intermittently raised secretion; in some subjects high values were reached at times which could not be related to external events or to stress. Growth hormone levels were consistently low during the absorption of glucose but rose immediately thereafter. This rise occurred increasingly late and reached increasing levels as the glucose loads were made progressively larger. Insulin had almost invariably returned to fasting levels before the growth hormone concentrations began to rise.

**A68-81251**
**BIOENGINEERING ANALYSIS OF FORCE ACTIONS TRANSMITTED BY THE KNEE JOINT.**
James B. Morrison (Strathclyde, U., Bioeng. Unit, Glasgow, Great Britain).
*Bio-medical Engineering*, vol. 3, Apr. 1968, p. 164–170. 14 refs.
Med. Res. Council supported research.

A description is given of experimental techniques devised to study the function of the human knee joint during activity. An engineering analysis has been developed to determine the forces transmitted between the femoral and tibial condyles, and the tensions developed in muscle groups acting across the knee joint in order to control the relative position of the thigh and shank. The results included show the magnitudes and phasic relation of these factors for subjects during normal level walking. Instrumentation is described.

**A68-81252**
**INFLUENCE OF DIAPHRAGM ACTIVITY ON THE MEASUREMENT OF TOTAL CHEST COMPLIANCE.**
Joseph M. Miranda and Ruy V. Lourenco (N. J. Coll. of Med., Dept. of Med., Jersey City).
*(Am. Federation for Clin. Res., Eastern Sect. Meeting, New York City, Dec. 1966).*
*Journal of Applied Physiology*, vol. 24, Jun. 1968, p. 741–746. 21 refs.
Grant PHS HE 08902.

In the present study, diaphragm relaxation during the determination of total chest compliance was assessed with a bipolar electrode introduced through the esophagus to the level of the diaphragm. Normal trained subjects and patients with chronic obstructive lung disease were studied. The results indicate that: (1) relaxation of the diaphragm is seldom present during the measurement of chest wall compliance even in trained subjects; (2) when diaphragm relaxation is not present, values of chest wall compliance are not reproducible and are often incorrect; (3) the electromyogram of the diaphragm provides a useful tool for the monitoring relaxation and can significantly improve the reproducibility and the accuracy of measurements of chest wall compliance; and (4) the abnormally low values of total chest compliance found in this and other studies in patients with chronic obstructive lung disease can be attributed solely to the effects of aging.

A68-81253
**THE "TISSUE" TENSION OF OXYGEN AND ITS RELATION TO HEMATOCRIT AND ERYTHROPOIESIS.**
Eivind B. Thorling and Allan J. Erslev (Jefferson Med. Coll., Cardeza Found. for Hematol. Res., Philadelphia, Pa.).
*Blood*, vol. 31, Mar. 1968, p. 332–343. 20 refs.
Grants PH H-4612, PH H-6374, and PH GRS-1967-33.

The variations in oxygen tension ($P_{O_2}$) in relation to induced changes in the hematocrit were investigated in mouse pneumoperitoneum and rat skin pockets. A close to linear relationship was found in the range of hematocrit from 20 to 60%. Above this hematocrit value, the correlation was lost and no further increase in $P_{O_2}$ was noted with increases in the hematocrit. A tendency to a minor fall in $P_{O_2}$ at very high hematocrit values was observed in both systems, however, the fall was never below normal value. Attempts to induce normovolemic erythrocytosis by exchange transfusions in rat demonstrated that this condition is transient, transforming into a hypervolemic erythrocytosis within hours. In spite of the increasing viscosity of the blood with increases in hematocrit, a hypervolemic erythrocytosis was found to cause a slight increase in tissue $P_{O_2}$ while a normovolemic erythrocytosis did not. Consequently, an accelerated rate of red cell production will have a dual effect on oxygen transport: (1) it will increase the oxygen carrying capacity; and (2) it will increase the blood volume and thereby decrease the peripheral resistance allowing the heart to transport more oxygen at no extra expense.

A68-81254
**LASER DESTRUCTION OF EXPERIMENTAL TUMORS: STATE OF THE ART AND PROTECTION OF PERSONNEL.**
Robert C. Hoye, Grant C. Riggle, and Alfred S. Ketcham (NIH, Natl. Cancer Inst., Bethesda, Md.).
*American Industrial Hygiene Association Journal*, vol. 29, Mar.–Apr. 1968, p. 173–180. 34 refs.

Experiments with high energy neodymium pulsed laser to destroy tumors in mice, rabbits, and monkeys have been conducted at the National Cancer Institute since 1964. These studies indicate that the rapid and precise destruction of localized tumors is possible. When combined with other anticancer modalities a three to four fold improvement in the cure rate of tumor has occurred. These encouraging results have been overshadowed by secondary effects associated with the laser–tissue interaction. These effects of pressure and varying degrees of cellular damage result in the dissemination of viable tumor into the air and tissue planes resulting in lethal secondary tumor growths. During the course of these studies, protection of laser personnel has been a prime consideration. For the safe operation of equipment, warning beacons, door interlocks, remote operation facilities and special environment conditions are all necessary. Various devices for the containment of the particles in the laser plume have been developed and successfully used.

A68-81255
**CHANGES IN BLOOD VOLUME DURING ABSOLUTE FASTING WITH AND WITHOUT SODIUM CHLORIDE ADMINISTRATION.**
Henrik Maagoe (Odense County and City Hosp., Dept. of Internal Med., Denmark).
*Metabolism*, vol. 17, Feb. 1968, p. 133–138. 16 refs.

Investigations were made of the blood volume of 13 obese patients during ten days of absolute fasting. In seven of the patients, a decrease in blood volume between 200 and 1,200 ml. was found, corresponding to 14% on the average. On the assumption that the changes occurred secondarily to a loss of sodium, the other six patients received 90 mEq. $Na+$ daily as sodium chloride during the fast. Under these conditions, the decrease in blood volume was significantly reduced, but the hypernatriuresis still occurred and weight loss continuously exceeded what could be expected on a caloric basis. Absolute fasting with sodium supply was found to eliminate the otherwise observed increase in blood volume under refeeding. However, the regimen could only diminish to some extent the weight gain in this situation. The possible mechanisms involved are discussed. It appears probable that changes in the production of aldosterone, as well as the hypernatriuresis produced, plays a great part in the problem.

A68-81256
**SORBENTS AND CATALYSTS FOR RESPIRATOR CARTRIDGES AND GAS MASK CANISTERS.**
David G. Hannan and C. R. E. Merkle, Jr. (Mine Safety Appliances Co., Pittsburgh, Pa.).
*American Industrial Hygiene Association Journal*, vol. 29, Mar.–Apr. 1968, p. 136–139.

The sorbent materials presently used in respirators include activated charcoal, soda lime, silica gel, molecular sieves, alkaline silicates, and impregnated charcoals. Design parameters of the sorbent bed which must be considered are baffling, tension on layers, packing uniformity, packing density, and both velocity and depth of bed. The selection of a sorbent depends on two groups of factors: (1) protection provided to the wearer, integrity of properties, and compatibility with proposed use; and (2) subcritical factors such as cost, bulk, weight, and ease of manufacture. To be effective, the best respirator must still be worn and maintained properly.

A68-81257
**EFFECTS OF SENESCENCE ON THE TEMPORAL RESOLUTION OF SOMESTHETIC STIMULI PRESENTED TO ONE HAND OR BOTH.**
Seymour Axelrod (N. Y., State U., Dept. of Psychiatry, Buffalo), Larry W. Thompson (Duke U., Durham, N. C.), and Louis D. Cohen (Fla., U., Gainesville).
*Journal of Gerontology*, vol. 23, Apr. 1968, p. 191–195. 15 refs.
Grants PHS K3-MH-5787 and PHS NB-06862.

The threshold for successiveness of paired electrical stimulations of the fingers was measured in young and senescent men under four conditions: (a) both stimuli to one hand (unimanual); (b) first stimulus to one hand, second stimulus to the other (bimanual), with hands close together; (c) bimanual, with hands spread apart; and (d) bimanual, with forearms crossed. The temporal thresholds were systematically higher in the senescent group than in the young group. In both groups, thresholds increased from (a) to (b) to (c) to (d). The increases were greater in the senescents than in the young subjects.

A68-81258
**TOLERANCE CURVES OF CARBON DIOXIDE DURING REBREATHING IN NORMAL SUBJECTS, PULMONARY EMPHYSEMA AND OBESITY.**
Ernest Pevny and Norbert Scheida (Komensky U., Med. School, Clin. of Phys. Therapy and Res. Inst. of Phys. Med., Balneol. and Climatol., Bratislava, Czechoslovakia).
*Diseases of the Chest*, vol. 53, Apr. 1968, p. 470–475. 24 refs.

The tolerance curves for $CO_2$ were investigated in 11 normal subjects, eight patients with pulmonary emphysema and seven with obesity using the rebreathing method for $CO_2$. The tolerance curves were shifted to the right in emphysema and obesity

in contrast to normal subjects for the beginning of hyperventilation by higher partial pressures of alveolar $O_2$. The correlation of these values with arterial $CO_2$ tension was significant only in obesity. The character of the curves and the degree of hyperventilation were not significantly different from that in normal subjects. This confirms the postulate that the decreased response of the respiratory center to $CO_2$ is the primary factor in the decreased respiratory response to $CO_2$ in emphysema and obesity. The values of partial pressures of $O_2$ and $CO_2$ at the termination of the investigation confirmed the elimination of hypoxic stimulus.

**A68-81259**
**THE EFFECT OF CARBON DIOXIDE ON ERYTHROPOIESIS. PART VIII. SUBJECTS RELATED TO THE PHYSIOLOGY OF ERYTHROPOIETIN.**
José Faura, Clifford W. Gurney, and Walter Fried (Chicago, U., Depts. of Med. and Physiol. and Argonne Cancer Res. Hosp., Chicago, Ill.).
*Annals of the New York Academy of Sciences*, vol. 149, Mar. 29, 1968, p. 456–461. 11 refs.
Grants PHS 1-F05-TW-922-01 and PHS F2-AM-20,919-01A1.

The effect of carbon dioxide on the ability to respond to hypoxis was investigated in mice. High inspired $PCO_2$ suppressed the erythropoietic response to administration of gas mixtures containing a low partial pressure of $O_2$. It did so by decreasing the production of erythropoietin. Five percent $CO_2$ in the inspired air of anemic mice did not impair their ability to produce erythropoietin. It was suggested that high inspired $PCO_2$ suppresses erythropoietin production by inducing hyperventilation, thereby increasing $HbO_2$ saturation and the delivery of $O_2$ to the tissues.

**A68-81260**
**STIMULATION SEEKING AFTER SEVEN DAYS OF PERCEPTUAL DEPRIVATION.**
P. E. Gendreau, N. Freedman, G. J. S. Wilde, and G. D. Scott (Queen's U., Kingston, Ontario, Canada).
*Perceptual and Motor Skills*, vol. 26, Apr. 1968, p. 547–550. 7 refs.
Grant SGD T.B. 654702.

Ten maximum security prison inmates underwent perceptual deprivation for seven days. There were ten controls. After seven days deprivation the deprived subjects sought a lower level of visual input and about the same level of auditory input as controls which was comparable to their own pre-test behavior. These results were discussed in terms of recent theory and research results in stimulation seeking.

**A68-81261**
**MOTOR SKILLS BIBLIOGRAPHY: LXXXVII. PSYCHOLOGICAL INDEX NO. 30, 1923.**
R. B. Ammons and C. H. Ammons (Mont., U., Missoula).
*Perceptual and Motor Skills*, vol. 26, Apr. 1968, p. 569–570. 57 refs.

Fifty-seven items on motor skills are listed alphabetically.

**A68-81262**
**INTERACTION OF HYPOXIA AND FOOD DEPRIVATION ON PATTERNS OF LOCOMOTOR BEHAVIOR IN RATS.**
Martin J. Gerben (U.S. Army Res. Inst. of Environ. Med., Natick, Mass.).
*Perceptual and Motor Skills*, vol. 26, Apr. 1968, p. 571–575.

Eight male rats were allowed 20 min. of free running in an activity wheel under normoxic (21% $O_2$) and hypoxic (8% $O_2$) conditions. In Experiment one, subjects were not food deprived. In Experiment two, subjects were food-deprived. Analogue records were taken of the speed of the wheel over time. Results indicated that the reduction of activity associated with hypoxia was related to increased duration of stopping periods. Characteristics of locomotor behavior within "bursts" of running showed relatively little change. Hypoxia generally had a greater effect on several aspects of the running behavior of nondeprived rats than on the behavior of deprived rats. Results are interpreted in terms of the effect of motivation on behavior under hypoxic conditions.

**A68-81263**
**MAGNETIC FIELDS AND ORIENTING MOVEMENTS IN MOLLUSKS.**
Stanley C. Ratner and Joseph W. Jennings (Mich. State U., East Lansing).
*Journal of Comparative and Physiological Psychology*, vol. 65, Apr. 1968, p. 365–368. 9 refs.
Grant NIH GM 08967.

The feeding structures, radulae, of six species of mollusks, including three of amphineura, two of snail, and one of limpet, were dissected and tested for responses to magnetic fields. The radulae of the amphineura, which are reported to contain magnetite, responded readily to above-normal magnetic fields; 59 live specimens of *Chaetopleura apiculata* were tested with magnetic fields ranging from normal to 8,000 gauss. Subjects moved more in normal magnetic fields than in above-normal fields.

**A68-81264**
**MOTOR SKILLS BIBLIOGRAPHY: LXXXVIII. PSYCHOLOGICAL INDEX NO. 31, 1924.**
C. H. Ammons and R. B. Ammons (Mont., U., Missoula).
*Perceptual and Motor Skills*, vol. 26, Apr. 1968, p. 620–622. 57 refs.

Fifty-seven selected items on motor skills are listed alphabetically.

**A68-81265**
**EFFECT OF CONFINEMENT UPON SUBSEQUENT ACTIVITY.**
Richard K. Lore (Rutgers–The State U., Douglass Coll., New Brunswick, N. J.).
*Journal of Comparative and Physiological Psychology*, vol. 65, Apr. 1968, p. 372–374. 11 refs.
Rutgers U. Res. Council supported research.

Using ultrasonic motion detectors, sensitive to both small restless movements and locomotion, rats confined for 40 days were found to be more active immediately following release and again during two novel cage tests given eight and 16 days after release than controls. Home cage activity, recorded during the intervening 13 days, did not differ. In a second experiment, 24 hr. of confinement failed to produce hyperactivity when subjects were tested in either the home cage or a novel cage. The results of both studies are inconsistent with the notion of an independent activity drive.

**A68-81266**
**COLONIC TEMPERATURE RESPONSE OF RATS DURING EXERCISE.**

Philip D. Gollnick and C. David Ianuzzo (Wash. State U., Exercise Physiol. Lab., Pullman).
*Journal of Applied Physiology,* vol. 24, Jun. 1968, p. 747–750. 30 refs.

The effect of varying work loads on the colonic temperature of rats trained to run for sustained periods of time at speeds between 1.0 and 2.0 m.p.h. has been investigated. Resting colonic temperature and heart rate were found to be 37.3 ± .18° C. and 332 ± 14 beats/min., respectively. During normal activity at night, colonic temperature rose to 38.4 ± .41° C. A rise in colonic temperature to 39.4 ± .21° C. occurred when the animals were placed in the stationary treadmills prior to exercise. Exercise was begun and continued 1.0 m.p.h. until colonic temperature plateaued. The speed of the treadmills was then increased to 1.33 m.p.h. until a second stabilization of colonic temperature occurred. Finally, the running speed was increased to 2.0 m.p.h. and the animals continued to run until exhausted. Colonic temperature stabilized at 40.2 ± .05 and 40.5 ± .10° C., respectively, at speeds of 1.0 and 1.33 m.p.h. A continual rise in colonic temperature occurred until the animals became exhausted during the 2.0 m.p.h. run. Final colonic temperature at exhaustion was 41.8 ± .30°C. A heart rate of 508 ± 12 beats/min. was recorded shortly after onset of exhaustion. These findings indicate that running at speeds of 1.0 m.p.h. or faster is a strenuous metabolic stress for rats and that the colonic temperature of rats does increase as a function of work load.

**A68-81267**
**PHYSIOLOGICAL VARIATIONS OF INSULIN OUTPUT IN URINE.**
Juan Jose Gagliardino (Hosp. for Sick Children, Res. Inst., Toronto, Canada).
*Metabolism,* vol. 17, Feb. 1968, p. 139–147. 30 refs.
Grant MRC, Canada MT-1202.

The diurnal variation of insulin output in urine was studied in normal rats. Two major determinants seem to regulate this parameter; namely, food intake and circadian rhythm. In addition, the influence of the latter can be suppressed by changing the time at which the animals are fed. The effect of a glucose tolerance test and a tolbutamide test on the output of urinary insulin was also studied. Although some delay in urinary elimination was observed, the changes paralleled the plasma insulin levels.

**A68-81268**
**TEMPORAL ESTIMATION IN THE PERCEPTION OF OCCLUDED MOTION.**
Horace N. Reynolds, Jr. (Cornell U., Ithaca, N. Y.).
*Perceptual and Motor Skills,* vol. 26, Apr. 1968, p. 407–416. 21 refs.
Contract Nonr 14-67-A-0077-0005 and Aerospace Med. Res. Labs. supported research.

Subjects were shown a rectangular object which moved transversely across their field of view and passed behind an opaque screen. The purpose was to investigate some of the factors affecting estimates of the time required for the occluded moving object to travel a given distance behind the screen. The factors selected for study were (1) method of viewing the moving object (pursuit, static fixation), (2) background structure (homogeneous, textured), and (3) object size. According to previous studies, these variables affect the perceived speed of a moving object and might therefore be expected to affect estimates of the duration of occluded traversal. The results did not show statistically significant differences among experimental groups, although data trends are discussed. An additional finding was that subjects significantly overestimated the duration of occluded traversal, consistent with a tendency to overestimate traversal distance. The experiment is related to Michotte's studies of "amodal perception" and discussed in terms of Gibson's stimulus information approach to perception.

**A68-81269**
**IMPROVEMENT OF RECOGNITION ON A MULTI-MODAL PATTERN DISCRIMINATION TEST.**
Daniel Cappon, Robin Banks, and Craig Ramsey.
*Perceptual and Motor Skills,* vol. 26, Apr. 1968, p. 431–441. 15 refs.

A multi-modal test of pattern discrimination, including vision, hearing, active and passive touch, is described. It measures changes in veridicality of recognition as a result of two kinds of treatment: variation in pattern definition or context and practice effects. The test consists essentially of stable familiar geometrical figures in the foreground against a background of graduated "noise" in the same modality as the embedded figure. Two-hundred-forty subjects, divided into four groups (one of each modality) were employed. Subjects were exposed to corrective feedback, repeated exposure or a control condition and to a random presentation of varying background for each of the foreground figures in a particular modality. Results indicated that both practice and background noise level affected veridicality of recognition.

**A68-81270**
**RATE OF ADAPTATION UNDER CONSTANT AND VARIED OPTICAL TILT.**
Sheldon M. Ebenholtz and Deborah Mayer (Wis., U., Madison).
*Perceptual and Motor Skills,* vol. 26, Apr. 1968, p. 507–509. 5 refs.
Grant NIMH MH-13006-02.

Two groups of eight subjects were exposed either to a constant optical tilt (Group C) of 30° for one-half hr. or to a series of prism tilts that varied from 5° to 30° in 5° increments every 5 min. (Group V). The rate of change in level of adaptation per unit time was significantly greater for Group V than Group C. The relation between these results and implications from the assumption of a comparator were discussed.

**A68-81271**
**A HOMOGENEOUS FIELD FOR LIGHT ADAPTATION.**
Henry W. Mertens (Civil Aeromed. Inst., Oklahoma City, Okla.).
*Perceptual and Motor Skills,* vol. 26, Apr. 1968, p. 521–522.

A light-adaptation device which creates a homogeneous field is described. It can be used easily between observations in space perception experiments to reduce sensitivity of the eyes to stray light in the experimental display and does not itself introduce extraneous cues.

**A68-81272**
**SHORT-TERM MEMORY, INDIVIDUAL DIFFERENCES, AND SHIFT PERFORMANCE IN CONCEPT FORMATION.**
Edwin Martin (Mich., U., Ann Arbor).
*Journal of Experimental Psychology,* vol. 76, Apr. 1968, p. 514–520. 10 refs.
Contract AF 49(638)-1235.

Using simple stimuli generated by four othogonal binary dimensions, 96 subjects solved two successive concept-formation problems. Between the two tasks, subjects recalled backwardly the most recent stimuli presented. When solution criterion was 8/8,

subjects who solved the original task rapidly did not differ from those who solved it slowly in recall of relevant and irrelevant stimulus attributes. Upon a nonreversal shift, subjects who were rapid solvers on the original task remained rapid solvers on the shift task. When a 40/40 overlearning criterion was imposed, those subjects who solved rapidly exhibited a backward memory deficit for relevant attributes and had difficulty with the shift task, whereas those who solved slowly exhibited a lengthened backward span and solved the shift task rapidly. There was a strong overlearning effect, but it was limited entirely to those subjects who solved the original task slowly.

**A68-81273**
**DISRUPTION OF THE CIRCADIAN RHYTHM OF TWO SPECIES OF MILLIPEDES BY LOW-LEVEL GAMMA RADIATION.**

Stacia Brandon (La. State U., Dept. of Zool., Baton Rouge).
*Proceedings of the Louisiana Academy of Sciences,* vol. 30, 1967, p. 70–73.
Grant NSF GY-767.

The nocturnalism of *Oxidus gracilis* and *Pachydesmus c. crassicutus* was established as circadian when tested under constant dim light, 21° ± 1°C., and 74 ± 2% relative humidity. After exposure to $CO^{60}$ radiation at six levels ranging from 1.3 rads to 3,800 rads, activity was tested under the same conditions. *O. gracilis* irradiated with 1.3 rads showed a diminished rhythm, and the circadian rhythm had disappeared in both species by the 1,980-rad level. Finally, radiation *O. gracilis* at each of the six levels was followed by three days of exposure to a controlled photoperiod approximating the current conditions for July. This resulted in a resumption of nocturnalism in all levels at which it had been destroyed.

**A68-81274**
**THE EFFECT OF HOSPITALIZATION AND ANTIBIOTIC THERAPY ON THE GRAM-NEGATIVE FECAL FLORA.**

H. D. Rose and J. Schreier (Marquette U., School of Med., Div. of Med. and Veterans Admin. Hosp., Med. Serv., Milwaukee, Wis.).
*American Journal of the Medical Sciences,* vol. 255, Apr. 1968, p. 228–236. 21 refs.

The fecal carrier rate of the common gram-negative bacilli was determined in 234 patients on the day of admission to the Medical Service of a large Veterans Administration hospital. One hundred of the original 234 patients remained hospitalized for a sufficient duration to permit a repeat study on the 21st hospital day. Fifty of these patients served as controls and did not receive antibiotics. There was no significant change in the fecal carrier rate in this group. All of the 50 patients comprising the second group received at least a five day course of antibiotic therapy (median 10.1 days) for an underlying infection. The total number of strains of gram-negative bacilli other than *Escherichia coli* isolated after three wk. was significantly greater than at the time of admission. The carrier rate of *Klebsiella pneumoniae* increased from 10 to 34%. Penicillin G, ampicillin, and antibiotic combinations caused the greatest alteration in the fecal flora. The acquisition of gram-negative bacilli other than *E. Coli* in the stools of hospitalized patients was secondary to antibiotic therapy and did not occur solely as the result of exposure to the nosocomial flora.

**A68-81275**
**BEHAVIOR OF ELECTRORETINOGRAPHIC OSCILLATORY POTENTIALS DURING ADAPTATION TO DARKNESS.**

V. DeMolfetta, D. Spinelli, and F. Polenghi (Milan U., Ophthalmol. Clin., Italy).
*(Ital. Ophthalmol. Soc., 50th Congr., Florence, Oct. 1, 1967).*
*Archives of Ophthalmology,* vol. 79, May 1968, p. 531–535. 13 refs.

The behavior of electroretinographic potentials during the course of dark adaption was studied in 30 humans after different preadaptation conditions. After preliminary dazzling with 1,500 apostilb (asb [=150 ml.]), the electroretinographic curve was determined in darkness immediately after dazzling, after 15 min. preadaptation to an ambient photopic illumination of 15 asb (=1.5 ml.), and after 15 min. in complete darkness after dazzling. The results clearly showed that the oscillatory potentials are materially influenced by the different preadaptation conditions. It was concluded that the results support the hypothesis of the dependence of oscillatory potentials on retinal photopic function.

**A68-81276**
**EFFECT OF TRANSAMINE AND IPRAZID ON THE MONOAMINOXIDASE ACTIVITY IN MIDBRAIN AND OPTIC LOBES OF THE BRAIN [VPLYV TRANSAMINU TA IPRAZYDU NA AKTYVNIST' MONOAMINOKSYDAZY SEREDN'OHO MOZKU I ZOROVYKH CHASTOK KORY HOLOVNOHO MOZKU].**

O. P. Hotovtseva (UkrSSR, Acad. of Sc., Inst. of Biochem., Kiev).
*Ukrains'kyi Biokhimichnyi Zhurnal,* vol. 40, no. 1, 1968, p. 7–10. 15 refs. In Ukrainian.

An effect was studied of large and small doses of transamine and iprazide on the monaminoxidase (MAO) activity of the midbrain and optic lobes of the animal brain. The effect of large doses of transamine was studied in adult dogs, the other investigations were conducted on puppies. The large doses of transamine and iprazide inhibited MAO activity in the midbrain of the animals under investigation more than that in the optic lobes of the brain. Small doses of transamine decreased by 50.3 to 45.6% MAO activity in the midbrain and exerted negligible inhibiting effect or had absolutely no effect on MAO activity in the optic lobes of the puppy brain. Small doses of iprazide did not affect MAO activity in the midbrain and optic lobes of the puppy brain.

**A68-81277**
**RESEARCH ON THE POTENTIATION OF TOXICITY IN THE ASSOCIATION OF INDUSTRIAL SOLVENTS. II REPORT. CHRONIC INTOXICATION BY INHALATION IN RATS USING DIFFERENT DOSAGES OF BENZOL AND ETHYL ACETATE [RICERCHE SUL POTENZIAMENTO DELLA TOSSICITA NELLA ASSOCIAZIONE DI SOLVENTI INDUSTRIALI. NOTA II—INTOSSICAZIONE CRONICA PER VIA INALATORIA DI RATTI A DIVERSI DOSAGGI DI BENZOLO E DI ACETATO DI ETILE].**

G. Catenacci, U. Maugeri, and G. Poggi (Pavia, U., Ist. di Med. del Lavoro, Italy).
*Lavoro Umano,* vol. 19, Oct. 1967, p. 463–478. 8 refs. In Italian.

Chronic intoxication was induced by inhalation for 30 days in rats, respectively by benzol (200, 400, 600, and 800 p.p.m.) and ethyl acetate (2,000, 4,0000, 6,000, and 8,000 p.p.m.); the body weight and the blood picture were controlled at the beginning, during and at the end of the intoxication. At the end of the intoxication the animals were killed and the weights of the various organs compared with those of the control animals. On the basis of the obtained data it was proposed to produce an intoxication by associating the two solvents at the doses of 800 p.p.m. (benzol) and 4,000 p.p.m. (ethyl acetate) in order to study a possible mechanism of potentiation of the toxic action.

**A68-81278**
**ELECTRORETINOGRAPHIC RESPONSES OF THE RABBIT AFTER X-IRRADIATION.**
Sumana K. Devi, Edgar F. Riley, and Charlotte A. Burns (Iowa, U., Dept. of Ophthalmol. and Radiation Res. Lab., Iowa City).
*Investigative Ophthalmology,* vol. 7, Apr. 1968, p. 219–226. 14 refs.
Contract AEC AT (11-1)-1024 and Grant NIH NB-03354.

The inhibitory effects of 250 KVP X-radiation on the electroretinographic response (ERG) of the rabbit were investigated. Rabbits were exposed (head only) to either a single dose ranging from 3,000 rad to 8,000 rad or to a fractionated dose, two doses of 3,000 rad each with an interval of five da. ERG responses of the dark adapted eyes of the rabbit were determined prior to exposure and at various intervals from 30 min. to one wk. (two to eight wk. in a few cases) after irradiation. At 30 min. after a dose of 5,700 rad or more, the b-wave was extinct and the a-wave nearly so. Both the a- and b-waves were extinct at one hr. after 6,000 rad. No recovery was evident from the ERG responses obtained during the first three wk. after 6,000 rad. At 30 min. after a dose in the range from 3,000 to 5,500 rad, the amplitudes of the a- and b-waves were inversely related to dose. In this dose range, various recovery patterns were indicated. After a single dose of 3,000 rad, no significant changes in the ERG response were found at 30 min., the amplitudes of the a- and b-waves were about 60% of the control mean at one day, and the amplitudes were in the normal range by the third wk. indicating a complete recovery. When a dose of 6,000 rad was fractionated, the amplitudes of the a- and b-waves were 10 to 15% of the control mean at 30 min. after the second dose of 3,000 rad. The amplitudes had increased to 32 to 36% at seven da. after irradiation indicating some recovery.

**A68-81279**
**RELATIONSHIP OF LIPID AND CARBOHYDRATE METABOLISM IN WOMEN DURING FASTING.**
R. Rath, J. Mašek, V. Brodan, E. Kuhn, K. Zvolánková (Inst. of Human Nutr., Prague, Czechoslovakia).
*Review of Czechoslovak Medicine,* vol. 13, no. 4, 1967, p. 231–237. 28 refs.

Obese and normal-weight women were subjected to a five-day fast, and comparisons of the glucose, ketone body, NEFA, blood levels and lower urinary excretion of vanilmandelic acid were made. During fasting significant relations were found between plasma NEFA and glucose levels in obese women ($r = 0.4125$) and controls ($r \approx 0.949$); in both groups they differ significantly. The relationship between NEFA and ketone body levels during fasting has an exponential character; from NEFA levels above 1.0 E/ml. practically only the level of ketone bodies rises. From a comparison of the influence of oral glucose on NEFA and ketone body levels before and after the five-day fast, it was assumed that fasting leads to a delayed drop of fatty acid oxidation after glucose administration. In an interpretation of a slighter response of obese subjects to fasting, the possibility of enzyme adaptation of tissue to the prolonged more ample supply of fatty acids as energy substrate was hypothetically considered.

**A68-81280**
**MECHANISM OF PHYSICAL WORK ON CHOLESTEROL METABOLISM. COMMUNICATION I. EFFECT OF PHYSICAL WORK ON THE CONTENT AND SYNTHESIS OF CHOLESTEROL [K MEKHANIZMU DEISTVIIA FIZICHESKOI RABOTY NA OBMEN KHOLESTERINA. SOOBSHCHENIE I. VLIIANIE FIZICHESKOI RABOTY NA SODERZHANIE I SINTEZ KHOLESTERINA].**
IU. I. Rodionov and V. I. IAkubovskaia (Karaganda Med. Inst., Dept. of Biochem., Kazakh SSR).
*Ukrains'kyi Biokhimichnyi Zhurnal,* vol. 40, no. 1, 1968, p. 51–56. 25 refs. In Russian.

Two and ten hr. physical work in untrained rats was accompanied by an increase of cholesterol synthesis intensity in the liver from acetate-1-$C^{14}$ and the rise of specific activity in the blood cholesterol. The degree of this effect was directly proportional to the duration of work. Regular (30 day) training decreased considerably the cholesterol synthesis in the liver and the fulfillment of work on the background of training increased this index again though less markedly, than in untrained ones. As a result of the work of the trained and untrained animals the rise of acetylating capacity in the liver was found; the degree of this rise is directly proportional to the duration of work. The content of cholesterol in the liver increased only after durable work. Under these experimental conditions the decrease is noted of sterine level in the blood, skeletal muscles, heart, brain and suprarenals.

**A68-81281**
**TASK VARIABLES AND THE EFFECTS OF RESPONSE-CONTINGENT STIMULUS CHANGE ON DISCRIMINATION PERFORMANCE.**
F. Robert Treichler and Sally J. Way (Kent State U., Ohio).
*Journal of Experimental Psychology,* vol. 76, Apr. 1968, p. 671–673. 5 refs.

Human subjects were tested on discrimination tasks under four different conditions of display termination. Six tasks composed of different numbers of correct and incorrect alternatives were presented and comparatively better performance was observed on almost all tasks when postchoice conditions included display of the correct alternative. Although the task characteristics influenced difficulty, the postresponse conditions showed substantial generality and the basis of their distinctive influences was considered.

**A68-81282**
**COMPONENTS OF HR RESPONSE IN ANTICIPATION OF REACTION TIME AND EXERCISE TASKS.**
William G. Chase, Frances K. Graham, and David T. Graham (Wis., U., Madison).
*Journal of Experimental Psychology,* vol. 76, Apr. 1968, p. 642–648. 16 refs.
Grants NIH HD01490 and NIH K3-MH-21,762.

Two experiments examined cardiac-rate changes during the four-sec. foreperiod of a reaction-time task involving either exercise or the traditional button-push response. three components of the heart-rate (HR) response were identified: (a) an initial deceleration to the READY signal, (b) an intermediate component which stabilized below prestimulus level in anticipation of a button-push but accelerated in anticipation of exercise, and (c) a deceleration immediately preceding the GO signal. The initial deceleration appeared to be an unconditioned orienting reflex to the READY signal and the deceleration preceding the GO signal, a conditional "attention" response. It was suggested that two factors determined cardiac response: energy requirements and stimulus reception requirements.

**A68-81283**
**INTERACTION OF ALCOHOL WITH INCENTIVE AND WITH SLEEP DEPRIVATION.**
R. T. Wilkinson and W. P. Colquhoun (Med. Res. Council, Appl. Psychol. Res. Unit, Cambridge, Great Britain).
*Journal of Experimental Psychology, vol. 76, Apr. 1968, p. 623–629. 11 refs.*
Med. Res. Council supported research.

Twenty-eight enlisted men carried out a 30-min. choice serial reaction test four times under all possible combinations of alcohol (A) (70 cc. of 90.5% proof spirit 45 min. before testing) and placebo (P) (a similar non-alcoholic drink) with 30-hr. sleep deprivation (SD) and normal sleep (NS). In accuracy the adverse effect of A was reduced by SD. In speed scores it was reduced in low blood-alcohol subjects but increased in high ones. In Experiment II knowledge (KR) and no knowledge (NKR) of results replaced the variables of SD and NS. KR increased the adverse effect of A upon speed and, marginally, upon accuracy. Behaviorally a moderate dose of alcohol appears to act as an arouser not a depressant, except, in susceptible subjects who have lost sleep.

**A68-81284**
**AN OBSERVATION OF PERSONNEL IN THE CARBON DISULFIDE HAZARD WITH SPECIAL REFERENCE TO THE DEVELOPMENT OF ARTERIOSCLEROSIS [SLEDOVANI ZAMESTNANCU Z RIZIKA SIROUHLIKU SE ZAMERENIM NA ROZVOJ ARTERIOSKLEROZY].**
Ivana Prerovská and Zdenék Roth.
*Pracovni Lekarstvi,* vol. 20, Jan. 1968, p. 6–10. 21 refs. In Czech.

A group of 50 persons aged 18 to 42 yr. and exposed to carbon disulfide, was investigated for the average values of cholesterol, phospholipids and beta-lipoproteins. All mean values were found to be significantly increased. However, the values of the exposed workers fluctuated round the upper limit of normal values; that is, they were not pathologic. Twenty workers were investigated six yr. after the original examination. No clinical signs of sclerotic changes on vessels were found, the serum levels of lipids proved to fall into physiological range and not to differ significantly from the control group or the values of the original examination. In relation with this finding, the question of biochemical test data of groups of different sizes is discussed. Objective data were obtained only from workers of the original 30 who left the risk job because of general health states. One of them underwent myocardial infarction, while no clinical signs of premature vessel sclerosis were found in the other persons. In spite of the relatively small number of examined workers, the authors arrived at the conclusion that an arteriosclerosis stimulating effect of carbon disulfide should be considered very carefully.

**A68-81285**
**CELLULAR MECHANISMS OF OXYGEN TOXICITY.**
Niels Haugaard (Pa., U. , School of Med., Dept. of Pharmacol., Philadelphia).
*Physiological Reviews,* vol. 48, Apr. 1968, p. 311–373. 355 refs.
Grant NIH HE-01813 and Am. Heart Assn. supported research.

A review concerned primarily with the basic metabolic mechanisms of oxygen toxicity in plants and animals was presented. Three major topics were considered: (1) cellular mechanisms of oxygen toxicity; (2) mechanisms of oxygen poisoning in the intact animal; and (3) agents that modify the toxic effects of oxygen. Extreme caution was suggested in cases of the clinical application of hyperbaric oxygen.

**A68-81286**
**WHIPLASH INJURY AND BRAIN DAMAGE.**
Ayub K. Ommaya, Fred Faas, and Philip Yarnell (Natl. Inst. of Neurol. Diseases and Blindness, Branch of Surg. Neurol., Bethesda, Md.).
*Journal of the American Medical Association,* vol. 204, Apr. 22, 1968, p. 285–289. 16 refs.
Naval Air Systems Command supported research.

Experimental whiplash injury in rhesus monkeys has demonstrated that experimental cerebral concussion, as well as gross hemorrhages and contusions over the surface of the brain and upper cervical cord, can be produced by rotational displacement of the head on the neck alone, without significant direct head impact. These experimental observations have been studied in the light of published reports of cerebral concussion and other evidence for central nervous system involvement after whiplash injury in man.

**A68-81287**
**PAIRED-ASSOCIATE LEARNING WITH SIMULTANEOUS AND SEQUENTIAL PRESENTATIONS.**
W. H. Jack.
*Journal of Experimental Psychology,* vol. 76, Apr. 1968, p. 574–578. 10 refs.

In this paired-associate learning experiment, simultaneous, and sequential presentations of the dyads were used to determine which of the two methods was more effective for learning and to determine why one method of presentation was superior to the other. There were 120 subjects placed into a three variable analysis of variance design with 15 subjects per cell. It was found that simultaneous presentation of dyads was superior to sequential presentation where the total display time was short (in the range of one or two sec.). The optimal total time in the simultaneous condition was about two sec. while the optimal total time for the sequential condition was about four sec.

**A68-81288**
**AN EXAMINATION OF TRACE STORAGE IN FREE RECALL.**
Norman J. Slamecka (Vt., U., Burlington).
*Journal of Experimental Psychology,* vol. 76, Apr. 1968, p. 504–513. 28 refs.
Grant NSF GB-2590.

A series of six free recall experiments was carried out to determine if traces of stored items are organized in relation to each other, or whether they are stored independently. The procedure involved providing one group with some of the list items at recall, and comparing its recall of the remainder with that of a group which had no items provided. Results strongly indicated that trace storage in these tasks was independent. A dual-component memory hypothesis was discussed in which perception of the general list structure forms the basis for a retrieval plan which then operates upon the independently stored traces.

**A68-81289**
**MICROELECTRODE RECORDING OF SINGLE UNIT RESPONSES FROM THE INFERIOR COLLICULUS AND MEDIAL GENICULATE BODY TO ACOUSTIC STIMULI OF VARIOUS FORMS AND INTENSITIES [DIE MIT MIKROELEKTRODEN ABLEITBARE REAKTION EINZELNER ELEMENTE DES COLLICULUS INFERIOR UND DES CORPUS GENICULATUM MEDIALE AUF AKUSTISCHE REIZE VERSCHIEDENER FORM UND VERSCHIEDENER INTENSITAT].**
E. David, P. Finkenzeller, S. Kallert, and W. D. Keidel (Erlangen–Nürnberg, U., I. Physiol. Inst., West Germany).
*Pflügers Archiv für die gesamte Physiologie,* vol. 299, Feb. 8, 1968, p. 83–93. 10 refs. In German.

To evaluate the activity variations of single neurons as a function of stimulus intensity the discharges of single elements were recorded extracellularly with microelectrodes from colliculus inferior and geniculate mediale. Noise bursts, tone bursts and clicks served as stimuli. It was found that the number of response patterns in the PST-histogram can be classified into a few groups

characterized by a ground type. These groups were described and the frequency distribution of 129 single elements of nine cats was studied with regard to the classification. The intensity function of single elements was studied on the basis of Ranke's adaptation theory and the curve was discussed. A simple scheme was shown to describe the relation between the intensity functions of single elements and that of element complexes.

**A68-81290**
**ARMY AEROMEDICAL EVACUATION PROCEDURES IN VIETNAM.**
Spurgeon Neel (Army, Dept., Office of the Surgeon Gen., Washington, D. C.).
*(Natl. Conf. on Rural Health, 21st, Seattle, Mar. 29, 1968).*
*Journal of the American Medical Association,* vol. 204, Apr. 22, 1968, p. 99–103.

Army aeromedical evacuation procedures in Vietnam provide service so that no soldier is more than 35 min. away from a medical facility capable of giving definite, resuscitative life-saving treatment. The use of the helicopter as a life-saving vehicle has not yet reached its full potential. The experiences that the Army Medical Service has gained in utilization of helicopter ambulances can and should be translated to comparable civilian emergency health programs.

**A68-81291**
**EXCITATION OF SUBJECTIVE LIGHT PATTERNS (PHOSPHENES) IN HUMANS BY SINUSOIDAL MAGNETIC FIELDS [ANREGUNG VON SUBJEKTIVEN LICHTERSCHEINUNGEN (PHOSPHENEN) BEIM MENSCHEN DURCH MAGNETISCHE SINUSFELDER].**
D. Seidel, M. Knoll, and J. Eichmeier (Tech. Hochschule, Inst. für Tech. Elektron., Munich, West Germany).
*Pflügers Archiv die gesamte Physiologie,* vol. 299, Feb. 8, 1968, p. 11–18. 25 refs. In German.

Subjective light patterns which appear "spontaneously" or as a result of electrical impulse stimulation are known as phosphenes. The patterns produced by electrical stimulation can be divided into about 15 different groups all of which represent elementary geometrical forms. It is shown in this paper that by means of a coil which is placed around the head, phosphenes can be stimulated by magnetic induction also. In the encephalographic frequency range the necessary induction is about 200 to 1,000 Gauss. Thirty subjects observed 39 patterns which are identical with geometrical phosphenes from groups already known from electrical stimulation experiments. However, there is a difference between the percentage of occurrence of magnetic and electrical patterns. Similar results were found in a second professional group of subjects (20 air force pilot applicants). The measured parameters of stimulation define a "range of stimulation" or a "range of existence" of magnetic phosphenes which is analogous to the "range of existence" for electrical phosphenes. Considerations about the conductivity distribution in a model of the head make it probable that an increase in density of induced stimulation currents near good-conducting media (for instance near the bulbi and, therefore, near the retina) might be the reason for the magnetic stimulation of phosphenes.

**A68-81292**
**AGE AND CHOICE REACTION TIME.**
Yoshiyuki Morikiyo, Hiroyasu Ilda, and Akira Nishioka.
*Journal of Science of Labour,* vol. 43, Nov. 1967, p. 636–642. 13 refs. In Japanese.

No significant differences were noted between occupational groups. In general, the choice reaction time in younger groups fits well with the model of dichotomous classification. This fact seems to suggest that younger persons are superior to older persons in skilled performance of information processing.

**A68-81293**
**MEDICAL APPLICATIONS OF DUST-FREE ROOMS. II. ELIMINATION OF AIRBORNE BACTERIA FROM AN OPERATING THEATER.**
Lewis L. Coriell, Gerard J. McGarrity (Inst. for Med. Res., Camden, N. J.), and William S. Blakemore (Pa., U., School of Med., Graduate Hosp., Dept. of Surg., Philadelphia).
*Journal of the American Medical Association,* vol. 203, Mar. 18, 1968, p. 1038–1046. 30 refs.
Grant PHS CA-04953-07 and John A. Hartford Found. supported research.

A clean room of the type constructed for the National Aeronautics and Space Administration (NASA) program for assembly of spacecraft in a dust-free environment was studied for its effect on airborne microorganisms in an operating suite. Using a combination of high efficiency particulate air (HEPA) filters and a plenum type of vertical air flow, it was possible to essentially eliminate airborne bacteria from ambient air throughout the operating room within minutes after starting the air filter system. Microbiological monitoring of 14 operations in the clean room showed that viable particulates in the operative field were reduced 10- to 18-fold within two to three min. after turning on the filter. This is a practical method for reducing airborne dust and bacteria and has many potential applications in a hospital.

**A68-81294**
**FUNCTION OF THERMORECEPTIVE STRUCTURES IN THE CERVICAL SPINAL CORD OF THE GUINEA PIG [ZUR FUNKTIONSWEISE THERMORECEPTIVER STRUKTUREN IM CERVICALMARK DES MEERSCHWEINCHENS].**
Wolf Wünnenberg and Kurt Brück (Marburg/Lahn, U., Physiol. Inst., West Germany).
*Pflügers Archiv für gesamte Physiologie,* vol. 299, Feb. 8, 1968, p. 1–10. 18 refs. In German.
Deut. Forschungsgemeinschaft supported research.

Shivering can be inhibited in the guinea pig by local heating of the spinal segments $C_6$–$Th_1$, experiments were carried out with guinea pigs whose cervical spinal cord was partially or totally transsected at $C_5$. It could be shown that the function of the thermosensitive structures ($C_6$–$Th_1$) was not impaired after destruction of the grey matter and interruption of the lateral and dorsal tracts at the level of $C_5$. However, after transsection of the tracts anterior to the ventral horns shivering could no longer be blocked by heating the segments $C_6$–$Th_1$. It is concluded from these experiments that the thermosensitive spinal neurons can be regarded as "thermosensors" of an intracranial controller.

**A68-81295**
**UTILIZATION OF STIMULUS ELEMENTS IN PAIRED-ASSOCIATE LEARNING.**
Eugene A. Lovelace and Elliott M. Blass (Va., U., Charlottesville).
*Journal of Experimental Psychology,* vol. 76, Apr. 1968, p. 596–600. 8 refs.
Grant NIH MH-11956.

Four experiments are reported which provide evidence of the amount and kind of stimulus selection which occurs in paired-associated (PA) learning as a function of type of stimulus trigram and stage of learning. Three types of trigrams were employed: (a) medium M CCCs, (b) low M, pronounceable CVCs, and (c)

English word CVCs. After learning six trigram-digit pairs to a criterion of 3/6, 6/6, or 50% overlearning (OL), subjects were shown individual letters of the trigrams and asked to recall the associated digit. R-S recall measures and subjects' reports of how they learned were obtained. More selection was evidenced for CCCs than low M CVCs, but for both the initial letters were selected. OL produced better performance on all three element positions for CVCs, but seemed effective only on first letters for CCCs.

**A68-81296**
**DELAYED RECALL AND THE SERIAL-POSITION EFFECT OF SHORT-TERM MEMORY.**
John C. Jahnke (Miami U., Coral Gables, Fla.).
*Journal of Experimental Psychology,* vol. 76, Apr. 1968, p. 618–622. 11 refs.
Contract AF 33(615)-2224 and Grant PHS MH 12343-01.

The present study examined the serial recall of lists of 6, ten, and 15 words after filled retention intervals of zero, three, nine, or 18 sec. Recall was inversely related to retention interval; most forgetting occurred within three sec. The primary effect of delay was to interfere with the recall of terminal items for each length of list: serial-position curves showed strong primacy and little or no recency, in contrast to those obtained with immediate recall.

**A68-81297**
**PERCEPTION AND RETENTION OF FAMILIAR AND UNFAMILIAR MATERIAL.**
Bruce Earhard (Dalhousie U., Halifax, Canada).
*Journal of Experimental Psychology,* vol. 76, Apr. 1968, p. 584–595. 27 refs.
Grant DRB, Canada 9401-32.

Three experiments were designed to examine the role of perception and retention as determinants of the difference in the accuracy with which briefly presented familiar and unfamiliar verbal material can be identified. There was no evidence of a difference between the two types of material in terms of the amount of visual detail which could be discriminated during a brief exposure. However, when detailed retention of the letter structure was required, familiar material was identified with more accuracy than was unfamiliar material, and the difference in accuracy of identification depended upon the amount of visual detail that had to be retained and reported.

**A68-81298**
**THE EFFECT OF TRAINING UNDER HYPOXIC CONDITIONS ON THE RESPIRATORY GAS EXCHANGE, MORPHOLOGICAL AND ENZYMATIC CHANGES IN BLOOD AND THYROID GLAND ACTIVITY [WPLYW TRENINGU W WARUNKACH HIPOKSJI NA WYMIANE GAZOWA ZMIANY MORFOLOGICZNO–ENZYMATYCZNE KRWI I CZYNNOSC TARCZYCY].**
I. Wojcieszak, I. Malarecki, B. Obuchowicz, and M. Wilk.
*Wychowanie Fizyczne i Sport,* vol. 11, no. 4, 1967, p. 81–93. 30 refs. In Polish.

Sixteen students were examined for the effect of training under conditions of hypoxia (oxygen content 15% and 10%) on work capacity development of physiological adaptation of the respiratory system, circulation, changes in blood and thyroid gland activity. The training consisted of work on a bicycle ergometer with the load of 1,050 kg./min. for four to six min. a day for 21 days. Submaximal and maximal effort while breathing a 15% oxygen mixture was applied before and after training. The pulmonary ventilation, oxygen consumption, carbon dioxide and oxygen tension in alveolar air, rate and arterial blood pressure were determined in the last minute of submaximal work. The cellular composition of blood, the hemoglobin concentration, the hematocrit index, the number of reticulocytes and the activity of the alkaline phosphatase in the neutrophil leucocyte were determined before and after training. The level of free thyroid hormones in blood was determined during the same periods of time by an indirect method. The results indicate that the three-wk. training increased the maximal work capacity in all groups and reduced the physiological cost of standard work in groups training under conditions of lowered oxygen content. It was found, on the other hand, that the training had no effect on blood components or on the activity of the alkaline phosphatase in the neutrophil leucocyte. It was also found that the training increased the level of free thyroid hormones in blood. The results indicate that it is possible to apply training under conditions of hypoxia as a form of pre-acclimatization.

**A68-81299**
**THE ANALYSIS OF GEOMETRIC OPTICAL ILLUSIONS THROUGH VECTOR FIELDS [DIE ANALYSE GEOMETRISCH-OPTISCHER TAUSCHUNGEN DURCH VEKTORFELDER].**
Günter Lehmann (Georg-August-U., Inst. für Psychol., Göttingen, West Germany).
*Zeitschrift für Experimentelle und angewandte Psychologie,* vol. 14, no. 3, 1967, p. 442–462. 9 refs. In German.

Geometric optical illusions are operationally defined as subjective distortions of figure-elements caused by figure-elements of the background. This suggests the hypothesis, that, like in the theory of elasticity, the distortions can be predicted by tensor fields depending on the form of the distorting background figure. A model is developed which explains the special case of the illusions of the lengths of straight lines within geometric figures by line integration of a constant vector field over these lines. A mathematical method is developed for approximating the field functions of the distorting background elements from empirical data. The method is demonstrated in an experiment of reproductions of the length of a variable straight line near a constant straight line which acts as a distorting background figure. The graphical illustrations of the field derived from the data show that its strength increases from a low plateau around the distorting line with growing distance. In addition the field shows two low-strength vertical extensions at the ends of the distorting line which possibly account for the T-illusion. The objective length of the distorting line can be derived with an accuracy of ±3% from the form of its field calculated from the illusions alone. Several variations of length illusions (T-illusions and the illusions of the sides of angles as part of the Müller–Lyer-illusion) can be predicted significantly from the independently derived field. Finally there is developed a mathematical approach to the composition of fields of distorting figures by fields of their point elements.

**A68-81300**
**VESTIBULAR INFLUENCES ON PRIMARY AFFERENTS IN THE SPINAL CORD.**
W. A. Cook, Jr., A. Cangiano, and O. Pompeiano (Pisa, U., Cattedra II, Ist. di Fisiol. Umana, Italy).
*Pflügers Archiv für die gesamte Physiologie,* vol. 299, Mar. 20, 1968, p. 334–338. 13 refs.
Grant PHS NB 05695-03.

In the decerebrate cat, repetitive stimulation of the VIIIth cranial nerve elicits dorsal root potentials in the lumbar cord at the same threshold frequency responsible for extrafusal contraction of extensor muscles. Excitability measurements indicate that presynaptic depolarization of Group I fibers from both flexor and extensor muscles as well large cutaneous afferents contribute to these dorsal root potentials. These findings suggest that the vestibular system can depress the orthodromic transmission of somatic afferent impulses to spinal motoneurons at presynaptic level just at the time descending vestibular volleys elicit motoneuronal discharge.

**A68-81301**
**INPUT–OUTPUT RELATION OF THE VESTIBULAR SYSTEM DURING SLEEP AND WAKEFULNESS.**
G. L. Lenzi, O. Pompeiano, and T. Satoh (Pisa, U., Cattedra II, Ist. di Fisiol. Umana, Italy).
*Pflügers Archiv für die gesamte Physiologie*, vol. 299, Mar. 20, 1968, p. 326–333. 14 refs.
Grant PHS NB 05695-03 and IBRO/Unesco supported research.

In unrestrained, unanesthetized cats a mass discharge can be recorded from the medical longitudinal fasciculus at mesencephalic level on single shock stimulation of the VIIIth cranial nerve. Latency measurements indicate that the potential is due to monosynaptic excitation of second order vestibular neurones. The changes in amplitude of this response have been investigated during physiological sleep and wakefulness. In particular the monosynaptic response is not affected during quiet wakefulness and synchronized sleep, nor during desynchronized sleep in the absence of ocular movements. A depression of the orthodromic potential, however, occurs during the transient orienting reaction elicited by arousing stimulations, and also during desynchronized sleep at the time of the rapid eye movements. The nature of this depression is discussed.

**A68-81302**
**OXIDATIVE PHOSPHORYLATION OF MITOCHONDRIA FROM BROWN FAT [OXYDATIVE PHOSPHORYLIERUNG DURCH MITOCHONDRIEN AUS BRAUNEM FETTGEWEBE].**
Hans–Jürgen Hohorst and Johannes Rafael (Marburg, U., Physiol.-Chem. Inst., West Germany).
*Hoppe–Seyler's Zeitschrift für Physiologische Chemie*, vol. 349, Feb. 1968, p. 268–270. 10 refs. In German.
Deut. Forschungsgemeinschaft supported research.

Isolation of mitochondria from brown adipose tissue of newborn rabbits and cold-acclimatized rats was carried out by a modified method. The mitochondria did not show respiratory control with Krebs-cycle-intermediated, glycerol-3-phosphate or palmitoylcarnitine. Preincubation in a medium containing high concentration of adenosine triphosphate restored respiratory control, the inhibitory effect of oligomycin and the stimulation of respiration by 2,4-DNP. Experiments with guanosine triphosphate under the same conditions considerably increased the restoration effect.

**A68-81303**
**RAPID-RESPONSE ATMOSPHERIC OXYGEN MONITOR BASED ON FLUORESCENCE QUENCHING.**
I. Bergman (Central Labs., Min. of Power, Safety in Mines Res. Estab., Sheffield, Great Britain).
*Nature*, vol. 218, Apr. 27, 1968, p. 396.

A monitor utilizing a fluorescent material exposed to exciting radiation was described. The monitor, based on fluorescence quenching, is used for measuring the partial pressure of oxygen in a gas. Specifications were given for one prototype instrument, and its response to nitrogen, air and oxygen was tabulated.

**A68-81304**
**PHYSIOLOGICAL AND PSYCHOLOGICAL INVESTIGATIONS ON ACTIVE REST IN INDUSTRIAL WORKS [FIZJOLOGICZNE I PSYCHOLOGICZNE BADANIA NAD WYPOCZYNKIEM CZYNNYM W ZAKLADACH PRACY].**
I. Wojcieszak, H. Lamers, and A. Pobudkowski.
*Wychowanie Fizyczne i Sport*, vol. 11, no. 4, 1967, p. 95–104. 15 refs. In Polish.

The aim of the investigations was to follow up the effects of "active rest" on work, productivity, state of health and the feeling of well-being, as well as to establish practical recommendations for the methods of active rest whose purpose is to speed up the regeneration of the forces of the worker. The investigations were carried out at the Electronic Valve Plant , the Computing Centers of the Polish State Railways and the Central Statistical Office. The observations were carried out for six mo. on 88 women (aged 18 to 28 yr.) in four groups. Two groups performed physical exercises during work breaks, while two groups had no recreational breaks during work at all. The evaluation of the effect of active rest was based on medical examinations, measurements of the arterial blood pressure, pulse rate, vital capacity, time of free breath holding, muscle strength, trunk flexibility and reaction of the cardiovascular system to a functional test (30 squat downs). The measurements were supplemented by psychological test. The investigations showed that recreational exercises during work result in an increase in vital capacity, a prolongation of the time of free breath holding, an increase in trunk flexibility, a faster return to rest values of the pulse rate and blood pressure after standard effort, and better results in the tests for the exactness of observation and the faculty of calculating. The ten min. spent daily for gymnastic exercises did not bring about a decrease in the daily output. Active rest is apparently the most effective and natural method for eliminating psychophysical fatigue in work which requires concentration of attention.

**A68-81305**
**DESYNCHRONIZATION OF CIRCADIAN RHYTHMS WITHIN AN ISOLATED GROUP [DESYNCHRONISATIONEN CIRCADIANER RHYTHMEN INNERHALB EINER ISOLIERTEN GRUPPE].**
Ernst Pöppel (Max-Planck-Inst. für Verhaltensphysiol., Seewiesen und Erling-Andechs, West Germany).
*Pflügers Archiv für die gesamte Physiologie*, vol. 299, Mar. 20, 1968, p. 364–370. 11 refs. In German.
NASA Grant NSG-259-62 and Bundesmin. für Wiss. Forsch. supported research.

In order to test whether social interaction is sufficient for synchronization of circadian rhythms, a group of four men were isolated. The subjects lived for three wk. under constant conditions in an underground bunker. For each subject were measured: periods of sleep and wakefulness, volume (ml./hr.) and concentration of electrolytes of each urine sample and body temperature during sleep. On several days the subjects were tested with psychological questionnaires. During the first half of the experiment, the subjects lived synchronized with each other; they had an average activity period of 26.2 hr. In the second half of the experiment, three subjects lengthened their activity period to 27.2 hr. One subject lived with a shorter activity period (24.1 hr.) desynchronized from the group. The increase of body temperature during sleep and the course of urine excretion, which is interpreted as beat, indicate that this subject was in fact synchronized in his activity period with the group during the first half of the experiment, but that the rhythm of the vegetative functions was free running with another period (internal desynchronization).

**A68-81306**
**THE FILTER "URS" FOR PURIFICATION OF WATER [FILTR TYPU "URS" DO OCZYSZCZANIA WODY].**
Stafania Haman and Jadwiga Kelus.
*Roczniki Państwowego Zakladu Higieny*, vol. 18, no. 3, 1967, p. 267–276. In Czech.

The results of bacteriological and chemical assays performed have provided evidence that the water filter "URS" retains bacteria of the size $0.5 \times 0.5 \div 1.0\mu$, and decreases coloration and oxidizability of water. After the elimination of some technical faults, the device can be applied for filtering water contaminated only with bacteria but correct in chemical composition.

**A68-81307**
**DYNAMICS OF RESPIRATORY WAVES OF THE INTRACRANIAL PRESSURE DURING TRANSVERSE ACCELERATION UP TO 40 $G_x$ [DINAMIKA DYKHATEL'NYKH VOLN VNUTRICHEREPNOGO DAVLENIIA PRI POPERECHNYKH PEREGRUZKAKH DO 40 ED].**
IU. E. Moskalenko, G. B. Vainshtein, and I. I. Kas'ian.
*Izvestiia Akademii Nauk SSSR. Seriia Biologicheskaia*, no. 6, Nov.–Dec. 1967, p. 843–850. 20 refs. In Russian.

Intracranial, pleural and tracheal pressure and chest mechanograms of 28 dogs anesthetized with urethan were monitored during exposure to transverse accelerations of 2 to 40 g. The test animals were rotated in a centrifuge with a radius of 4.2 m. The exposure of dogs to transverse accelerations was accompanied by an increase of the amplitude of respiratory waves of the intracranial pressure proportional to the acceleration levels. This was due to greater pressure gradients of the pleural respiration cycle relation to the protective spasm of the glottis during accelerations up to 10 g. During exposure of animals to accelerations over 12 g. the phenomenon took place due to additional bronchial compression caused by blood accumulation in lung vessels, the compression of lungs by acceleration forces and pulmonary edema. In most of the experiments the physiological protection against acceleration effects gave rise to a drop of the intracranial pressure during the inspiration. This was not observed in 10–15% of the experiments due to the deficiency of protective reactions. The mechanical effect of respiration on the general blood circulation and brain circulation increases in proportion to the transverse acceleration value, caused by the contraction of air passages. A rapid return to normal of the intracranial and pleural pressure after the exposure gives evidence for the tolerance of brain circulation to transverse accelerations.

**A68-81308**
**HYGIENIC ASPECTS OF THE APPLICATION OF POLYVINYL CHLORIDE TUBES IN WATER SUPPLIES [ASPEKTY HIGIENICZNE STOSOWANIA RUR Z POLICHLORKU WINYLU DO ZAOPATRZENIA LUDNOSCI W WODE].**
Celina Sikorowska and Grazyna Jutkiewicz.
*Roczniki Państwowego Zakladu Higieny*, vol. 18, no. 4, 1967, p. 433–438. 16 refs. In Polish.

The influence of polyvinyl chloride tubes on the quality of water was investigated. It was found that the polyvinyl chloride tubes, made in Poland, contaminate water initially with lead. The content of the lead in water was dependent on the time of the primary flushing. Therefore, a method for flushing the polyvinyl chloride pipes of water conduits was determined so that the water was not contaminated with lead after 48 hr. contact.

**A68-81309**
**AN ASSAY ON UTILITY OF THE DETERMINATION OF PYRUVIC ACID IN URINE FOR EVALUATING THE FATIGUE [PROBA OCENY PRZYDATNOSCI OZNACZANIA KWASU PIROGRONOWEGO W MOCZU, JAKO WSKAZNIKA ZMECZENIA].**
Lech Zdunkiewicz and Elzbieta Polus-Szeniawska.
*Roczniki Państwowego Zakladu Higieny*, vol. 18, no. 4, 1967, p. 447–452. 15 refs. In Polish.

In a group of boys, ages 12 to 15 yr., assays of pyruvic acid in urine, tests of drawing letters, static endurance and flicker tests were performed before and after the boys performed school work. Results of the respective tests were compared with the content of pyruvic acid in urine. Some correlations found between results of the tests and quantities of excreted pyruvic acid provide evidence that the pyruvic assay might be useful in evaluating the degree of fatigue as one of the tests applied.

**A68-81310**
**STUDIES OF INTESTINAL MICROFLORA. V. FECAL MICROBIAL ECOLOGY IN ULCERATIVE COLITIS AND REGIONAL ENTERITIS: RELATIONSHIP TO SEVERITY OF DISEASE AND CHEMOTHERAPY.**
Sherwood L. Gorbach, Laila Nahas, Andrew G. Plaut, Louis Weinstein, James F. Patterson, and Ruven Levitan (Tufts U., School of Med., Dept. of Med. and New England Med. Center Hosp., Infectious Disease Serv. and Gastroenterol. Serv., Boston, Mass.).
*Gastroenterology*, vol. 54, Apr. 1968, p. 575–587. 27 refs.
Grants PHS 5TIAI-276, PHS AI-6365, and PHS AM-09332.

Quantitative and qualitative microbiological studies of the stools were carried out in 25 patients with untreated ulcerative colitis and regional enteritis. The mild to moderately ill patients with idiopathic ulcerative colitis were noted to harbor a fecal microflora very similar to that of healthy individuals. However, those with regional enteritis and severe ulcerative colitis had increased numbers of coliforms in their stools. Treatment of ulcerative colitis with salicylazosulfapyridine (Azulfidine) tended to increase the numbers of some microbial species, especially Gram-positive forms. These changes did not appear to be related to the severity of disease or the effectiveness of treatment. In a group of normal individuals receiving drug or placebo in a double blind study, salicylazosulfapyridine caused no definite alterations in the fecal microflora. Systemic corticosteroid therapy of ulcerative colitis resulted in little change in the intestinal flora. Modest decreases in the number of fecal coliforms appeared to be associated with clinical improvement.

**A68-81311**
**A STUDY ON THE RESTING METABOLISM AND THE NUTRITIONAL REQUIREMENT.**
Kokichi Numajiri.
*Journal of Science of Labour*, vol. 43, Dec. 1967, p. 679–682. 17 refs. In Japanese.

Estimations of energy requirements/day are made by means of the relative metabolic rates (RMR) of various activities. RMR values of various types of industrial work were measured by the Institute for Science of Labour and the data collected were published as a data book. In calculating the daily energy expenditure, and also in determining RMR as indicators of work metabolism, the resting metabolism including specific dynamic actions of food and metabolism due to some muscular and visceral activities were considered. Repeated determinations in field surveys and experiments revealed that the resting metabolism was fairly constant and was about 1.2 times as much as the basal metabolism. In usual cases of estimating nutritional requirement/individual for food supply in industries it was found that the food supply would not meet the actual requirements of half the members concerned unless 10% were added to the estimated requirement.

**A68-81312**
**CHANGES IN THE LEVEL OF CERTAIN METABOLIC COMPONENTS IN THE BLOOD OF MAN AT REST AND AFTER WORK IN LOWERED ATMOSPHERIC PRESSURE. [ZMIANY POZIOMU NIEKTORYCH SKLADNIKOW METABOLICZNYCH WE KRWI U CZLOWIEKA W SPOCZYNKU I PO PRACY W OBNIZONYM CISNIENIU ATMOSFERYCZNYM].**
W. Missiuro, Z. Sarol, E. Walajtys, and L. Tomaszewska.
*Wychowanie Fizyczne i Sport*, vol. 11, no. 4, 1967, p. 37–51. 24 refs. In Polish.

The results are presented of determinations of some metabolic component levels in the blood of young, clinically normal men during a stay in lowered atmospheric pressure (525 mm. Hg and 462 mm. Hg) at rest and after work on a cycloergometer under

a work load of 1,050 kg./min. for ten min. The levels of lactate, pyruvate, free fatty acids, lactate dehydrogenase (LDH) activity, and acid-base equilibrium were determined. The elevation of the lactate level during work in an atmospheric pressure of 525 mm. Hg was less distinct than after the same work load in normal atmospheric pressure. A more distinct elevation of the blood lactate level was observed after work in the atmospheric pressure of 462 mm. Hg. The pyruvate level and the LDH activity were elevated after work in lowered atmospheric pressure, and the character of these changes was similar in both experimental conditions (525 mm. Hg and 462 mm. Hg). After the work in lowered atmospheric pressure, changes in acid-base equilibrium were observed that can be described as a metabolic acidosis after the Astrup classification. It was stated that the character of the changes observed was in correlation with the physical fitness of the subjects.

**A68-81313**
**ADAPTIVE CAPACITY OF BOYS AGED 9–17 TO WORK IN HYPOXIA [ZDOLNOSCI ADAPTACYJNE DO PRACY W WARUNKACH HIPOKSJI U CHLOPCOW W WIEKU 9–17 LAT].**
W. Missiuro, I. Wojcieszak, H. Lamers, and I. Malarecki.
*Wychowanie Fizyczne i Sport,* vol. 11, no. 4, 1967, p. 25–36. 16 refs. In Polish.

Changes in the physiological indices and the reaction of subjects at various stages of development to the load of muscular work under normal conditions and under conditions of a reduced oxygen content in the inspired air were investigated. The investigation was carried out on a group of boys aged nine to 17 yr. and students of physical education. The boys performed standard work (450 kgm./min.) for three min. and individual maximal work (from 675 kgm./min. to 1,350 kgm./min.) under normal conditions and when breathing with a 15% mixture of oxygen in nitrogen. Physical education students performed only maximal work (1,500 to 1,800 kgm./min.). The pulse rate was registered telemetrically during work. Pulmonary ventilation and oxygen consumption were determined in the final min. of standard and maximal work, and the arterial blood pressure was determined directly after work. It was found that the standard effort applied in the case of younger groups approximated their maximal possibility. The reaction of the subjects to standard effort was expressed in a higher acceleration of the pulse rate in the younger groups and a higher oxygen consumption in relation to body weight. Both these indices are in inverse proportion to the age of the subjects. The maximal work capacity increases with age. The same applies to the maximal pulmonary ventilation and the oxygen consumption. A compensatory increase in pulmonary ventilation with a simultaneous deterioration of oxygen utilization and a decrease in the actual oxygen consumption was registered in all subjects under conditions of hypoxia. Working time under conditions of hypoxia was shortened in all subjects. The results obtained indicated that mechanisms of adaptation and compensation for work under conditions of hypoxia and maximal work capacity develop with age.

**A68-81314**
**NOISE HABIT [NAVYK NA HLUK].**
Stefan Kubik.
*Pracovni Lekarstvi,* vol. 20, Jan. 1968, p. 22–24. 6 refs. In Czech.

A certain degree of noise adaptation may be observed in practice. The investigation of several vegetative reactions of the organism in noise environments proved that a noise adaptation may develop; however, the adaptation is possible only up to a certain noise level. The adaptation develops only in such cases where the acoustic signals bring some positive information and/or a positive attitude of the workers toward the noise. All higher intensities of noise act unfavorably on humans, irrespective of the personal attitude to them. It was concluded, that all levels of noise exceeding the established limits act upon the organism unfavorably. Therefore, workers should be protected from being exposed to dangerous levels of noise.

**A68-81315**
**BENZENE CONTENT IN SOME SOLVENTS IN CZECHOSLOVAKIA AND ABROAD AND THE POISONING HAZARD BY BENZENE CONNECTED WITH THEIR USE [OBSAH BENZENU V NEKTERYCH ROZPOUSTEDLECH U NAS I V ZAHRANICI A NEBEZPECI OTRAVY BENZENEM PRI JEJICH POUZITI].**
Alexandr Fuchs.
*Pracovni Lekarstvi,* vol. 20, Jan. 1968, p. 12–17. 21 refs. In Czech.

The content of benzene in technical-grade petrols and lacquer toluene was reviewed in detail. The analysis of technical standards showed that benzene content in technical-grade petrol and lacquer toluene has not exceeded six % and was below one % in most of the petrols and about four to five % in the case of lacquer toluene. The situation in Czechoslovakia was compared with those in several other countries. The six % content of benzene in solvents was considered to lead to unfavorable working conditions by the analysis of exposure of workers in such production where glues are dissolved in technical-grade petrol and on the basis of literature data. It was concluded that the benzene in solvents and preparations will have to be gradually decreased to as low as one %.

**A68-81316**
**RESULTS OF INVESTIGATIONS ON ADAPTATION TO SPORT EFFORTS AT MEDIUM ALTITUDES DURING THE II INTERNATIONAL SPORTSMEN'S WEEK IN MEXICO IN 1966 [WYNIKI BADAN ADAPTACJI DO WYSILKOW SPORTWYCH NA SREDNICH WYSOKOSCIACH W CZASIE II MIEDZYNARODOWEGO TYGODNIA SPORTOWEGO W MEKSYKU 1966].**
I. Malarecki, J. M. Szajewski, and S. Krzepkowski.
*Wychowanie Fizyczne i Sport,* vol. 11, no. 4, 1967, p. 105–112. 11 refs. In Polish.

Changes were observed in pulmonary ventilation and oxygen consumption during submaximal and maximal work and the level of hemoglobin and erythrocyte count during a 14 to 17 day training period in Mexico City. It was found that during the first two days the oxygen consumption during submaximal work dropped by 4% in comparison with previous levels, and reached the starting level after 14 to 17 da. During maximal work, on the other hand, the values amounted to –19% and –12% respectively, which indicates a marked deterioration of working conditions during strenuous efforts and the impossibility of full adaptation in the course of the 14 to 17 da. involved. Similarly, the pulmonary ventilation during maximum work expressed in standard values (STPD) in Mexico was lower than in Warsaw. This shows that the increase in the pulmonary ventilation registered under BTPS conditions was insufficient for compensating the reduced partial oxygen pressure in ambient air. It was found also that the content of hemoglobin and the number of red blood cells during the training period in Mexico increased by about 20%. This increase was evidently more rapid and slightly higher in sportsmen subjected to heavier training loads.

**A68-81317**
**THE REACTION OF THE RESPIRATORY AND CIRCULATORY SYSTEMS TO STATIC EXERCISES IN BOYS AGED 12–16 [REAKCJA UKLADU ODDECHOWEGO I KRAZENIA NA CWICZENIA STATYCZNE U CHLOPCOW W WIEKU 12–16 LAT].**

I. Wojcieszak.
*Wychowanie Fizyczne i Sport,* vol. 11, no. 4, 1967, p. 69–79. 16 refs. In Polish.

The effects of static exercises on the respiratory and circulatory systems were investigated in an attempt to analyze the elements of static exercises performed during gymnastic lessons on the basis of physiological examinations. The aim of the work was to watch the reaction of the circulatory and respiratory systems to static effort in 15 boys aged 12 to 16 yr. and to find out whether there exist any contraindications for the inclusion of such exercises in the school program. Three kinds of static exercises were employed: a hanging exercise, support and strength exercises. Respiratory rhythm, pulmonary ventilation, oxygen consumption and pulse rate were recorded during one min. of exercise and during five min. of recovery. The time of free breath holding, the maximal strength of expiration and the maximal strength of the spinal muscles were also registered at rest. The time of free breath holding fluctuated within the limits of 31.6 to 61.5 sec., the maximal strength of expiration amounted to 71 to 107 mm. Hg, the maximal strength of the spinal muscles to 75 to 140 mm. Hg, and the maximal showed a correlation with the age of the subjects (breath holding r = 0.83; expiration strength = 0.60, strength of spinal muscles = 0.99). The level of gas exchange during static exercises was low (oxygen consumption was 325 to 457 ml./min.), while the acceleration of the pulse rate was moderate (120 to 138 beats/min.). Static exercises did not cause disturbances in the respiratory rhythm. Intensification of the gas exchange after the exercises ended did not appear in all subjects. It was found on the basis of the statistical analysis that the energy cost of the exercises depended on the age of the subjects, while the pulse rate depended on the type of the exercise. It was suggested that static exercises should be introduced into the gymnastic lessons, with due account being taken of the permissible load which depends on the general development of a given subject.

**A68-81318**
**EVALUATION OF THE GENERAL ENDURANCE LEVEL OF ROWERS BASED ON THE HARVARD STEP-TEST [OCENA STOPNIA WYTRZYMALOSCI OGOLNEJ WIOSLORZY NA PODSTAWIE STEP-TESTU HARWARDZKIEGO].**
D. Onichimowska and M. Lukawska.
*Wychowanie Fizyczne i Sport,* vol. 11, no. 4, 1967, p. 159–162. In Polish.

The Harvard step-test was found to be very reliable in the assessment of physical endurance of athletes, particularly in rowing. The data provided by the test helped to evaluate the improvement in physical fitness, to compare individual or group performances, and to provide additional information on the degree of training of athletes. The Harvard step-test should be widely employed and included in all training programs.

**A68-81319**
**NEW ASPECTS OF FATIGUE INDUCED BY PHYSICAL WORK [NOWE ASPEKTY ZMECZENIA PRACA FIZYCZNA].**
W. Romanowski.
*Wychowanie Fizyczne i Sport,* vol. 11, no. 4, 1967, p. 63–67. 21 refs. In Polish.

Using data found in the literature, the recent research and theories dealing with the physiological causes of fatigue subsequent to physical work are analysed.

**A68-81320**
**CHANGES IN THE CONCENTRATION OF POTASSIUM, SODIUM AND CALCIUM AS THE RESULT OF ENDURANCE EFFORTS [ZMIANY STEZENIA POTASU, SODU I WAPNIA W SUROWICY KRWI POD WPLYWEM WYSILKOW WYTRZYMALOSCIOWYCH].**
E. Preisler and R. Kabza.
*Wychowanie Fizyczne i Sport,* vol. 11, no. 4, 1967, p. 53–61. 16 refs. In Polish.

Investigations were carried out on the level of potassium, sodium and calcium in venous blood serum in 122 persons before and after endurance effort of varying intensity (80 min. track and field exercises, gymnastics and motor games; 1,500 m. swimming; driver's work at a bus steering-wheel). It was found that the level of potassium and sodium decreased after strenuous effort, while the level of calcium showed an upward tendency.

**A68-81321**
**SECRETORY GAMMA A IN NORMAL URINE.**
John Bienenstock and Thomas B. Tomasi, Jr. (N.Y., State U., Dept. of Med., Rheumatic Disease Unit, Buffalo and Buffalo Gen Hosp., N. Y.)
*(Am. Soc. of Clin. Res., Atlantic City, May 1967).*
*Journal of Clinical Investigation,* vol. 47, May 1968, p. 1162–1171. 31 refs.
Grant PHS 7 RO1 AM-10419 and N. Y., State U. supported research.

The physicochemical nature of $\gamma$A was investigated in normal male and female urine concentrated approximately 1,000 times. Sucrose density gradient ultracentrifugation and Sephadex G-200 chromatography revealed that urinary $\gamma$A has sedimentation properties intermediate between 19S and 7S molecules. Isolation of urinary $\gamma$A by DE 52 chromatography free of other immunoglobulins with subsequent antigenic analysis showed that the urinary $\gamma$A-molecule is antigenically indistinguishable from the $\gamma$A-molecules found in other external secretions and has a corrected sedimentation coefficient of 11.8S. In addition, like other secretory $\gamma$A-molecules and unlike serum polymeric $\gamma$A, urinary $\gamma$A resisted mild reductive measures with 0.1 $\beta$-mercaptoethanol. Free or unattached secretory "piece" was found in all normal urines tested and in agammaglobulinemic urine. The average daily excretion of urinary $\gamma$A was 1.1 mg. The maximum excretion of urinary 7S $\gamma$G per 24 hr. was approximately 3 mg.

**A68-81322**
**THE SIGNIFICANCE OF THE EFFECT OF METEOROLOGICAL FACTORS ON SPORT RESULTS [ZNZCZENIE WPLYWU CZYNNIKOW METEOROLOGICZNYCH NA WYNIKI SPORTOWE].**
E. Grzedziński.
*Wychowanie Fizyczne i Sport,* vol. 11, no. 4, 1967, p. 149–158. 18 refs. In Polish.

On the basis of numerous Polish and foreign works from the field of biometeorology the author points to the distinct effects of meteorological factors, both in their isolated and complex activity, on humans. This effect can be observed both subjectively and objectively in healthy and sick individuals. Meteorological factors also affect sports results. According to the author, it is therefore necessary to work out forecasts in the field of sports biometeorology. The forecasts would be used by coaches for correct training procedures.

**A68-81323**
**FREE DIVING AND SOME PHYSIOLOGICAL PROBLEMS [NURKOWANIE SWOBODNE A NIEKTORE ZAGADNIENIA FIZJOLOGII].**
A. Lisiecki.
*Wychowanie Fizyczne i Sport,* vol. 11, no. 4, 1967, p. 145–147. 11 refs. In Polish.

A review is given of literature data on physiological studies on skin diving. The main problems encountered, and the progress made in this field during the last years are discussed.

**A68-81324**
**DYNAMIC ELECTROCARDIOGRAPHY WITH STRENUOUS EXERTION AT HIGH ALTITUDES.**
Lenard L. Politte, Carl H. Almond, and John T. Logue (Mo., U., Depts. of Med. and Surg., Columbia).
*American Heart Journal*, vol. 75, Apr. 1968, p. 570–572. 13 refs.
Grant PHS FR-5387-06.

The effects of high altitude, cold temperatures and strenuous exertion were compared in acclimatized and non-acclimatized human subjects. Heart rates, electrocardiograms and blood pressures were determined at rest and during maximal physical exercise. The physiologic and electrocardiographic responses were much greater in non-acclimatized than in acclimatized subjects.

**A68-81325**
**INVESTIGATIONS ON PHYSICAL FITNESS AND EVALUATION OF ADAPTIVE RESPONSES TO PHYSICAL EFFORT ON THE BASIS OF THE HARVARD STEP-TEST [BADANIA WYDOLNOSCI FIZYCZNEJ I OCENA ZMIAN ADAPTACYJNYCH DO WYSILKU NA PODSTAWIE STEP-TESTU].**
A. Klimek and L. Petek.
*Wychowanie Fizyczne i Sport*, vol. 11, no. 4, 1967, p. 127–144. 21 refs. In Polish.

Investigations on cardiovascular efficiency carried out on students from the School of Physical Education in Cracow and on coaches of the Polish Ski Federation showed no correlation between the Harvard fitness index (FI) values and biometric measurements such as body height, body weight, height-weight index and body surface area. According to the authors, the FI result depends not only on the efficiency of the cardiovascular system, but also to a considerable extent on the functional properties of the leg muscles and the muscles of the spine. In the light of these results no modifications of the Harvard Step-Test appear necessary. The physical effort performed during the step test intensified to the greatest extent the cardiac output and the systolic blood pressure. A significant decrease in the pulse rate and cardiac output was registered after three min. of recovery in the most highly trained subjects. The return to the rest value of the systolic pressure was faster than that of the diastolic pressure. A comparison of the point results of the FI index with the actual sporting condition of the subjects confirms the high objectiveness of the step test for the determination of work capacity based on the efficiency of the cardiovascular system. This shows that it is possible to introduce the Harverd Step Test as an index of endurance for candidates for the studies of physical education.

**A68-81326**
**EFFECT OF PHYSICAL EFFORT ON THE CONTENT OF CORTICOSTERONE AND ASCORBIC ACID IN THE ADRENALS IN RATS [WPLYW WYSILKU FIZYCZNEGO NA ZAWARTOSC KORTYKOSTERONU I KWASU ASKORBINOWEGO W NADNERCZACH SZCZUROW].**
J. Ottowicz, K. Nazar, and A. Wolowska.
*Wychowanie Fizyczne i Sport*, vol. 11, no. 4, 1967, p. 119–126. 24 refs. In Polish.

The effect of five wk. treadmill training on the endocrine activity of the adrenal cortex in 65 male white rats was examined by the determination of the content of corticosterone and ascorbic acid in the supradrenal glands and by the gland weight. The rats were divided into four groups; rats at rest, rats submitted to a single maximum effort on a treadmill, rats trained for five wk. on a treadmill and trained rats submitted subsequently to a single maximum effort. It was found that a single intensive physical effort caused an increase in the endocrine activity of the suprarenal glands of rats without hypertrophy, while an excess in weight and an increase in the endocrine activity of this gland resulted from training. Against the background of the intensified secretion of the adrenal cortex in rats trained on a treadmill, an additional maximum effort caused a further increase in the secretion of corticosterone, and this reaction was quantitatively less marked than in the group of untrained rats.

**A68-81327**
**THE NECESSITY OF DEVELOPMENT OF THE ENDOCRINE RESEARCH IN SPORTSMEN [O POTRZEBIE WPROWADZENIA BADAN ENDOKRYNOLOGICZNYCH W SPORCIE].**
J. Ottowicz and I. Dzierzykray-Rogalska.
*Wychowanie Fizyczne i Sport*, vol. 11, no. 4, 1967, p. 113–118. 18 refs. In Polish.

The possibilities and importance of endocrinological investigations in highly competitive sports were presented. The role of the pituitary gland, the thyroid gland and the cortex and the medulla of the adrenal gland in the light of physiological mechanisms of adaptation was described. The evaluation of the functioning of these glands in highly competitive sportsmen will permit the selection of optimum conditions for competition, taking into account the biological rhythm of a given individual and the degree of formation of the hormonal mechanism of adaptation. Functional disturbances of the above endocrine glands occurring sometimes in healthy people practicing competitive sports were also described. The introduction of endocrinological investigations to sportsmen would permit the early diagnosis and effective prevention of the above disturbances.

**A68-81328**
**MMPI PROFILES AS A FUNCTION OF CHRONOLOGICAL AGE.**
Fred J. Thumin (Mo., U., St. Louis).
*Psychological Reports*, vol. 22, Apr. 1968, p. 479–482. 8 refs.

Minnesota Multiphasic Inventory (MMPI) and Otis mental ability scores were studied as a function of chronological age among 176 male job applicants who were referred to a psychological consulting firm for evaluation. Subjects were divided into four groups with mean ages of 24.8, 31.4, 37.7, and 45.1 yr., and the groups were relatively well matched in terms of formal education. Statistical analysis revealed that there were no significant differences among the scores made by the various age groups on any of the 13 basic scales of the MMPI or on the Otis. The results failed to support the popular notion that middle-aged workers are risky prospects for employment because, as compared with their younger counterparts, they are relatively defensive, threatened, rigid, subjective in their evaluations, difficult to get along with, and lacking in adaptability and mental alertness.

**A68-81329**
**THE EFFECTS OF HYPOTHALAMIC AND RETICULAR STIMULATION ON EVOKED RESPONSES IN THE VISUAL SYSTEM OF THE CAT.**
Carl C. Chi and John P. Flynn (Yale U., Dept. of Psychol., New Haven, Conn.).
*Electroencephalography and Clinical Neurophysiology*, vol. 24, Apr. 1968, p. 343–356. 21 refs.
Grant PHS MH-08936-03.

The purpose of this experiment was to compare the changes induced by reticular stimulation in the magnitude of evoked responses of the visual system of the cat with changes occurring during stimulation of two areas in the hypothalamus, each of which directed the cat's attention to specific visual stimuli. It was found that: (1) Hypothalamic and reticular stimulation significantly increased the amplitude of evoked responses recorded from the lateral geniculate body, optic radiation, and superior colliculus. (2) The cortical response evoked by stimulating the optic radiation was

depressed by hypothalamic stimulation and facilitated by reticular stimulation. (3) The cortical response evoked by stimulating the optic tract was facilitated by low intensities and depressed by high intensities of hypothalamic stimulation. Reticular stimulation facilitated the cortical evoked response at all intensities. (4) Lesions of the reticular formation did not alter either the facilitatory effect of hypothalamic stimulation at the subcortical level or its depressive effect at the cortex. (5) Stimulation of the lateral hypothalamus which elicited quiet attack directed at a rat and stimulation of the medial hypothalamus which elicited effective attack directed at the experimenter or at the rat had the same effects on visual evoked potentials.

**A68-81330**
**REACTION TIME: STIMULUS UNCERTAINTY WITH RESPONSE CERTAINTY.**

Martin Hannes, Samuel Sutton, and Joseph Zubin (N. Y., City U., Hunter Coll.; N. Y. State Dept. of Mental Hyg., Biometrics Res.; and Columbia U., New York City).

*Journal of General Psychology*, vol. 78, Apr. 1968, p. 165–181. 28 refs.
Grants PHS MG-0776 and PHS MG-7997.

Reaction time of one of two alternative stimuli (sound) is considered as a function of varying sequential dependency in a situation in which response information and transmitted information are zero: i.e., the subject makes the identical response regardless of stimulus. It was found that (a) despite the fact that only stimulus information is varied, reaction time to sequentially uncertain stimuli is longer than reaction time to sequentially certain stimuli; (b) reaction time is sensitive to the degree of stimulus uncertainty if the sequence involves a shift in sensory modality (crossmodal), but not if the sequence involves no shift in sensory modality; (c) when averaging across two subjects, the relationship between reaction time and stimulus information is linear if the sequence is crossmodal; and (d) practice does not appear to alter these relations.

**A68-81331**
**LATERAL EYE MOVEMENT BEHAVIOR.**

J. D. Duke (Mont. State U., Bozeman).

*Journal of General Psychology*, vol. 78, Apr. 1968, p. 189–195.

Some observations by another investigator pertaining to lateral eye movements are confirmed by research data collected by the experimenter. After complex or reflective questions, a subject will momentarily break his gaze upon the experimenter. He will laterally turn his eyes to the right or left before responding. Simple questions seldom elicit eye movement behavior. The direction chosen is characteristic for individuals, but not for the group. Males more consistently than females turn in one direction only. Eye dominance is independent of the phenomenon. Gazing interactions are replete with research potential for interested investigators.

**A68-81332**
**A COMPARISON OF THE EFFECTS OF CHLORPROMAZINE AND DROPERIDOL ON THE RESPIRATORY RESPONSE TO $CO_2$.**

D. Kissil and J. Yelnosky (Warner Lambert Res. Inst., Dept. of Pharmacol., Morris Plains, N. J.).

*Archives Internationales de Pharamcodynamie et de Therapie*, vol. 172, Mar. 1968, p. 73–77. 8 refs.

The effects of chlorpramazine and droperidol, major tranquilizers of the phenothiazine and butyrophenone groups respectively, were compared on the respiratory response to $CO_2$ in dogs anesthetized with pentobarbital and on the sleeping time of mice injected with hexobarbital. Both tranquilizers showed little or no respiratory depressant actions *per se*. The principle pharmacologic effect noted was an interaction of chlorpromazine or droperidol with the barbiturates resulting in an increased duration of the respiratory depressant effects of the barbiturate in the dog and an increase in the sleeping time in the mouse. One possible explanation for these results is that droperidol, like chlorpromazine, reduces the rate of barbiturate metabolism and attenuates the effects of sensory input on the nonspecific activating system.

**A68-81333**
**A REPORT UPON CIRCADIAN RHYTHM OF BODY TEMPERATURE DURING A LONGITUDINAL AIR TRAVEL.**

Kokichi Ohara (Nagoya City U., Med. School, 2nd Dept. of Physiol., Japan).

*Nagoya Medical Journal*, vol. 13, Sep. 1967, p. 143–149. 5 refs.

The daily rhythm of body temperature was measured orally in a Japanese subject during a round trip made mostly by air from Japan to and from London. The following results can be derived: (1) lag time of the shift from the Japanese to the English rhythm was found to be ten to 12 days, while that from the English to the Japanese rhythm was seven days; the speed of the adjustment was suggested to be different according to whether the subject is transported from his native land to a foreign one or in the reverse direction; (2) dispersions were observed between temperature cycle and activity cycle after rapid transpositions across the longitudes, indicating that the two oscillators are differently coupled under the circumstances, and, (3) a finding was obtained which suggested that inertia effect is involved in the adjustment process of the circadian rhythm.

**A68-81334**
**STUDIES ON PHYSICOCHEMICAL PROPERTIES OF THE FIBRINOLYTIC SUBSTANCES IN HUMAN SALIVA.**

Hatsuo Nitta, Isamu Sugie, Seiji Morimoto, and Shigetaka Sato (Nagoya City U., Med. School, First Dept. of Physiol., Japan).

*(Physiol. Soc. of Japan, 44th Ann. Meeting, Mar. 1967).*
*Nagoya Medical Journal*, vol. 13, Sep. 1967, p. 151–164. 31 refs. Min. of Educ. and Tokai Gakujyutsu Shoreikai supported research.

The fibrinolytic substances in human mixed saliva, pure parotid saliva and pure submaxillary-sublingual saliva and their physicochemical properties were investigated and the following results were obtained. (1) Considerable amounts of a proactivator and plasminogen were found in all samples of three sets of saliva above mentioned except in only one of the mixed saliva. All samples showed no inhibitory activity against plasmin. (2) The degree of the fibronolytic activity by addition of streptokinase (SK) was in the order of the mixed saliva, pure submaxillary sublingual saliva and pure parotid saliva. (3) The physico-chemical properties of proactivator and plasminogen in three sets of human saliva were almost similar to those in blood plasma, namely: (a) optimal concentration of SK and optimal pH value for the fibronolytic activity of saliva; (b) instability to heating and sensitivity to $\epsilon$-ACA of proactivator and plasminogen; and (c) protein fraction of proactivator (over 50,000–70,000 molecular weight).

**A68-81335**
**OBTAINING SYNCHRONOUS CULTURES OF ALGAE.**

W. A. Glooschenko and H. Curl, Jr. (Ore. State U., Dept. of Oceanog., Corvallis).

*Nature*, vol. 218, May 11, 1968, p. 573–574.

A method for producing synchronous cell division induced by the photoperiod used which involved dilution of cultures at the end of each dark period was criticized. It was felt that the method could cause a lag phase, and that it was not possible to confirm whether or not light was the controlling factor of autospore formation. The effect of three light intensities on the marine diatom, *Skeletonema costatum* was studied and no synchronous cell division

was observed. It was concluded that more research is needed before photoperiod alone can be considered to cause synchronous cell division.

**A68-81336**
**ANTIBACTERIAL ACTION OF HUMAN SKIN IN VIVO EFFECT OF ACETONE ALCOHOL AND SOAP ON BEHAVIOUR OF STAPHYLOCOCCUS AUREUS.**
R. W. Lacey (Bristol Roy. Infirmary, Dept. of Clin, Pathol., Great Britain).
*British Journal of Experimental Pathology,* vol. 44, Apr. 1968, p. 209–215. United Bristol Hosps. supported research.

A method is described for studying the behavior of *Staphylococcus aureus* on the human skin over five hr. Skin previously treated with 100% acetone, 74% ethanol, or soap, favors the persistence of surface inoculated staphylocci. The possible mechanisms and implications of this are discussed.

**A68-81337**
**EFFECTS OF CHRONIC ADMINISTRATION OF THE AMPHETAMINES AND OTHER STIMULANTS ON BEHAVIOR.**
Mary Ellen Kosman and Klaus R. Unna (Ill., U., Coll. of Med., Med. Center, Dept. of Pharamcol., Chicago).
*Clinical Pharmacology and Therapeutics,* vol. 9, Mar.–Apr. 1968, p. 240–254. 87 refs.
Grant PHS 2B 5262.

After a brief survey of effects in man, behavioral studies in animals on the effects of chronic administration of dl-amphetamine, d-amphetamine, methamphetamine, cocaine, pipradrol, methylphenidate, phemetrazine, and caffeine are reviewed. The areas covered include: food and water intake, general behavior, self-administration of drugs, activity, fatigue, and performance of learned responses. The review is primarily concerned with changes in various parameters of behavior which develop during the course of chronic drug administration. These changes include both increases and decreases in the magnitude of response, reversal of effects, and the appearance of new patterns of behavior. The effects observed after cessation of chronic drug administration are discussed with reference to withdrawal symptoms and to persistent effects which are revealed by observation of general behavior and by tests of activity, performance, learning ability, and response to various drugs. Areas in which further research is needed are mentioned throughout the review. Emphasis is placed on the need for more comparative studies on the amphetamines, as the available data suggest that, under conditions of chronic administration, the effects of methamphetamine differ significantly from the effects of dl- and d-amphetamine.

**A68-81338**
**EFFECTS OF HIGH OXYGEN ON CORONARY FLOW AND HEART FORCE.**
Herman B. Daniell and Ervin E. Bagwell (S.C., Med. Coll., Dept. of Pharmacol., Charleston).
*American Journal of Physiology,* vol. 214, Jun. 1968, p. 1454–1459. 27 refs.
Grants NHI HE-10411 and NHI HE-00040; S. C. Heart Assn. supported research.

Studies in open-chest dogs were undertaken to assess the effects of abrupt changes in inspired oxygen tensions on the relationship between isometric systolic tension (IST) and coronary flow (CF). Changing and inspired oxygen concentration from 25 to 100% resulted in consistent and equivalent reductions in IST and CF with alterations in CF preceding those of IST. These changes were not abolished by alpha, beta, or complete sympathetic blockade. Although the alterations in CF and IST were similar both in direction and magnitude, they were not related as to cause and effect. Experiments in which CF was maintained constant by pump perfusion showed that, when $O_2$ tension was increased, IST decreased to the same degree as before. These data support the view that alterations in CF are not entirely dependent on myocardial oxygen demands but that there is some intrinsic component of the coronary vessels sensitive to alterations in $O_2$ tensions. It is further suggested that the observed decreases in IST at high $O_2$ tensions are manifestations of early oxygen toxicity.

**A68-81339**
**EFFECT OF CHRONIC HYPOXIA ON THE PULMONARY ARTERIAL BLOOD PRESSURE OF THE CHICKEN.**
R. R. Burton, E. L. Besch, and A. H. Smith (Calif., U., Dept. of Animal Physiol., Davis).
*American Journal of Physiology,* vol. 214, Jun. 1968, p. 1438–1442. 20 refs.
Grant PHS HE 01920

Single-comb White Leghorn chickens hatched and living in a high-altitude environment of 12,500-ft. elevation, had pulmonary arterial blood pressures approximately twice as great as found in chickens at sea level. The pulmonary arterial blood pressures were highly correlated with the relative right ventricular masses of the individual birds at all altitudes. The proportionality coefficients of this relationship in chickens were doubled those reported by others in cattle. In the female chicken it appears that each one mm. Hg increase in the mean pulmonary arterial blood pressure above sea level control values results in a 41-mg. increase in the right ventricular mass (hypertrophy). Inhalation of 95% oxygen and 5% carbon dioxide for ten min. had no apparent effect on this pulmonary arterial hypertension at high altitude, although acute hypoxia (asphyxia, by tracheal occlusion) produced a pulmonary arterial hypertension in sea-level birds. The occlusion of one major pulmonary artery produced a 67% increase in the pulmonary arterial blood pressure in the unobstructed lung. Chronic hypoxia (12,500-ft. elevation) produced a 47% reduction in the arterial oxygen tension and no significant changes in the arterial carbon dioxide tension and pH. Anesthesia at the surgical level in chickens results in an acute hypoxia and an acidosis. This hypoxic effect from the anesthesia was much less marked at high altitude. Pulmonary arterial blood pressures reached control values within two days after the high altitude-adapted animals were returned to sea level.

**A68-81340**
**ADIPOSE TISSUE IN ALTERED LIPID METABOLISM OF RATS EXPOSED TO CENTRIFUGATION STRESS.**
D. D. Feller, E. D. Neville, and K. S. Talarico (NASA, Ames Res. Center, Environ. Biol. Div., Moffett Field, Calif.).
*American Journal of Physiology,* vol. 214, Jun. 1968, p. 1434–1437. 12 refs.

Male Sprague–Dawley rats, nine wk. of age, were centrifuged at 4.7 g for periods from 0.5 hr. to 21 days. The concentration of serum glucose, free fatty acids, triglycerides, and cholesterol was measured periodically. The conversion of acetate-2-$^{14}C$ into $^{14}CO_2$ and fatty acids in slices of epididymal fat pads and its fatty acid content was studied. Significant increases in newly formed fatty acids were found in adipose tissue excised from rats exposed to centrifugation for periods of 24 hr. or less. Serum glucose, free fatty acids, and triglycerides increased during this period. As the exposure continued beyond three days, serum glucose fell below control values, depot fat stores decreased, and the conversion of acetate-2-$^{14}C$ to fatty acids in adipose tissue from stressed rats returned to control values. No significant change in acetate-$^{14}C$ oxidation to $^{14}CO_2$ by adipose tissue was noted. It is concluded that adipose tissue plays an important role in contributing to body energy during the acute phase of centrifugation stress in rats.

**A68-81341**
**PROTEIN METABOLISM IN HEPATIC TISSUE OF HIBERNATING AND AROUSING GROUND SQUIRRELS.**
Bertwell K. Whitten and George J. Klain (Fitzsimons Gen. Hops., U.S. Army Med. Res. and Nutr. Lab., Physiol. Div., Denver, Colo.).
*American Journal of Physiology,* vol. 214, Jun. 1968, p. 1360–1362. 22 refs.

Protein metabolism in hepatic tissue of hibernating, arousing, and normothermic ground squirrels, *Citellus tridecemlineatus,* was assessed by three methods: (1) measurement of alanine-U-$^{14}C$ utilization by liver slices; (2) incorporation of methionine (methyl-$^{14}C$) into protein by microsomal preparations from liver; and (3) measurement of arginase activity in liver homogenates. Measurements were made at six and 37°C. In comparison to hepatic tissue of normothermic animals: (a) protein synthesis from methionine and lipogenesis from alanine were markedly lowered in hepatic tissue of hibernating and arousing animals when measured at 37°C., whereas no change was observed at 6°C.; (b) incorporation of alanine into hepatic glycogen was increased in hibernating animals at six and 37°C. In comparison to hepatic tissue of hibernating animals: (1) oxidation of alanine to $CO_2$ was increased in hepatic tissue of arousing and normothermic animals at six and 37°C.; (2) arginase activity was increased in hepatic tissue of arousing animals at six and 37°C. and in normothermic animals at 37°C. These data suggested an increased protein catabolism during arousal.

**A68-81342**
**EFFECT OF $PCO_2$ ON THE RELATION OF LACTATE AND EXCESS LACTATE TO $O_2$ DEFICIT.**
Stephen M. Cain (USAF School of Aerospace Med., Physiol. Branch, Brooks AFB, Tex.).
*American Journal of Physiology,* vol. 214, Jun. 1968, p. 1322–1327. 17 refs.

Because changes in carbon dioxide tension ($P_{CO_2}$) alone are known to affect blood levels of lactate these experiments were designed to ascertain the effect of the level of arterial $P_{CO_2}$ on the relationships of increases in blood lactate ($\Delta L$) and excess lactate (XL) to the $O_2$ deficit incurred during hypoxia. Twelve anesthetized dogs were made hypoxic for 30 min. while eucapnic ($P_{CO_2}$ = 40 torr) and again while hypercapnic ($P_{CO_2}$ = 77 torr) with appropriate control and recovery periods. Another group of 12 were treated similarly except they were hypocapnic ($P_{CO_2}$ = 18 torr) during one hypoxic period and eucapnic during the other. The net $O_2$ deficit (NOD) was estimated from the decrease in $\dot{V}O_2$ from the base-line value just prior to hypoxia and corrected for changes in $O_2$ stores. A linear relationship was obtained for $\Delta L$ and NOD which was different at each level of $P_{CO_2}$, and which varied inversely with the $P_{CO_2}$ level. Similar results were obtained for the relationship of XL to NOD. On this basis, the more complicated measure of excess lactate offered no advantage over the simpler measurement of the lactate increase.

**A68-81343**
**OXYGEN CONSUMPTION BY OBESE YELLOW MICE AND THEIR NORMAL LITTERMATES.**
Andrzej Bartke and Andrzej Górecki (Jagiellonian U., Dept. of Animal Genet. and Organic Evolution, Kraków, Poland).
*American Journal of Physiology,* vol. 214, Jun. 1968, p. 1250–1252. 10 refs.

Oxygen consumption (cc. $O_2/g^{2/3}$ per hr.) was measured in yellow ($A^ya$) and nonyellow (aa) mice of the same inbred strain at the age of approximately five to six wk., before obesity develops, and at the age of two to 12 mo. In young mice there was no difference in oxygen consumption. In adult mice in 10 and 20°C. environments the oxygen consumption was significantly lower in Aya animals. The difference at 30°C. was not significant. Moreover, adult Aya mice appeared to have better body insulation and lower intensity of chemical thermoregulation. The differences in oxygen consumption, insulation and thermoregulation reflect elevated fat content of adult Aya animals. It remains unclear whether the lethal yellow (Ay) gene increases fat deposition by lowering the metabolic rate or rather by increasing food intake and utilization.

**A68-81344**
**THE EFFECT OF LITHIUM AND AMPHETAMINE ON DESMETHYLIMIPRAMINE-RO 4-1284 INDUCED MOTOR HYPERACTIVITY.**
N. Matussek and M. Linsmayer (Max-Planck-Inst. für Psychiat., Biochem. Abt., Munich, West Germany).
*Life Sciences,* vol. 7, part 1, Apr. 1, 1968, p. 371–375. 13 refs.

It was demonstrated that lithium chloride and amphetamine inhibit the DMI-Ro 4-1284 induced motor hyperactivity in rats. Lithium, however, cannot antagonize the amphetamine excitation.

**A68-81345**
**VISUAL PERCEPTION, ILLUSIONS AND THE STABILIZED RETINAL IMAGE.**
Morton K. Ohlbaum (Ind. U., Bloomington).
*Optical Journal and Review of Optometry,* vol. 105, May 1, 1968, p. 29–31. 11 refs.

Investigations of previous workers concerned with visual perception and the retinal image were presented, and the relationships of color adaptation, stabilized retinal images and eye movements to static and dynamic visual illusions were discussed.

**A68-81346**
**HUMAN ELECTRORETINOGRAM NEAR THE ABSOLUTE THRESHOLD OF VISION.**
Daniel Finkelstein, Peter Gouras, and Mary Hoff (NIH, Natl. Inst. of Neurol. Diseases and Blindness, Ophthalmol. Branch, Bethesda, Md.).
*Investigative Ophthalmology,* vol. 7, Apr. 1968, p. 214–218. 8 refs.

With total visual field stimulation and the aid of a computer of average transients, the electroretinogram (ERG) can be recorded with stimulus intensities approaching the absolute visual threshold. At these low intensities, the predominant feature of the ERG is a corneal negative potential.

**A68-81347**
**WATER VAPOR INDEPENDENT INLET-SYSTEMS FOR RESPIRATION-MASS-SPECTROMETERS [WASSERDAMPF-UNABHANGIGE PROBENEINLASSSYSTEME FUR RESPIRATIONSMASSENSPEKTROMETER].**
K. Muysers, L. Delgmann, and U. Smidt (Bonn U., Physiol. Inst., West Germany).
*Pflügers Archiv für die gesamte Physiologie,* vol. 299, Feb. 23, 1968, p. 185–190. In German.

The influence of changing water vapor in mass spectrometric analyses of inspired and exhaled air can cause errors, when the conductivity of the inlet system is different for water vapor and permanent gases. The paper describes a two-step and a three-step inlet system for quantitative analysis of exhaled gases despite changing water vapor.

**A68-81348**
**ELECTROPHYSIOLOGICAL RETINAL CHANGES AND VISUAL DEPRIVATION.**
Anne Christake Cornwell and Seth K. Sharpless (Albert Einstein Coll. of Med., Dept. of Pharmacol., New York, N. Y.).
*Vision Research,* vol. 8, Apr. 1968, p. 389–401. 19 refs.
Grants PHS NB-04341, PHS NB-06656, PHS 5KB-15,296, and PHS 2M-6418.

Adult cats were subjected to monocular or binocular light deprivation for periods ranging from 36 hr. to three wk. One wk. of deprivation resulted in a significant reduction of the electroretinogram and an increased susceptibility to light adaptation, produced by dim background illumination or by continuous flicker. Following one wk. of light deprivation, exposure to room illumination for three to five days was sufficient to restore the b-wave to normal; longer periods of deprivation required longer periods for recovery. These data suggest that relatively long-lasting but reversible changes in a "neural" adaptation mechanism may be produced by prolonged light deprivation in adult animals.

**A68-81349**
**DIFFERENCES BETWEEN MONOCULAR AND BINOCULAR STROBOSCOPIC MOVEMENT PERCEPTION.**

Bela Julesz and Richard A. Payne (Bell Telephone Labs., Inc., Murray Hill, N. J.).

*Vision Research*, vol. 8, Apr. 1968, p. 433–444. 9 refs.

Stroboscopic movement perception of random-dot stereograms differs from the perception of classical stimuli both quantitatively and qualitatively, provided that the former stimuli are presented such that in addition to the elimination of all monocular form cues all monocular movement cues are removed as well. When random-dot stereograms are presented this way and a binocularly perceivable grid is portrayed in translational or rotational movement, a new perceptual response can be experienced between the classical optimal movement and simultaneity regions. This new region a single grid is seen at standstill. This binocular standstill should be contrasted with simultaneity in which the two alternate stimuli are seen as superimposed.

**A68-81350**
**VELOCITY-SENSITIVE ELEMENTS IN HUMAN VISION: INITIAL PSYCHOPHYSICAL EVIDENCE.**

Allan J. Pantle and Robert W. Sekuler (Northwestern U., Evanston, Ill.).

*Vision Research*, vol. 8, Apr. 1968, p. 445–450. 7 refs.
Grant NINDB NB-06354 and Northwestern U. Res. Comm. supported research.

Luminance thresholds for contours moving at 2°/sec., 5°/sec., or 9°/sec. of visual angle were measured after adaptation periods in which contours moving at each of several different angular velocities were viewed. The range of velocities of adapting motion was 1/2°/sec. to 45°/sec. Thresholds for conditions when adapting and test motions in the same direction were elevated relative to conditions when adapting and test motions were in opposite directions. Largest threshold elevations were obtained when adapting and test contour velocities were similar. The results indicate that the human visual system contains different velocity-sensitive mechanisms, each of which is most responsive to a specific range of contour velocities.

**A68-81351**
**SPECTRAL ANALYSIS OF THE VISUALLY EVOKED OCCIPITOGRAM IN MAN.**

T. Shipley, R. Wayne Jones, and Amelia Fry (Miami, U., School of Med., Bascom Palmer Eye Inst., Fla.).

*Vision Research*, vol. 8, Apr. 1968, p. 409–431. 19 refs.
Contract DA-49-193-MD-2344.

The visually evoked occipitogram (VEOG) was studied in two color-normal observers over the visible spectrum (380 to 700 nm.) in 16 steps at matched intensities. Confirming earlier reports, the waveform of the responses varied as a function of wavelength. A Fourier analysis indicated that this chromatic coding is confined primarily to the four to eight c.p.s. components in the waveforms. However, uncoded responses were also reported for other color-normal observers, which introduces a note of caution into the interpretation of these findings. These individual differences persist for on–off, on and off evocation. The VEOG responses in several color-deficient observers were also reported, indicating that an amplitude depression exists in the deutan group.

**A68-81352**
**THE EXTREMELY LONG LATENCY RESPONSE FROM ON–OFF RETINAL GANGLION CELLS: RELATIONSHIP TO DARK ADAPTATION.**

S. G. Pickering (Max-Planck-Inst. für Biol., Tübingen, West Germany).

*Vision Research*, vol. 8, Apr. 1968, p. 383–387. 6 refs.
Grant NIH 1 F 2 NB 24,455-01 and Deut. Forschungsgemeinschaft supported research.

Microelectrode recordings were made from Class III (on–off) ganglion cells of the frog retina while stimulating the eye with short light flashes. The extremely long delay time between stimulus and the major response activity increased with the instantaneous dark adaptation level. In a completely dark adapted retina the response was delayed more than ten sec. after stimulus application.

**A68-81353**
**LONG-TERM BACTERICIDAL EFFECTS OF REDUCED AMBIENT WATER ACTIVITY: USE OF MEMBRANE FILTER SUPPORT FOR TEST ORGANISMS.**

J. B. Bateman (Biol. Sci. Lab., Fort Detrick, Frederick, Md.).

*American Journal of Epidemiology*, vol. 87, Mar. 1968, p. 349–366. 49 refs.

*Serratia marcescens* 8 UK put on membrane filters was used in a study of the lethal effects of exposure (up to 72 hr.) to reduced ambient water activity ($a_w$). For descriptive purposes two successive stages of the population decay process are distinguished, each following an equation of the type log log ($N_0/N$) = b log kt, where $N_0$ is initial number of cells, N is number surviving after time t, b and k are constants. The constants are dependent upon ambient $a_w$. In qualitative terms, the initial death rates are very low when $a_w > 0.98$, are somewhat larger but fairly constant when $0.5 < a_w < 0.98$, rising steeply as $a_w$ is decreased from 0.5 to 0. At all $a_w$ the decay process tends to become self-limiting, with $0 < b < 0.5$. The curves showed no "critical" $a_w$ zones of rapid killing, but such a zone at $a_w$ 0.5 could be created by use of toxic additives (urea, NaCl, LiBr). The $a_w$ of maximum toxicity did not correspond to that predicted from the $a_w$ of saturated solutions of these substances. Further experiments showed the effects of increasing or decreasing rate of water loss, some of which are attributed to the combined action of oxygen and desiccation. Results are discussed in terms of a set of processes involving interaction of dehydrated groups with a reversibly oxidizable cell component. The simultaneous increase of the reactant formed by dehydration and asymptotic disappearance of the oxidizable substance provides a basis for the self-limiting character of killing brought about by desiccation.

**A68-81354**
**PROLONGED CHANGES IN VISUAL SYSTEM ACTIVITY PRODUCED BY SOMATIC STIMULATION.**

R. Melzack, K. Konrad, and B. Dubrovsky (McGill U., Dept. of Psychol., Montreal, Canada).

*Experimental Neurology*, vol. 20, Mar. 1968, p. 443–459. 31 refs.
Contract DOD SD-193.

The tonic electrical activity in the visual radiations and lateral geniculate nucleus was recorded in anesthetized cats. It was found that somatic stimulation, such as rubbing a paw, vibration of the skin, or electrical stimulation of the sciatic nerve, frequently produces marked, prolonged decreases in the tonic activity. The

majority of the changes have durations of 3–12 min., but sometimes last for more than 30 min. Prolonged increases in tonic activity are also occasionally observed. The prolonged changes, characteristically observed when the cats are in a state of moderate anesthesia, are abolished by large doses of barbiturate, but are still seen when the animal is light enough for paw pinch to produce withdrawal reflexes. Control experiments show that changes in EEG, blood pressure, and intraocular pressure may occur concomitantly with stimulation but are not the causal mechanisms of the prolonged activity changes. The fact that the prolonged changes are abolished by lesions of the anterolateral pathways but not of the dorsal columns suggests that the reticular formation may mediate the effects of the somatic input on visual system activity.

**A68-81355**
**CONVERGENCE OF AUDITORY AND VISUAL STIMULI ON SINGLE CELLS IN THE PRIMARY VISUAL CORTEX OF UNANESTHETIZED UNRESTRAINED CATS.**
Ephraim Bental, Nachum Dafny, and Shaul Feldman (Hadassah U. Hosp., Lab. of Neurophysiol., Dept. of Nervous Diseases and Hebrew U.-Hadassah Med. School, Jerusalem, Israel).
*Experimental Neurology*, vol. 20, Mar. 1968, p. 341–351. 28 refs. Grant NIH RF 37.

The spontaneous electrical activity and the responsiveness to photic and acoustic stimuli of 227 single cells in the primary visual cortex of unanesthetized unrestrained cats was studied during periods of sleep and wakefulness. The responsiveness of the cells was statistically evaluated by applying the chi-square and the critical-ratio tests. During periods of sleep there was an increase in the spontaneous and evoked rate of firing. Sixty-one percent of all the units showed a statistically significant covergence of photic and acoustic responses. The results suggest that there exists a high degree of interaction between the auditory and visual pathways resulting in convergence at the single-cell level, in the primary visual cortex.

**A68-81356**
**ACTIVITY AND LEARNING IN RATS AFTER MAGNESIUM PEMOLINE.**
B. Soumireu-Mourat and B. Cardo (Bordeaux, U., Fac. des Sci., Lab. de Psychophysiol., France).
*Psychopharmacologia*, vol. 12, Feb 14, 1968, p. 258–262. 5 refs.

Magnesium pemoline enhances the learning of a conditioned avoidance response in rats. Twenty-four hr. later this enhancing effect is no longer significant. With the same doses, magnesium pemoline induces a marked hyperactivity. In an experimental situation of simple visual discrimination magnesium pemoline does not alter the performance of the animals but seems to bring about an abnormal fixation of certain types of behavior.

**A68-81357**
**ALTITUDE-ACCLIMATIZATION: ITS EFFECT ON HYPOXIA-INDUCED PERFORMANCE DECREMENTS.**
John M. Vacher and A. T. Miller, Jr. (N. C., U., Depts. of Psychol. and Physiol., Chapel Hill).
*Psychopharmacologia*, vol. 12, Feb. 14, 1968, p. 250–257. 10 refs.
Contract DA-49-193-MD-2371.

The effects of hypoxia on performance of altitude-acclimatized and non-acclimatized rats were tested in three experiments. The first experiment tested acclimatized and non-acclimatized animals in either 20% $O_2$, 10% $O_2$ or 5% $O_2$ atmospheres in (1) an open field, (2) a Lashley III water maze, and (3) a discrimination apparatus. The second experiment compared acclimatized and non-acclimatized rats in the performance of an already learned task (the water maze) in either 20% $O_2$ or 5% $O_2$ atmospheres. The third experiment tested the performance of non-acclimatized animals in a 5% $O_2$ atmosphere on an overlearned task in the water maze. There was severe disruption of performance of non-acclimatized rats in severe (5% $O_2$) hypoxia. This disruption occurred during learning of the tasks and during performance of already-learned and unlearned tasks. The acclimatized animals showed no such disruption in 5% $O_2$; in fact they performed as well as did the group in the 20% $O_2$ atmosphere. The results were analyzed in terms of behavioral fixation as a result of intense drive.

**A68-81358**
**A PSYCHOPHYSIOLOGICAL STUDY OF EFFICIENCY OF DIFFERENT FORMS OF ALTERNATION OF WORKING OPERATIONS [OPYT PSIKHOFIZIOLOGICHESKOGO ISSLEDOVANIIA EFFEKTIVNOSTI RAZLICHNYKH FORM CHEREDOVANIIA TRUDA].**
L. N. Gorbunova.
*Voprosy Psikhologii*, no. 1, Jan.–Feb. 1968, p. 21–26. 7 refs. In Russian.

Data obtained permitted a conclusion to be made about the higher level of workers' fatigability when operations are performed without a change in activity. The difference in two forms of alternation of work consists in the longer period of dragging into work with operations altered on weeks. This form of alternation is, thus, more expedient in the case of simple, easily automatized kinds of activity. It was assumed that, when selecting working complexes for alternation and choosing the order of the change of working, concrete characteristics of operations and conditions of activity must be taken into consideration along with factors of monotony and intensity.

**A68-81359**
**BLOOD CIRCULATION IN FOREARM MUSCLES DURING STATIC TENSIONS OF VARIOUS STRENGTH AND DURATION [KROVOSNABZHENIE MYSHTS PREDPLECH'IA PRI STATICHESKIKH NAPRIAZHENIIAKH RAZLICHNOI SILY I DLITEL'NOSTI].**
V. I. Tkhorevskii (USSR, Acad. of Med. Sci., Inst. of Labor Hyg. and Occupational Diseases, Moscow).
*Fiziologicheskii Zhurnal SSSR*, vol. 54, Feb. 1968, p 199–206. 18 refs. In Russian.

Studies were made to determine the blood supply in the skeletal muscles of man during static exercise of various intensity and duration. The experiments were carried out on seven male subjects, ages 21 to 25 yr., and a hand dynamometer with tensions varying from 10 to 60% of the maximum contraction strength was used. The grip was maintained up to 40 min., and the blood flow in the forearm muscles of the exercising hand was measured by plethysmography. Electromyographic recordings were done simultaneously, and the blood pressure was measured periodically. The comparison of the amount of blood flow in the muscles at the end of the exercise and immediately after showed that isometric contraction of the forearm muscles occluded the blood flow in these muscles, the level of occlusion being directly related to the magnitude of the muscle tension. The blood flow in the muscles was found to be adequate up to 0.10 maximal contraction strength.

**A68-81360**
**OBTAINING SYNCHRONOUS CULTURES OF ALGAE.**
C. L. M. Steenbergen (Hydrobiol. Inst., "Vijverhof", Nieuwersluis, The Netherlands).
*Nature*, vol. 218, May 11, 1968, p 574. 7 refs.

Culture techniques and some of the problems involved for obtaining synchronous cultures of algae were discussed. These topics included dilution of media, DNA replication and photoperiod control.

**A68-81361**
**HYPOTHALAMIC CONTROL OF SOME ASPECTS OF ENERGY METABOLISM IN THE CEREBRAL CORTEX [O GIPOTALAMICHESKOI REGULIATSII NEKOTORYKH STORON ENERGETICHESKOGO OBMENA KORY BOL'SHIKH POLUSHARII].**

A. IA. Mogilevskii, E. V. Gerasimovich, V. F. Meshman, I. V. Popel'nitskaia, and D. G. Rasina (Kharkov Sci.-Res. Inst. of Neurol. and Psychiat., UkrSSR).

*Zhurnal Vysshei Nervnoi Deiatel'nosti,* vol. 17, Nov.–Dec. 1967, p. 1043–1051. 24 refs. In Russian.

The experiment conducted on 19 dogs and 40 cats investigated the effect of stimulation of the posterior hypothalamus on the cortex consumption of oxygen and glucose, on its content of macroergic substances as compared with the dynamics of cortical bioelectrical activity, its blood flow and some vegetative characteristics. Electrical stimulation of the posterior hypothalamus led to an increase in the minute volume of the cortical blood flow and durably raised the level of absorption of oxygen and glucose by the cortex and of oxygen tissue tension. The data obtained showed that the posterior hypothalamic ascending and descending components affected the shifts in the basic processes of the cortical energy metabolism and their supply with energy resources.

**A68-81362**
**CHANGES IN THE RESPONSES OF THE LATERAL GENICULATE BODY UNITS TO MULTIPLE PHOTIC STIMULATION [IZMENENIE REAKTSII NEIRONOV LATERAL'NOGO KOLENCHATOGO TELA PRI MNOGOKRATNOM PRIMENENII SVETOVYKY RAZDRAZHITELEI]**

T. G. Beteleva (M. V. Lomonosov Moscow State U., Dept. of Physiol. of Higher Nervous Activity, USSR).

*Zhurnal Vysshei Nervnoi Deiatel'nosti,* vol. 17, Nov.–Dec. 1967, p. 1052–1059. 20 refs. In Russian.

The responses evoked in the lateral geniculate body units of rabbits by repeated flashes with a frequency of 0.6 c.p.s. were recorded and studied. Signs of enhancement of excitatory processes (reduced latencies and increased number of impulses) and of inhibitory processes (opposite changes) were observed in the changes of initial discharges of different units in the course of repeated stimulation. A decreased variability of the initial discharge was the most common change in different units. In secondary discharges, changes due to enhanced inhibitory processes were more pronounced than in initial discharges. The activation of excitatory and inhibitory processes was also reflected in the changes occurring in the spontaneous rhythms of the units in the intervals between the stimuli.

**A68-81363**
**SIGNIFICANCE OF VARIOUS CHARACTERISTICS OF RHYTHMIC MECHANICAL STIMULUS FOR PROPRIOCEPTIVE REFLEX [ZNACHENIE RAZLICHNYKH KHARAKTERISTIK RITMICHESKOGO MEKHANICHESKOGO RAZDRAZHITELIA DLIA PROPRIOTSEPTIVNOGO REFLESKA].**

M. F. Stoma (Sanit.–Hyg. Med. Inst., Dept. of Normal Physiol., Leningrad, USSR).

*Fiziologicheskii Zhurnal SSSR,* vol. 54, Feb. 1968, p. 160–165. 14 refs. In Russian.

The relation of muscular bioelectric potential responses to various characteristic mechanical stimuli evoked in proprioceptors was studied. Unanesthetized rabbits were used as experimental animals, and the stimulus was produced by a special vibrator attached to the rabbit's foot. The muscle activity was recorded electromyographically (EMG). The use of an adequate stimulus allowed a quantitative evaluation by EMG of the reflex activity of motor analyzers, and a maximal reflex response was observed with a vibration stimulus with a frequency of 50 c.p.s. and a stretch rate of 0.25 m./sec. An optimal amplitude evoking maximal responses was noted for each vibration frequency studied. To characterize the proprioceptive stimulus the absolute value and the rate of its increase was taken into account. The quantitative regularities of the reflex activity of the motor analyzer were common to all sense organs.

**A68-81364**
**NEUROPHYSIOLOGICAL ANALYSIS OF THE EFFECT OF ANTIDEPRESSANTS ON LIMBIC REACTIONS [NEIROFIZIOLOGICHESKII ANALIZ DEISTVIIA ANTIDEPRESSANTOV NA REAKTSII LIMBICHESKOGO PROISKHOZDENIIA].**

L. Kh. Allikmets and F. P. Vediaev (USSR, Acad. of Med. Sci., Inst. of Expt. Med., Leningrad).

*Fiziologicheskii Zhurnal SSSR,* vol. 54, Feb. 1968, p. 145–151. 23 refs. In Russian.

In chronic experiments on rabbits, studies were made of the effect of antidepressants on behavioral and electroencephalographic reactions evoked by stimulation of limbic structures of the forebrain and medial thalamic nuclei. It was shown that antidepressants (one to ten mg./kg.) are practically ineffective with respect to behavioral reactions due to stimulation of non-specific thalamic nuclei, whereas they significantly decrease the electroencephalographic reaction of activation. On the other hand, inhibition of the agressively-defensive reaction to stimulation of the amygdala was more complete provided imipramine and amitryptiline were used but not chlorpromazine, amyzile or chloracysine. Injection of imipramine or amitryptiline increases the behavioral reactions evoked by stimulation of the hippocampus. It is suggested that inhibition of the amygdaline complex plays a rather important role in antidepressive mode of action of the preparations studied.

**A68-81365**
**INTERRELATIONSHIPS BETWEEN THE CORTEX AND SOME SUB-CORTICAL STRUCTURES IN DOG'S BRAIN DURING EXPERIMENTAL HYPERKINESES DUE TO PHOTIC STIMULATION [VZAIMOOTNOSHENIIA KORY I PODKORKOVYKH OBRAZOVANII PRI EKSPERIMENTAL'NYKH GIPERKINEZAKH, VYZYVAEMYKH SVETOVYM RAZDRAZHENIEM].**

E. I. Tkachenko (USSR, Acad. of Med. Sci., Inst. of Expt. Med., Leningrad).

*Fiziologicheskii Zhurnal SSSR,* vol. 54, Feb. 1968, p. 138–144. 17 refs. In Russian.

During the development of epileptiform hyperkineses evoked by photic stimulation, two periods of changes in bioelectrical activity of the cortex and sub-cortical structures may be distinguished. In the first of these periods, both the cortex and sub-cortical structures exhibit predominantly slow activities in a form of theta- and delta-waves. On the contrary, in the second period mainly fast types (similar to beta- and alpha-rhythms) of activities are observed together with irregular spikes. Temporal discrepancies may occur between the pattern of bioelectrical activity of the brain and motor disturbances.

**A68-81366**
**ON EXTERIORIZATION REACTIONS IN LONG ISOLATION CONDITIONS AND THEIR IMPORTANCE FOR THE UNDERSTANDING OF SPLIT PERSONALITY MECHANISMS [OB EKSTERIORIZATSIONNYKH REAKTSIIAKH V USLOVIIAKH MEKHANIZMOV RAZDVOENIIA LICHNOSTI].**

O. N. Kuznetsov and V. I. Lebedev.

*Voprosy Psikhologii,* no. 1, Jan.–Feb. 1968, p 31–41. 26 refs. In Russian.

The social-psychological aspects of long durations in sound-proof chamber tests on individuals in isolation in terms of the conception of personality external-internal balance with social environment were analyzed. It was shown that different forms of external reactions and external personality trends develop in long test conditions. The experimentally revealed degree of personality internalization was considered as a socially valuable quality for professions connected with the necessity of independent responsible activity in ecologically and geographically limited situations. Experimental external reactions modeling split personality were compared with clinical-psychiatric data and doubles' images in fiction. An attempt was made to show the promise of studying external-internal relationships for the analysis of split personality syndrome.

**A68-81367**
**AUDITORY EVOKED RESPONSES FROM THE EXPOSED HUMAN CORTEX.**

Gastone G. Celesia, Roger J. Broughton, Theodore Rasmussen, and Charles Branch (McGill U., Dept. of Neurol. and Neurosurg., Montreal and Montreal Neurol. Inst., Canada).

*Electroencephalography and Clinical Neurophysiology*, vol. 24, May 1968, p. 458–466. 23 refs.
Med. Res. Council, Canada supported research.

Average responses to clicks were recorded in seven patients from the human cortex exposed during surgery for treatment of focal epilepsy. The early components of the evoked activity were one or two positive waves 10-25 $\mu$ V in amplitude and 26-40 msec. in latency. These responses were obtained from the posterior part of the superior temporal gyrus and the parietal and frontal operculum. Direct recording from the superior surface of the temporal lobe was not carried out. Average responses to click were also recorded from the scalp and were compared with the auditory responses from the cortex. It was concluded that the early scalp deflections usually represent myogenic potentials, while the late components of the responses are a mixture of myogenic and neurogenic potentials.

**A68-81368**
**DIFFERENTIATION BETWEEN VISUALLY EVOKED F AND V POTENTIALS.**

Kenneth A. Kooi, Mahmoud Shafii, and Eldred T. Richey (Mich., U., Med. Center, Nerurosychiat. Inst., Lab. of Electroencephalog., Ann Arbor).

*Electroencephalography and Clinical Neurophysiology*, vol. 24, May 1968 p. 482–485.
Grant PHS NB 02560.

A frontal dominant wave (F wave), evoked by single photic stimuli presented at intervals of several seconds, and made evident by computer averaging technique, was described in man and differentiated from the evoked vertex dominant wave (V wave) on the basis of its distribution and latency. The F wave typically culminated between 150 and 200 msec. as compared with 110 to 160 msec. for the V wave. Amplitude was ordinarily below 20 $\mu$V. Normative data were presented for a group of 90 subjects, in which the wave could be positively identified, in regard to range of latencies, mean latency, range of amplitudes, mean amplitude, range of wave duration, mean duration, frequency of spread to central regions and left-right wave symmetry.

**A68-81369**
**CARBON DIOXIDE FIXATION DURING HIBERNATION AND AROUSAL FROM HIBERNATION.**

George J. Klain and Bertwell K. Whitten (Fitzsimons Gen. Hosp., U.S. Army Med. Res. and Nutr. Lab., Denver, Colo.).

*Comparative Biochemistry and Physiology*, vol. 25, Apr. 1968, p. 363–366. 12 refs.

*In vitro* studies indicate that hepatic tissue preparations from hibernating and arousing ground squirrels have a greater capacity for incorporation of $C^{14}O_2$ into glucose and glycogen than similar preparations from normothermic animals. An increase in $CO_2$ fixation was observed both at 37 and 6°C.

**A68-81370**
**THE ABILITY TO SEE A PEDESTRIAN AT NIGHT: THE EFFECTS OF CLOTHING, REFLECTORIZATION AND DRIVER INTOXICATION.**

Richard D. Hazlett and Merrill J. Allen (Ind. U., Div. of Optometry, Bloomington).

*American Journal of Optometry and Archives of the American Academy of Optometry*, vol. 45, Apr. 1968 p. 246–258. 18 refs.
Minn. Mining and Manuf. Co. supported research.

In the United States, pedestrian deaths account for nearly 20% of all traffic fatalities. During darkness the pedestrian's risk is increased. This risk is further increased if a pedestrian is wearing dark clothing or must travel on a roadway concurrently with a driver who has been drinking. In the laboratory phase of this study it was found that at low levels of illumination an individual's sensitivity to contrast decreases as his blood alcohol level increases. All subjects exhibited a significant ($p < .01$) decrease in contrast sensitivity at blood alcohol levels greater than 0.04%. In the road test phase of the study visibility distances were found to be unacceptably short for "dummy" pedestrians covered with black or gray fabric. Dummies covered with white fabric were safely visible for a driver traveling up to a speed of 50 M.P.H.; however, only reflectorized dummies were safely visible above that speed. At blood alcohol levels greater than 0.04% all of the observers exhibited a significant ($p < .01$) decrease in the mean visibility distance for each of the simulated pedestrian conditions.

**A68-81371**
**ELECTRICAL REACTION OF THE RABBIT CEREBRAL CORTEX TO VARIOUS ELECTROMAGNETIC FIELDS [ELEKTRICHESKAIA REAKTSIIA KORY BOL'SHIKH POLUSHARII GOLOVNOGO MOZGA KROLIKA NA RAZLICHNYE ELEKTROMAGNITYNE POLIA].**

R. A. Chizhenkova (USSR, Acad. of Sci., Inst. of Higher Nervous Activity and Neurophysiol., Moscow).

*Zhurnal Vysshei Nervnoi Deiatel'nosti*, vol. 17, Nov.–Dec. 1967, p. 1083–1090. 20 refs. In Russian.

An electromagnetic ultrahigh frequency field (with a 30 v/m tension), a superhigh frequency field (with a current density of 40 mwatt/cm2) and a constant magnetic field (with a tension of 460 oersteds), acting one to three min., caused an increased number of slow waves and spindles in the rabbit electroencephalography (EEG). The EEG changes were not accompanied by a change in the respiratory and cardiac rates. Electrical reactions in the brain appeared only under the action of electromagnetic fields on the animal's head. Electromagnetic ultrahigh and superhigh frequency fields enhanced while a constant magnetic field diminished the excitability of visual analysers. The data obtained were processed by means of automatic analysis, and the blind method of analysis; functional tests were analyzed statistically.

**A68-81372**
**SOME PECULIARITIES OF LOW-FREQUENCY RHYTHMIC RESPONSE OF THE VISUAL CORTEX [NEKOTORYE OSOBENNOSTI NIZKOCHASTOTNOGO RITMICHESKOGO OTVETA ZRITEL'NOI KORY].**

I. A. Kolomeitseva, G. D. Kuznetsova, and M. S. Myslobodskii (USSR, Acad. of Sci., Inst. of Higher Nervous Activity and Neurophysiol., Moscow).
*Zhurnal Vysshei Nervnoi Deiatel'nosti, vol. 17, Nov.–Dec. 1967, p. 1074–1082. 33 refs.* In Russian.

In acute and chronic experiments on awake rabbits a study was made on the restoration cycle of responses evoked by two to seven stimuli and of the responses of single units in the visual cortex to a single and low-frequency rhythmic photic stimulus. The typical form of rhythmic response of the visual cortex to low-frequency photic stimulation depends on interaction between the evoked potential and the slow negative wave of the response to the previous stimulus. The ascending phase of rhythmic responses is due to the coincidence of the given stimulus with the summit of the preceding slow negative wave and to the appearance of a facilitated evoked potential. The decrease in the reaction amplitude is related to the escape of the slow negative wave from the stimulus due to its shorter duration and to greater steepness of the anterior front, and to a longer latency of the facilitated evoked potential and (or) a greater duration of the slow negative wave. Against the background of the rhythmic spindle discharges most elements of the visual cortex were inhibited, and the smaller part activated. It has been assumed that the direction of changes in the unit activity, when passing from single stimuli to low-frequency rhythmic stimulation, depends on the initial level of polarization of the cortical cell membranes.

**A68-81373**
**NATURE OF NEURON DISCHARGES IN THE VISUAL CORTEX OF ALERT RABBITS DURING ENHANCED FREQUENCY OF FLICKERING LIGHT [KHARAKTER RAZRIADOV NEIRONOV ZERITEL'NOI KORY BODRSTVUIUSHCHEGO KROLIKA PRI POVYSHENII CHASTOTY MEL' KAIUSHCHEGO SVETA].**

V. B. Polianskii (M. V. Lomonosov Moscow State U., Dept. of Physiol. of Higher Nervous Activity, USSR).
*Zhurnal Vysshei Nervnoi Deiatel'nosti,* vol. 17, Nov.–Dec. 1967, p. 1060–1065. 13 refs. In Russian.

The graphic analysis of reactions of 30 units in the visual cortex of alert rabbits to a flickering light showed that increased frequency of flashes resulted in a decrease in the total number of impulses in the cell response during the first two sec. of stimulation, and in the unit discharge to each flash. Such a decrease in the number of impulses may be due to the disappearance of late discharge components and to the development of inhibition (apparently recurrent), which limits the early part of the discharge. A diminished number of impulses to a flash has also been found in response to a successive application of stimuli of different frequency. It may be assumed that this results from the summation of inhibition at cortical neurons.

**A68-81374**
**BIOCHEMICAL CHANGES IN HYPERTHERMIA IN ALBINO RATS: AN EXPERIMENTAL STUDY**

K. M. Wahal, Abhaya Kumar, and Pramod Nath (K. G. Med. Coll., Dept. of Pathol. and Bacteriol., Lucknow, India).
*Indian Journal of Medical Research,* vol. 56, Jan. 1968, p. 12–19. 21 refs.

Experimental hyperthermia was produced in albino rats by exposing them to a high ambient air temperature in a thermostatically controlled water tank. Forty-six animals were subjected to a single exposure of four hr. duration. Biochemical studies were made about serum proteins (including its fractions) and enzymes, SGPT, SGOT and serum alkiline phosphatase. Deviation in total serum proteins and the fraction were observed immediately after the exposure which accentuated till 24 to 48 hr. but normal values were obtained once again by 96 hr. onward. Deviations from normal in the values of SGOT and SGPT was maximum within first 48 hr. of the single exposure and near normal values were obtained by the end of 96 hr. The pathogenesis of these deviations in proteins and enzymes have been discussed.

**A68-81375**
**THE RELATIVE ROLE OF STORAGE AND SYNTHESIS OF BRAIN NOREPINEPHRINE IN THE PSYCHOMOTOR STIMULATION EVOKED BY AMPHETAMINE OR BY DESIPRAMINE AND TETRABENAZINE.**

F. Susler, M. L. Owens, M. R. Norvich, and J. V. Dingell (Vanderbilt U., School of Med., Dept. of Pharmacol. and Central State Hosp., Psychopharmacol. Res. Center, Nashville, Tenn).
*(Am. Soc. for Pharmacol. and Exptl. Therap., Mexico City, Jul. 1966).*
*Psychopharmacologia,* vol. 12, Apr. 9, 1968, p. 322–332. 31 refs.
Grant NIMH MH 11468.

The relative role of storage and synthesis of brain norepinephrine in the psychomotor stimulation evoked by amphetamine or by despramine (DMI) and tetrabenazine was investigated. The blockade of norepinephrine synthesis by the tyrosine hydroxylase inhibitor $\alpha$-MT abolishes the central stimulatory action of amphetamine but not that evoked by tetrabenazine in DMI pretreated rats. In contrast, depletion of norepinephrine by $\alpha$-MMT prevents the central stimulation evoked by the DMI-tetrabenazine combination but not that elicited by amphetamine. The $\alpha$-methylated tyrosine derivatives do not interfere with either the metabolism of amphetamine and DMI or their entry into the brain. The results of the present studies, thus, are consistent with the views that the central action of amphetamine requires an uninterrupted synthesis of brain norepinephrine whereas a rapid release of norepinephrine from its storage sites is essential for the behavioral stimulation elicited by tetrabenazine in DMI pretreated rats.

**A68-81376**
**MAIN FEATURE OF THE DYNAMICS OF EVOKED POTENTIALS IN THE PROCESS OF TRANSITION FROM ALERTNESS TO SLEEP IN UNANESTHETIZED CATS [OSNOVNAIA OSOBENNOST' DINAMIKI VYZVANNYKH OTVETOV PRI PEREKHODE OT BODRSTVOVANIIA K SNU U NENARKOTIZLROVANNYKH KOSHEK].**

I. M. Gil'man (USSR, Acad. of Med. Sci., Inst. of Normal and Pathol. Physiol., Lab. of Physiol. Analysis of Endogenic Neurotropic Drugs, Moscow).
*Zhurnal Vysshei Nervnoi Deiatel'nosti,* vol. 17, Nov.–Dec. 1967, p. 1091–1097. 19 refs. In Russian.

A study was made on unanesthetized cats of the photic evoked potentials in cortical primary and associative areas, in comparison with electroencephalograms (EEG), during transition from alertness to various stages of sleep with synchronized EEG rhythms. Distinct evoked potentials with a short duration of the first positive–negative complex and a well-pronounced second positive oscillation were recorded in the actively alert animals against a desynchronized EEG background. Wtih increased EEG synchronization, duration of the first negative phase increased (from 50 to 60 msec. to 360 to 460 msec.), and the second positive wave decreased accordingly, sometimes disappearing completely. Changes in the first positive phase were not steady. It was assumed that the genesis of the first and second positive phases was different. The dependence of duration of the first negative phase of the evoked response on the magnitude of the second positive shift was supposed to be related to hyperpolarization of dendrites, as reflected in the second positive oscillation (which, as a rule, was more pronounced in the associative cortex), while the first positive phase reflected depolarization of the soma of cells of the III and IV cortical layers.

**A68-81377**
**THE EFFECT OF FOUR DRUGS ON SLEEP PATTERNS IN MAN.**
Ernest Hartmann (Boston State Hosp., Mass.).
*Psychopharmacologia*, vol. 12, Apr. 9, 1968, p. 346–353. 12 refs.
Grants PHS K3-MG-8522 and PHS MG 08715; Hoffman LaRoche, Inc. supported research.

The acute effects of four drugs (pentobarbital, amitriptyline, RO 5-6901 (a new benzodiazepine), and chlordiazepoxide) on sleep were investigated in ten normal human subjects. All drugs produced a slight increase in total sleep time. Rapid eye movement (REM) time and REM-time percent were moderately reduced by pentobarbital and greatly reduced by amitriptyline. The two benzodiazepines had no effect on these variables, i.e. they produced a night of normal or increased sleep without the reduced REM-time found after most clinically used drugs. The possibility is discussed that the effect of antidepressant agents on sleep patterns, specifically a reduction in the "need for REM", may be related to their clinical action.

**A68-81378**
**TEMPORAL AND INTENSIVE FACTORS IN BINAURAL LATERALIZATION OF AUDITORY TRANSIENTS.**
Lloyd F. Elfner and Richard T. Tomsic (Fla. State U., Tallahassee).
*Journal of the Acoustical Society of America*, vol. 43, Apr. 1968, p. 746–751. 6 refs.
NSF supported research.

The present experiment employed three experienced listeners. The primary purpose was to investigate the ability of the listener to detect a just noticeable shift from center of a dichotically produced auditory image. Thresholds were determined using a modification of Fechner's Method of Right and Wrong Cases. Thresholds were evaluated by means of an oscilloscope and camera. All combinations of a 600 c.p.s. and a 6,000 c.p.s. tone and rise times of 10, 50 and 250 msec. were used. Individual threshold plots are shown for each experimental condition. Tables are presented showing the intensity levels of the lead signal and the intensity differences between the two signals during the rise-time portion of the signal complex for the various values employed. A frequency-dependent relationship was indicated only for the ten msec. rise-time signal. It was also noted that time differences between equal intensity portions (of the two signals) are not constant throughout the rise time of the signals.

**A68-81379**
**FLASH AND SCAN STIMULATION OF RETINAL FIELDS AND EVOKED RESPONSE PRODUCTION.**
W. W. Dawson, N. W. Perry, Jr. and D. G. Childers (Fla., U., Coll. of Med. and Center for Neurobiol. Sci., Coll. of Health Related Profess., and Coll. of Eng., Visual Sci. Lab., Gainesville).
*Electroencephalography and Clinical Neurophysiology*, vol. 24, May 1968, p. 467–473. 12 refs.
Grants PHS NB-06635, PHS NB-06875, and PHS NB-06654.

Micro-electrode recorded data from the visual cortex of animals indicates that diffuse light stimulation of the retina is less efficient than target movement across the retinal fields. Some investigators have established relationships between cortical cell response and evoked slow wave activity. Pre-programmed computer processing of potentials from the scalp of the occipital area of humans allows direct comparison with the findings from animals. Magnitude of the visually evoked cortical response in humans is directly related to the amount of light admitted to the retina whether the stimulus is diffuse or scans the retinal fields. When a luminous spot moving at 21 and 45 cm. sec.$^{-1}$ was viewed the evoked response magnitude exceeded that produced by a diffuse flash although the flash brightness was greater by a 15 factor. Movement rates above 45 cm. sec.$^{-1}$ evoked responses which were less in magnitude than those elicited by the standard diffuse flash. Above 45 cm. sec.$^{-1}$ latency of the evoked response positive peak was positively related to scan speed. Latency data suggest that the responses to moving stimuli were not initiated at the macula. The findings were discussed with reference to extra intracellular records from animals. Good agreement was obtained between the human and animal data.

**A68-81380**
**THE EFFECTS OF GRADED HYPOXIA UPON TRANSIENT CEREBRAL BLOOD FLOW AND OXYGEN CONSUMPTION.**
S. Shimojyo, P. Scheinberg, K. Kogure, and O. M. Reinmuth (Miami, U., School of Med., Dept. of Neurol., Fla.).
*Neurology*, vol. 18, Feb. 1968, p. 127–133. 29 refs.
Grant PHS NB 05820-01.

The effects of progressive hypoxia on cerebral blood flow and cerebral metabolism transients were measured in 17 patients without attempting to control $PaCO_2$. No significant change in cerebral blood flow (CBF), arterial cerebral venous $O_2$ difference, oxygen consumption rate ($CMRO_2$), or cerebral vascular resistance (CVR) occurred in the group of patients in whom $PaO_2$ was not reduced below 30 mm. Hg. In the group of patients in whom $PaO_2$ was reduced below 30 mm. Hg, CBF was increased 56% above control, $CMRO_2$ was unchanged, and CVR was significantly reduced. Graphic analysis of the 52 CBF measurements made during various degrees of hypoxia indicate that the effect of hypoxia on cerebral circulation is a threshold phenomenon, quite constant in a heterogeneous population. This is quite different from the curvilinear effect of $PaCO_2$ change on CBF. $CMRO_2$ remained constant even when hypoxia produced a striking elevation of CBF and also when hypoxia resulted in momentary loss of consciousness with electroencephalography slowing. The data suggest that the vasodilating effect of hypoxia on cerebral vessels is not the consequence of tissue hypoxia alone.

**A68-81381**
**METABOLIC ASPECTS OF ACUTE STARVATION.**
Harry J. Krzywicki, C. Frank Consolazio, LeRoy O. Matoush, and Herman L. Johnson (Fitzsimons Gen. Hosp., U. S. Army Med. Res. and Nutr. Lab., Denver, Colo.).
*American Journal of Clinical Nutrition*, vol. 21, Jan. 1968, p. 87–97. 41 refs.

Body composition changes were observed in six healthy adult males 21–52 yr. of age, while fasting for ten days. Fluid was available *ad libitum*. The mean loss in body weight (7.30 kg.) was densitometrically partitioned into a 3.46 kg. loss of fat and a 3.84 kg. loss in the fat-free body mass, which included a loss of 0.77 kg. of dry protein. The United States Army Medical Research and Nutrition Laboratory fat-predicting nomogram described fat losses adequately; however, urinary potassium and creatinine excretion, or potassium-40 counting, exceeded densitometric estimates of the dry-protein compartment by 22 and 31%, respectively. The triceps and scapula skin folds demonstrated the greatest decrease (24.1 and 21.6%) while extremity girths decreased from 9.8 to 3.2% with the circumferences of the waist and buttocks diminishing by 5.8%. Blood, plasma, and red blood cell volumes were significantly lowered during the fast in accordance with the severe hypohydration that was exhibited. No sequelae were noted during and after 40 days of rehabilitation when body weight was virtually restored to control levels. Use of $D_2O$ as a tracer to demonstrate total body water appeared to be inapplicable during the starvation phase of the study.

**A68-81382**
**SPECTROGRAPHIC ANALYSIS OF DIVERS' SPEECH DURING DECOMPRESSION.**

Robert S. Brubaker and John W. Wurst (Singer Co., HRB-Singer, Inc., State College, Pa.).
*Journal of the Acoustical Society of America*, vol. 43, Apr. 1968, p. 798–802. 8 refs.
ONR supported research.

The distorting effects of a pressurized helium environment on the speech of three experienced divers at five depths of submersion were studied by means of spectrography. The results indicate that under such conditions, vocal fundamental, vowel formants, and consonant-vowel amplitude ratios are elevated. Implications for helium-speech processing are presented, and the results are interpreted as consistent with the hypothesis that, in addition to the helium and pressure effects, increased vocal effort contributes to speech distortion in such environments.

**A68-81383**
**LAMBDA WAVE STUDIES ON THE EEG OF ANIMALS.**
Donald F. Scott, Frank R. Lichtenheld, and Reginald G. Bickford (Mayo Clin. and Mayo Found., Rochester, Minn.).
*Archives of Neurology*, vol. 18, May 1968, p. 574–582. 14 refs.
Grants PHS NB-2056, PHS NB-7066, and PHS NB-4457.

Single wave analogous to the lambda waves in man have been demonstrated by scalp, extradural, and depth recordings in the monkey, cat, and dog. In the monkey, summation techniques with eye-movement triggering were used in conjunction with the other recording methods. Lambda waves were not found in the rat, guinea pig, and rabbit. As in the human, lambda waves appear to be responses evoked in the cortical and subcortical visual system by changing retinal stimuli. The latency of the response in the animals studied was sufficiently strong to make the hypothesis of a neuronal shutter mechanism less attractive since the main movement component would be accomplished before the peak lambda wave response was reached.

**A68-81384**
**THE EFFECT OF A PROTEIN MEAL WITH AND WITHOUT SUBSEQUENT EXERCISE ON PLASMA INSULIN AND GROWTH HORMONE.**
M. Y. Sukkar, W. M. Hunter, and R. Passmore (Edinburgh, U., Dept. of Physiol. and Med. Res. Council, Clin. Endocrinol. Res. Unit, Edinburgh, Great Britain).
*Quarterly Journal of Experimental Physiology and Cognate Medical Sciences*, vol. 53, Apr. 1968, p. 206–217. 37 refs.

Plasma levels of insulin and growth hormone were measured over a six hr. period in ten normal subjects; (a) fasting and resting, (b) after a protein meal and resting, and (c) after a protein meal followed by two hr. moderate exercise. Low levels of insulin and growth hormone were found during fasting and the insulin levels fell further throughout the fast. After ingestion of protein, plasma insulin and growth hormone concentrations increased; the rise in insulin secretion preceded the rise in growth hormone. Moderate muscular exercise in the absorptive phase of the meal abolished or markedly diminished the insulin response to protein and enhanced the growth hormone response. It was concluded that dietary protein may have a role in the physiological regulation of insulin and growth hormone release. The metabolic implications of these findings were discussed in terms of the requirements of energy metabolism.

**A68-81385**
**FORCE FEEDING ON THE RESPONSE OF JAPANESE QUAIL TO OXYGEN TOXICITY.**
Harold S. Weiss and Ronald A. Wright (Ohio State U., Coll. of Med., Dept. of Physiol., Environ. Physiol. Lab., Columbus).
*Comparative Biochemistry and Physiology*, vol. 25, Apr. 1968, p. 95–106. 19 refs.
NASA Grant NsG-295-62 and Grant NIH HE-09026.

Sixteen out of 30 *ad lib.* fed adult quail (*Coturnix japonica*) survived 12 to 24 days of exposure to 100% $O_2$ at one atm. (OAP). Most of the deaths occurred between the fifth and tenth day. Rick of mortality statistics and the estimated $LT_{50}$ of 14 days indicated higher resistance to $O_2$ toxicity than in small mammals. Quail reacted to OAP with a rapid depression in food and water intake and loss in body weight. These decreases were significantly more drastic for those which ultimately died, permitting differentiation within two to three days of potential fatalities from eventual survivors. Survivors reached minima in body weight (85%) and intakes (33 to 50%) between the fourth and seventh day, followed by recovery. Twelve days of force feeding 20 quail in OAP at one-third normal intake did not alter mortality rate but did eliminate difference in body weight and intakes between fatalities and survivors. This was interpreted to mean that inanition and adipsia contribute little to death or survival in OAP, and that if food is ingested, alimentary processes can proceed normally.

**A68-81386**
**DETECTION OF MONAURAL SIGNALS AS A FUNCTION OF INTERAURAL NOISE CORRELATION AND SIGNAL FREQUENCY.**
W. A. Wilbanks and John K. Whitmore (Miss., U., Dept. of Psychol., University).
*(Acoust. Soc. of Am., 69th and 70th Meetings, Washington, D. C., Jun. 1965).*
*Journal of the Acoustical Society of America*, vol. 43, Apr. 1968, p. 785–797. 45 refs.
NASA, Naval Ship Systems Command, and Miss., U. supported research.

The effects of varying the interaural correlation for the masking noise on the detection of monaural signals between 150 c.p.s. and 4,000 c.p.s. were investigated. A rating-scale procedure was used to obtain receiver-operating-characteristic (ROC) curves, from which measures of detection ($d_s$) and masking level differences (MLD's) were calculated. The results show that: (1) the magnitude of the advantage for binaural over monaural detection depends on the interaural correlation for the masker and the frequency of the signal; (2) the effect of signal frequency on MLD can be portrayed as a simple reduction in the interaural correlation for noise; (3) any sizeable binaural assistance in detecting monaural signals in noise of moderate intensity is confined to frequencies between 225 and 1,200 c.p.s.; (4) additive acoustic noise produced in the ear canal is not a sufficient explanation for the dramatic reduction in binaural assistance found for signals below 250 c.p.s.; (5) the striking dependence of low-frequency MLD's on noise level suggests that the speed of propagation of the traveling wave, and the basal spread of neural excitation on basilar membrane are the major determiners of binaural unmasking for these signals; (6) the consistent agreement of ROC curves for human observers with the appropriate theoretical curves for the degraded amplitude detector provides no evidence for believing that the stimulus distributions for binaural detection differ markedly in form from the amplitude distributions for monaural detection; and (7) as long as care is taken in the training of observers, the Jeffress conversion from one value of $d_s$ and signal level to another is an efficient means of obtaining differences among interaural conditions.

**A68-81387**
**A CASE OF DEMENTIAL ENCEPHALOPATHY AFTER ACUTE CARBON MONOXIDE POISONING [UN CASO DI ENCEFALOPATIA DEMENZIALE POSTUMO DI INTOSSICAZIONE ACUTA DA OSSIDO DI CARBINIO].**
M. Tomasini (Milan, U., Clin. del Lavoro "L. Devoto", Italy).
*Dedicina del Lavoro*, vol. 58, Oct. 1967, p. 632–635. 19 refs.
In Italian.

The case of a 39 yr. old worker, who showed a deep change of personality, after a very serious acute poisoning from carbon monoxide with a comatose state lasting six days is presented. Six yr. after the accident there was no sign of improvement, the disease was interpreted as a severe chronic demential encephalopathy resulting from a permanent lesion of the central nervous system caused by hypoxia.

**A68-81388**
**FACTORS IN HUMAN ENDURANCE.**
Ralph H. Johnson (Oxford, U., St. Peter's Coll., Great Britain).
*British Medical Journal,* vol. 1, Mar. 16, 1968, p. 697–700. 32 refs.
Med. Comm. on Accident Prevent. supported research.

A discussion is presented on the variations in physical capacity and adaptability of men in different environmental situations. The limiting factors including the individual's physical characteristics, such as race, sex, and age, the difficulties imposed by the environment such as high altitude, hot or cold climate, immersion in water, the extent to which physiological mechanisms can adapt themselves, and the psychological factors are reviewed. The influence of these factors on performance are considered as well as the importance of diet and clothing. The accidents which may occur under the stress of environmental conditions, the danger presented by the use of drugs combined with physical exhaustion, the lack of organization and adequate equipment, and the over all importance of man's personality and courage to survive, are discussed.

**A68-81389**
**FREQUENCY DEPENDENCY OF AURAL DIFFERENCE TONES.**
Claude H. Wenner (Jefferson Med. Coll., Dept. of Otolaryngol., Philadelphia, Pa.).
*Journal of the Acoustical Society of America,* vol. 43, Apr. 1968, p. 780–784. 11 refs.

Aural difference tones ranging from 125 to 3,000 c.p.s. were produced by primary tones between 1,900 and 7,700 c.p.s., wherein the normal threshold in decibels (re 0.0002 $\mu$bar) is relatively similar. Using difference tones as a masking stimulus for pure tones of the corresponding frequency, masked thresholds were obtained when the primary tones ranged in intensity from 60 to 110 db sound pressure level. The masking effect of the difference tones does not become apparent until the intensity of the primary tones reaches a level of 60 to 70 db, after which there is a constant growth in the masking effect for each 10-db increase in the intensity of a given set of primary tones. Threshold shift due to the use of the difference tone as a masking stimulus is not dependent upon the frequency of the difference tone, but is a constant value for a given intensity and a group of primary tones. There is an inverse linear relationship between the intensity of the difference tone to that of the frequencies of the primary tones used to produce it. A maximum amount of threshold shift occurs in the vicinity of 650 to 1,000 c.p.s. owing to resonance, and manifests itself when the primary tones have an intensity level of 80 db or more.

**A68-81390**
**INFLUENCE OF FATIGUE ON SLEEP**
J. Matsumoto, T. Nishisho, T. Suto, T. Sadahiro, and M. Miyosi (Tokushima U., School of Med., Dept. of Physiol., Japan).
*Nature,* vol. 218, Apr. 13, 1968, p. 177–178. 8 refs.

Experiments were conducted on adult male albino rats to study the influence of somatic fatigue on sleep, especially paradoxical sleep. The electromyograph and electrocardiograph of the rats were monitored, and respiration and eye movements were recorded. The animals were weighed before and after exercise. Each rat was placed on a treadmill for four hr., and after the exercise the animal was put in a sound proof, dimly illuminated box for electrographic recordings and observation. The results of the experiments showed that paradoxical sleep was inhibited by exhaustion, the inhibition continued for six hr. and was eliminated by administration of dihydroxyphenylalanine. From these results and from earlier reports, it could be implied that the inhibition of paradoxical sleep was due to a decrease in the norepinephrine amount in the brain. During the period of inhibition the slow-wave sleep was accentuated in all test rats.

**A68-81391**
**ON THE RELATION BETWEEN THE ACOUSTIC REFLEX AND LOUDNESS.**
Strange Ross (Syracuse U., Lab. of Sensory Commun., N.Y.).
*Journal of the Acoustical Society of America,* vol. 43, Apr. 1968, p. 768–779. 12 refs.
PHS supported research.

For each of four subjects, a set of equal-loudness contours constructed from obtained loudness balances was compared to contours of contra- or ipsilateral sinusoidal stimulations that activate the acoustic reflex to the same degree, as indicated by a constant change in acoustic impedance at the eardrum. Two subjects produced "normal" equal-loudness contours, showing close coincidence with the respective equal-reflex contours; the remaining two subjects produced "abnormal" equal-loudness contours, exhibiting significant departures from the respective equal-reflex contours. Results indicate no systematic difference in the sensitivity of the acoustic reflex to ipsi- and to contralateral stimulation. Middle-ear attenuations calculated from the magnitude of the acoustic impedance at the eardrum, together with estimates of the reflex-generated attenuations, were employed to transform the sound-pressure levels of the equal-reflex contours to relative values of volume velocity of the cochlear fluid. The transformed contours support the hypothesis that the acoustic reflex is activated to the same degree by sinusoidal stimulations producing the same total number of neural impulses within about 200 msec. For some subjects, equality of loudness between two sinusoidal stimulations appear to be attained under this same condition.

**A68-81392**
**EFFICIENCY OF MENTAL ACTIVITY AS AFFECTED BY ITS TEMPO [EFFEKTIVNOST' UMSTVENNOI DEIATEL'NOSTI V ZAVISIMOSTI OT EE TEMPA].**
K. K. Ioseliani.
*Voprosy Psikhologii,* no. 1, Jan.-Feb. 1968, p. 12–20. 14 refs. In Russian.

The highest possible tempo of mental activity was studied in 430 subjects. Their task consisted of continually adding and subtracting simple numbers in a fixed tempo in normal conditions and under the influence of acceleration, hypoxia and vibration. The findings showed that high tempo mental activity proved to be highly susceptible to the factors under study and the more the time deficit, the greater the decrease in mental efficiency. It was revealed that age and even slightly expressed autonomous-vascular pathology imposed restrictions on man's speedy mental possibilities.

**A68-81393**
**GAS CHROMATOGRAPHIC DETERMINATION OF LEAD TETRAETHYL IN THE ATMOSPHERE [LA DETERMINAZIONE GAS CROMATOGRAFICA DEL PIOMBO TETRAETILE NELL'ATMOSFERA].**
G. Perin (Padua, U., Ist. d'Igiene, Italy).
*Medicina del Lavoro,* vol. 58, Oct. 1967, p. 624–631. 15 refs. In Italian.

The use of gas chromatography for detection and dosage of tetraethyl lead (PTE) in atmospheric air samples is described.

The different techniques of air sampling and dosage according to the PTE concentrations are described. With the help of these techniques the gas chromatographic method offers precise and fast results and is of value for routine determinations.

**A68-81394**
**HEAT ACCLIMATIZATION AND OPERATING FATIGUE [ACCLIMATEMENT A LA CHALEUR ET FATIGUE OPERATIONNELLE].**
René Henane.
*Revue des Corps de Santé des Armées Terre Mer Air*, vol. 8, Dec. 1967, p. 809–824. 22 refs. In French.

The study of human acclimatization to heat, and the various experimental methods used are reviewed. Their criteria and limitations, and the results that could be expected with the present knowledge of the problem are discussed. The beneficial aspects and amelioration of performances that can be obtained with a correct acclimatization method are stressed, as well as the importance of acclimatization studies in applied physiology. Further studies to perfect the present knowledge of human adaptation processes to various environmental temperatures are needed.

**A68-81395**
**THE EAR AS A FREQUENCY ANALYZER. II.**
R. Plomp and A. M. Mimpen (Inst. of Perception RVO-TNO, Soesterberg, The Netherlands).
*Journal of the Acoustical Society of America*, vol. 43, Apr. 1968, p. 764–767. 8 refs.

Previous experiments on the limit of the ear's frequency-analyzing power, carried out with only two subjects, were repeated for four other subjects. The limit was investigated by measuring the number of harmonics of a complex tone that can be heard separately. It was found that, even under the most favorable conditions, not more than the first five to seven harmonics can be distinguished. This limit agrees with the critical-band concept, that is to say, a partial of a multitone stimulus can be heard only when the adjacent tones are separated by more than the critical bandwidth.

**A68-81396**
**INFLUENCE OF WEAK ELECTRO-MAGNETIC FIELDS ON THE CIRCADIAN CYCLE OF HUMANS [EINFLUSS SCHWACHER ELEKTRO-MAGNETISCHER FELDER AUF DIE CIRCADIANE PERIODIK DES MENSCHEN].**
Rütger Wever (Max-Planck-Inst. für Verhaltensphysiol., Seewiesen and Erling-Andechs, West Germany).
*Die Naturwissenschaften*, vol. 55, Jan. 1968, p. 29–32. 17 refs. In German.
NASA Grant NSG 259-62 and Fed. Min. for Sci. Res. supported research.

The differences between natural and artificial electro-magnetic fields and their effects on the circadian period of humans were investigated. The activity period was reflected through diagrams of activity and rest times, and the period of body temperatures through graphs of temperature maxima and minima. The other measured vegetative function (electrolyte separation by the kidneys) ran parallel to body temperature so that separate representations were not given. Both fields speed up the period, and both fields inhibit internal desynchronization. Results indicated that the circadian period could be affected through imperceptible physical factors, and that factors of the natural environment were by no means considerable to exert a measurable effect on humans.

**A68-81397**
**HISTOLOGY OF RETINAL LESIONS PRODUCED WITH Q-SWITCHED LASERS.**
J. Marshall and J. Mellerio (Inst. of Ophthalmol., Depts. of Anat. and Physiol. Optics, London, Great Britain). Experimental Eye Research, vol. 7, Apr. 1968, p. 225–230. 8 refs.
Min. of Defence and Med. Res. Council supported research.

The histology of retinal lesions induced by a Q-switched laser is described. The age of the lesions ranges from two min. to two mo. The lesions do not show a pigment ring and gas bubble, but may be divided into two concentric areas, an inner area of retinal breakdown and an outer area of less severe effects. A trapped subretinal hemorrhage is a feature of the lesions immediately above the energy threshold, and with larger energy doses the retina breaks down and the blood passes into the vitreous. There is a delay in the onset of macrophage activity not noted in passive laser lesions. Presently available Q-switched lasers are considered unsuitable for retinal surgery because of the delay in healing and small amount of scar tissue formed.

**A68-81398**
**RESPONSES TO VISUAL STIMULI OF UNITS IN THE SUPERIOR COLLICULUS OF RATS AND MONKEYS.**
N. K. Humphrey (Cambridge, U., Psychol. Lab., Great Britain).
*Experimental Neurology*, vol. 20, Mar. 1968, p. 312–340. 44 refs.
Grant MRC 965/96/B and Sci. Res. Council supported research.

Units in the superior colliculus of the rat responded primarily either to moving objects or to objects which, having moved, came to a stop in the receptive field. Small dark objects moving relatively slowly gave the best responses on the whole but there was considerable latitude in the range of effective stimuli; directional specificity was not found. The units fell into two major classes on the basis of size of receptive field, small-field units and large-field units. Anatomically, these corresponded to the two superficial layers of the colliculus, the stratum griseum superficiale, and the stratum opticum. Small fields, 2–15 deg. across, were circular in shape. Large fields, 30–90 deg. across at their widest point, were oval or irregular in shape, usually oriented horizontally, and often patchy as though made up of a conglomerate of smaller fields. Responses were frequently unstable in time and tended to wane with repeated stimulation. The over-all properties were unchanged by neocortical ablation. Units in the monkey likewise responded primarily to moving objects, although not to objects stopping in the field. Here, luminous objects were more effective than dark ones but again there was no great selectivity. The units did not fall into two classes on the basis of field size but there was a clear trend for field size to increase with depth. The range of field sizes was 2–90 deg. across. The smaller fields were circular in shape; the largest approximated quadrants of the visual field. Here, too, responses were unstable. The results for the rat are strikingly like those reported for the frog optic tectum. It is argued that the present results together with those of other single unit studies point to a role for the mammalian colliculus in the detection and location of "evocative" visual stimuli, perhaps as part of a visual attention mechanism.

**A68-81399**
**SLEEP SATIATION: EXTENDED SLEEP IN NORMAL SUBJECTS.**
Paul Verdone (Natl. Inst. of Mental Health, Bethesda, Md.).
*(Assn. for Psychophysiol. Study of Sleep, 5th Ann. Meeting, Washington, D. C., Mar. 1965).*
*Electroencephalography and Clinical Neurophysiology*, vol. 24, May 1968, p. 417–423. 21 refs.

The distribution of rapid eye movement (REM) sleep was studied by allowing each subject to sleep until he was ready to terminate the night. This procedure provided data relevant to the

three simple alternatives with regard to the nocturnal curve of REM sleep: (1) REM sleep is positively accelerated throughout the night; (2) REM sleep is negatively accelerated throughout the night; and (3) REM sleep is linearly related to total amount of sleep. The 22 subjects, all college students, slept for a combined total of 60 nights, averaging 578 min. of sleep per night. In general, the findings were most consistent with the third alternative. Evidence pertaining to the possibility that a constant amount of REM sleep (i.e., dreaming) is required each night was negative.

**A68-81400**

## ADAPTATION, ITS EFFECT ON APPARENT BRIGHTNESS AND CONTRIBUTION TO THE PHENOMENON OF BRIGHTNESS CONSTANCY.

J. E. Saunders (City U., Dept. of Appl. Physics, London, Great Britain).

*Vision Research,* vol. 8, Apr. 1968, p. 451–468. 31 refs.
Sci. Res. Council and City U. supported research.

The effect of a large surround field (to which the observer is preadapted) on the apparent brightness of a 2° test field was investigated by interocular matching using a total of 11 observers. Supplementary tests suggested that the data may be applicable for observations of a few seconds on test fields of between 1° and 9° angular subtense, and for apparent birghtnesses from near threshold to blinding white. The data were used to explain the phenomenon of brightness constancy in terms of adaptation influences. A family of scales of apparent brightness was proposed. Evidence was obtained of an ocular interaction when the two eyes were adapted to different conditions.

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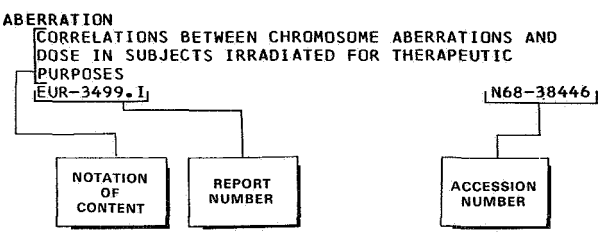


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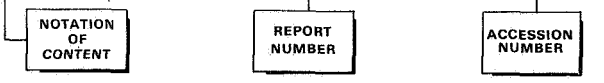


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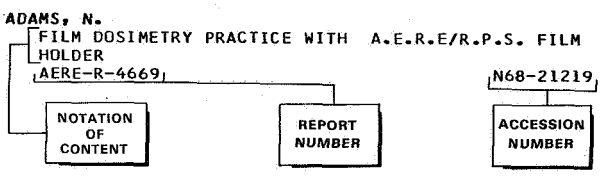


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