AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES
AEROSPACE MEDICINE 
AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES
INTRODUCTION

This issue of *Aerospace Medicine and Biology* (NASA SP-7011) lists 147 reports, articles and other documents originally announced in July 1991 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*. The first issue of *Aerospace Medicine and Biology* was published in July 1964.

Accession numbers cited in this issue are:

- **STAR (N-10000 Series)**: N91-21059 — N91-23072
- **IAA (A-10000 Series)**: A91-32449 — A91-36012

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which humans are 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. Applied research receives the most emphasis, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the publication consists of a standard bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged by **STAR categories 51 through 55**, the Life Sciences division. The citations include the original accession numbers from the respective announcement journals.

Seven indexes—subject, personal author, corporate source, foreign technology, contract, report number, and accession number—are included.


Information on availability of documents listed, addresses of organizations, and NTIS price schedules are located at the back of this issue.
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Three areas related to human orientation control are investigated: (1) reflexes associated with the control of eye movements and posture; (2) the perception of body rotation and position with respect to gravity; and (3) the strategies used to resolve sensory conflict situations which arise when different sensory systems provide orientation cues which are not consistent with one another or with previous experience. Of particular interest is the possibility that a subject may be able to ignore an inaccurate sensory modality in favor of one or more other sensory modalities which do provide accurate orientation reference information. This process is referred as sensory selection. This proposal will attempt to quantify subject's sensory selection abilities and determine if this ability confers some immunity to the development of motion sickness symptoms.

Author
AEROSPACE MEDICINE AND BIOLOGY
A Continuing Bibliography (Suppl. 352)

AUGUST 1991

51
LIFE SCIENCES (GENERAL)

A91-33163
REACTIONS TO HYPOXIA IN HUMANS AND IN ANIMALS
DEPENDING ON INDIVIDUAL PECULIARITIES OF THE
VEGETATIVE NERVOUS SYSTEM [REAKTSIJA NA GIKPOSIU
ORGANIZMA CHELOVEKA I ZHIVOTNYKH V ZAVISIMOSTI OT
INDIVIDUAL'NYKH OSOBNOSTEI VEGETATIVNOI NERVNOI
SISTEMY]
F. V. OS'MININ, E. I. BARANOVA, A. F. ERSHOV, IU. A.
RIABCHUK, A. P. PISANKO (Nauchno-Issledovatel'skii Institut
Biologii i Biofiziki, Tomsk, USSR) et al. Fiziologicheskii Cheholovka
Copyright

The effects of hypoxia on the parameters of the gas-transport
system in humans and rats were investigated in subjects divided
into three groups: sympathotonic (S), parasympathotonic (P),
and mesotonic (M). Hypoxic conditions were created by 1-hr-long
exposures to simulated altitudes of 3500 m (humans) or 7000 m
(rats). It was found that exposures to hypoxia of S subjects caused
reactions typical of hyperventilation (including a decrease of tonus
in the vagus-nerve nuclei, an increase in the ionotropic heart
function, a dilation of brain arteries, and a hyperoxegenation of
arterial blood after hypoxia). In contrast, P subjects exhibited
hypomobilization-type symptoms. Subjects in the M group reacted
to hypoxia by discoordination of the activities of the vascular and
the respiratory systems, leading to a decreased work capacity
during hypoxia and a delay in oxygen saturation after hypoxia.
I.S.

A91-33173
THE ROLE OF CHANGES IN THE BIOELECTRIC ACTIVITY
OF CARDIOMYOCYTES IN THE ANTIARRHYTHMIC EFFECT
OF ADAPTATION TO HYPOBARIC HYPOXIA [ROL' IZMENENII
BIOELEKTRICHESKOI AKTIVNOSTI KARDIOMIOTITOV V
ANTIARRITMICHESKOM EFKETE ADAPTATSI K
GIPOBARICHESKII GIKPOSIU]
F. Z. MEERSON and V. I. VOVK (AMN SSSR,
Nauchno-Issledovatel'skii Institut Obschesti Patologii i Pato-
logicheskoi Fizioligii, Moscow, USSR) Fiziologicheskii Zhurnal
Copyright

The effect of adaptation to periodic hypoxia on the bioelectric
activity of rat cardiomyocytes was investigated for both normal
and calcium-overload physiological conditions, using measurements
in isolated papillary cardiac muscles from control rats and from
rats adapted to periodic hypobaric hypoxia. Results on muscles
perfused by either physiological buffer or by a buffer containing
CaCl2 showed that adaptation to periodic hypoxia increases
the duration of the action potential (AP) in the cardiomyocytes and
prevents the depression of the rest potential (RP), the amplitude,
and the duration of the AP under high-calcium load and
high-frequency stimuli. At the same time, adaptation significantly
limits the contracture of papillary muscles and the depression of
the cardiomyocyte RP in a hypocalcium solution. The mechanisms
responsible for these adaptation effects are discussed.
I.S.

A91-33174
THE DYNAMICS OF OXYGEN TENSION IN THE RAT BRAIN
UNDER ACUTE HYPOBARIC HYPOXIA [DINAMIKA
NAPRAZHENII KISLORODA V MOZGE KRYS V USLOVIACH
OSTROEI GIPOBARICHESKII GIPOXI]
IU. A. KISLIAKOV and N. I. POPOVA (AN SSSR, Institut Informatiki
i Avtomatizatsii, Leningrad, USSR). Fiziologicheskii Zhurnal SSSR
Copyright

The effect of hypobaric hypoxia on the dynamics of oxygen
tension, P(O2), in the rat brain cortex was investigated using rats
fitted with implanted electrodes. The rats were subjected to acute
hypobaric hypoxia by being exposed to atmospheric conditions
equivalent to those at altitudes of 4000 m (group 1) or 8000 m
(group 2). Results of polarographic measurements show that the
dynamics of P(O2) in the brain cortex under conditions of hypoxia
has a phasic character, expressed by successive changes in the
P(O2) levels, which depend on the degree of hypoxia. The changes
in P(O2) levels are considered to be induced by systemic and
local responses compensating for the shortage of oxygen in air.
I.S.

A91-33175
CHANGES IN RESPONSES OF THE CEREBRAL AND THE
PERIPHERAL VESSELS TO BIOLOGICALLY ACTIVE DRUGS
UNDER THE INFLUENCE OF HYPERTHERMIA AND
HYPOTHERMIA [IZMENENII REAKTIVNOSTI
TSEREBRAL'NYKH I PERIFERICHESKIH SOSUDOV NA
BIOLOGICHESKI AKTIVNYE VESCHESTVA POD VLIIaniem
GIPER- I GIPOTERMII]
V. N. POGORELYI and L. M. GAEVAIA (Pliatigorskii
Farmatsveticheskii Institut, Pliatigorsk, USSR). Fiziologicheskii
Zhurnal SSSR (ISSN 0015-329X), vol. 76, Nov. 1990, p. 1575-1580.
In Russian. refs

Copyright

The effects of adrenaline, noradrenaline, acetylcholine,
histamine, and GABA on the tone of the cerebral and the hindlimb
vessels of a cat were investigated (under conditions of
autohemoperfusion) during a gradual increase (to 40 C) or a gradual
decrease (to 25 C) of the blood temperature. Results show that
the specific reactions of both the cerebral and the peripheral
vessels to these biologically active substances may change
significantly under both types of temperature regimes. Possible
mechanisms of these changes are discussed.
I.S.

A91-33200
PROTEIN SOLUBILITIES DETERMINED BY A RAPID
TECHNIQUE AND MODIFICATION OF THAT TECHNIQUE TO A
MICRO-METHOD
ELIZABETH CACIOPPO, MARC LEE PUSEY (NASA, Marshall
Space Flight Center, Huntsville, AL). International Conference on
A simple, rapid method for determination of protein solubilities has been developed which is based upon maximization of the free solution volume to be brought into equilibrium. The tetragonal lysozyme solubility diagram has been determined from pH 4.0 to 5.2 (0.1 M sodium acetate), 2-7 percent NaCl, 3-25 C, and portions of the orthorhombic solubility diagram using this technique. Both tetragonal and orthorhombic solubilities were found to increase smoothly with decreasing salt concentration and increasing temperature; no retrograde solubilities were observed. Using column volumes of 75, 300, and 900 microliters, identical tetragonal lysozyme solubility diagrams were obtained. Chymotrypsinogen solubilities have also been determined using this apparatus, being retrograde over the temperature range tested. It is noted that the primary limiting factor in reducing the crystalline volume is the minimum solution sample size needed to accurately quantify the protein.

L.K.S.

A91-33204
National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
GLUTAMINE SYNTHETASE IMMUNOREPRESENT IN OLIGODENDROGLIA OF REGIONS OF THE CENTRAL NERVOUS SYSTEM
FERNANDO D'AMELIO (NASA, Ames Research Center, Moffett Field, CA), LAWRENCE F. ENG (Stanford University, CA), and MICHAEL A. GIBBS (USVA, Medical Center, Palo Alto, CA) GLIA (ISSN 0894-1491), vol. 3, 1990, p. 335-341. USVA-supported research. refs (Contract NCC2-449; NIH-NS-11632)
Copyright
Glutamine synthetase immunoreactive oligodendrocytes were identified in the cerebral cortex, cerebellum, brain stem, and spinal cord. They were mostly confined to the gray matter, particularly close to neurons and processes. The white matter showed few immunoreactive oligodendroglia. It was suggested that some type of oligodendrocytes, specially those in perineuronal location, might fulfill a functional role more akin to astrocytes than to the normally myelinating oligodendroglia.

Author

A91-33829
ALTERATIONS IN CELLS OF PERIPHERAL BLOOD IN GUINEA PIGS EXPOSED TO A CONSTANT MAGNETIC FIELD [IZMENENIIA KLETOK MORSKIKH SVINOK POSEL VOZDEISTVIYA POSTOIANNOGO MAGNITNOGO PO利亚]
Copyright
The effects of the exposure of adult guinea pigs to a steady magnetic field (SMF) on the content of hemoglobin in peripheral blood, the numbers of red and white blood cells, and blood-cell morphology were investigated in animals subjected for 10 days to static or multiple (for 3, 5, 10, or 25 min) daily exposures to a 300-Oe magnetic field. Results show that white blood cells had a higher sensitivity to SMF exposures than did erythrocytes; the degree of cell damage, the character of morphological changes, and the rate of restoration depended upon the duration of exposures.

I.S.

A91-34338
MORPHOMETRIC EVALUATION OF THE MYOCARDIA OF RATS FLOWN ON THE BIOSATELLITE COSMOS 2044 FOR 14 DAYS [MORFOMETRICZNA OCENA KOMOREK MIESNA SERCOWEGO U SZCZUROW KTORE ODBYLY 14 DNIOWY LOT W SATELICIE BIOSPUTNIK 2044]
PIOTR SKOPINSKI, WANDA BARANSKA, MAGDALENA JAROSZ (Warszawa, Akademia Medyczna, Instytut Biostruktury, Warszaw, Poland), and ALEKSANDR KAPLANSKII (Institut Mediko-Biologicheskih Problem, Moscow, USSR) Postepy Aeronautyki (ISSN 0373-5982), vol. 23, no. 1-2, 1991, p. 75-85.

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I.S.
A91-35948* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

ANALYTICAL RELATIONSHIPS OF NUCLEAR FIELD AND MICROSOMETRIC QUANTITIES FOR TARGET FRAGMENTATION IN TISSUE SYSTEMS

JOHN W. WILSON (NASA, Langley Research Center, Hampton, VA), FRANCIS A. CUONNOTTA, and FERENC HAUNAL (DOE, Environmental Measurements Laboratory, New York) Health Physics (ISSN 0017-9078), vol. 60, April 1991, p. 559-565. refs

A simple analytic formula for the nuclear fields formed by target fragmentation in tissue systems is derived using the continuous slowing down approximation (CSDA). The energy fluctuations in sensitive localized sites within the tissue system caused by these nuclear events are defined by microdosimetry. In that CSDA is used, the energy fluctuations exclude the role of secondary electrons. The relations also relate to the response of microdosimetric devices to nuclear fragmentation fields. Author

N91-21696* National Aeronautics and Space Administration, Washington, DC.

EXPLORING THE LIVING UNIVERSE: A STRATEGY FOR SPACE LIFE SCIENCES


The knowledge obtained by space life sciences will play a pivotal role as humans reach out to explore the solar system. Information is needed concerning the existence of life beyond the Earth, the potential interactions between planets and living organisms, and the possibilities for humans to inhabit space safely and productively. Programs in the involved disciplines are an integral part of NASA's current and future missions. To realize their objectives, the development and operation of diverse ground and productively. Programs in the involved disciplines are an integral part of NASA's current and future missions. To realize their objectives, the development and operation of diverse ground


SCIENCE, MEDICINE AND ANIMALS

JOHN E. BURRIS and STEVE OLSON, ed. 1991 41 p

The history, status, and potential of animal research is described in the hopes of providing the information which will allow people to judge the merit and necessity for continuing animal research. The use of animals in research; advances as a result of animal alternatives; animal rights; laws and regulations; pain and suffering; experimentation; benefits to animals from animal research; to judge the merit and necessity for continuing animal research. Author

N91-21698# European Space Agency, Paris (France).

IN VITRO PHOTOREACTIVATION OF TRANSFORMING DNA OF BACILLUS SUBTILIS SPORES AFTER IRRADIATION BY ULTRAVIOLET LIGHT

CORINNA PANITZ (Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Cologne, Germany, F.R.)

The knowledge obtained by space life sciences will play a pivotal role as humans reach out to explore the solar system. Information is needed concerning the existence of life beyond the Earth, the potential interactions between planets and living organisms, and the possibilities for humans to inhabit space safely and productively. Programs in the involved disciplines are an integral part of NASA's current and future missions. To realize their objectives, the development and operation of diverse ground and productively. Programs in the involved disciplines are an integral part of NASA's current and future missions. To realize their objectives, the development and operation of diverse ground

N91-21700* National Aeronautics and Space Administration.

SPIN 4-ROTH BIO-REACTOR CELL CULTURE APPARATUS Patent

RAY P. SCHWARZ, inventor (to NASA) and DAVID A. WOLF, inventor (to NASA)

A bioreactor system is described in which a tubular housing contains an internal circularly disposed set of blade members and a central tubular filter all mounted for rotation about a common horizontal axis and each having independent rotational support and rotational drive mechanisms. The housing, blade members and filter preferably are driven at a constant slow speed for providing a fluid culture medium with discrete microbeads and cell cultures in a discrete spatial suspension in the housing. Replacement fluid medium is symmetrically input and fluid medium is symmetrically output from the housing where the input and the output are part of a loop providing a constant or intermittent flow of fluid medium in a closed loop. Author

N91-21701* National Aeronautics and Space Administration.

SPIRAL VANE BIOREACTOR Patent

DENNIS R. MORRISON, inventor (to NASA) 14 p Filed 29 Nov. 1986

A bioreactor system is described in which a tubular housing contains an internal circularly disposed set of blade members and a central tubular filter all mounted for rotation about a common horizontal axis and each having independent rotational support and rotational drive mechanisms. The housing, blade members and filter preferably are driven at a constant slow speed for providing a fluid culture medium with discrete microbeads and cell cultures in a discrete spatial suspension in the housing. Replacement fluid medium is symmetrically input and fluid medium is symmetrically output from the housing where the input and the output are part of a loop providing a constant or intermittent flow of fluid medium in a closed loop. Author
clarify the metabolic conditions under which intermediate(s) were produced.

N91-22173*# Fielder (Judith), Reston, VA.

A HYDROPONIC DESIGN FOR MICROGRAVITY AND GRAVITY INSTALLATIONS

JUDITH FIELDER and NICKOLAUS LEGGETT (Leggett, Nickolaus, Reston, VA) In NASA. Lewis Research Center, Vision-21: Space Travel for the Next Millennium p 436-439 Apr. 1990

Avail: NTIS HC/MF A25 CSCL 06/3

A hydroponic system is presented that is designed for use in microgravity or gravity experiments. The system uses a sponge-like growing medium installed in tubular modules. The modules contain the plant roots and manage the flow of the nutrient solution. The physical design and materials considerations are discussed, as are modifications of the basic design for use in microgravity or gravity experiments. The major external environmental requirements are also presented.

Author

N91-22175*# Wake Forest Univ., Winston-Salem, NC. School of Medicine.

CHARACTERIZATION OF BLOOD DRAWN RAPIDLY FOR USE IN BLOOD VOLUME EXPANSION STUDIES: AN ANIMAL MODEL FOR SIMULATED WEIGHTLESSNESS

V. MICHELLE CHENAULT, COLLEEN D. LYNCH, MARIANA MORRIS, JILL CLODFELTER, and PHILLIP M. HUTCHINS In NASA. Lewis Research Center, Vision-21: Space Travel for the Next Millennium p 460-467 Apr. 1990

Avail: NTIS HC/MF A02 CSCL 06/3

It was demonstrated that up to 8ml of blood can be drawn from donor rats without significantly increasing volume and stress sensitive hormones, and thus can be used for volume expansion studies. Infusion of whole blood allows more physiological changes that can be seen with volume expansion by saline or other ionic solutions. The infusion of whole blood to induce hypervolemia may provide an improved model to study the fluid balance and control mechanisms operative in weightlessness. Blood samples were drawn as quickly as possible from femoral artery catheters chronically implanted in Sprague Dawley rats and analyzed for hematocrit, plasma sodium, potassium, osmolality, corticosterone, epinephrine, norepinephrine, and vasopressin. The levels were found to be comparable to those of normal rats. 

Author
46,000 and 33,000. (H3)-azido PCP was irreversibly incorporated into each of these bands after UV-irradiation. The dissociation of (H3)TCP to the purified complex exhibited a sensitivity to 3.3 nmol/mg protein. The binding and pharmacological features of (H3)TCP binding to the purified NMDA/PCP receptor was 120 nM. The maximum specific binding (B_max) for (H3)TCP binding was 120 nM. The application of avidin-biotin technology, originally designed to facilitate and improve purification and localization procedures for biologically active macromolecules, has led to major advances in immobilized diagnosis and other new applications of affinity targeting, crosslinking and immobilization studies, cell cytometry, affinity purification, drug delivery, bioaffinity sensors, fusogenic sensors and hybridoma technology. Biotin, coupled to low- or high-molecular weight molecules, can still be recognized by avidin, so that mediation through the avidin-biotin complex often leads to a dramatic enhancement in signal and/or sensitivity levels. In recent years, there has been a tendency to replace egg-white avidin with the bacterial cognate, streptavidin, which is a nonglycosylated, neutral protein with a similarly high affinity constant for binding biotin, and which is free of the egg-white protein's oligosaccharide moiety and basicity. A number of new biotin-containing reagents and additional avidin- and streptavidin-conjugated probes have been designed. Modification of some of the disadvantageous properties of the egg-white glycoprotein is being attempted, since it is much less expensive than the bacterial protein. Determination of the structural and functional requirements for the high-affinity avidin-biotin interaction is being attempted, with the aim of improving its application and better understanding other lower-order affinity interactions.

The N-methyl-D-aspartate (NMDA) / phencyclidine (PCP) receptor from rat forebrain was solubilized with sodium cholate and purified to apparent homogeneity by a single step of affinity chromatography on amino-PCP-agarose. By means of this single step procedure, a marked increase in immobilized MAbs activity was recorded when the available amino groups of the antibody were reversibly blocked with dimethylmaleic anhydride before coupling with a chemically reactive carrier. MAbs were found to differ markedly in their response to the various reagents and procedures used. An assay has been developed to monitor the amount of non-specifically adsorbed proteins, and procedures have been developed to reduce non-specific adsorption, which could lead to severe contamination of the product protein. Polyethylene glycol, of average m.w. 400 or 1,500, was found particularly useful for this purpose.

N91-22685# Tel-Aviv Univ. (Israel). Lab. of Neurobiochemistry. AFFINITY CHROMATOGRAPHY PURIFICATION OF THE NMDA/PHENCYCLOLINE RECEPTOR COMPLEX Abstract Only A. F. IKIN, Y. KLOOG, and MORDECHAI SOKOLOVSKY. In Weizmann Inst. of Science, 8th International Symposium on Affinity Chromatography and Biological Recognition: Program and Abstracts 1 p 3 Nov. 1989 Copyright Avail: NTIS HC/MF A07

The N-methyl-D-aspartate (NMDA) / phencyclidine (PCP) receptor from rat forebrain was solubilized with sodium cholate and purified to apparent homogeneity by a single step of affinity chromatography on amino-PCP-agarose. By means of this single purification step (with a relatively short purification time: 12-15 hrs) about 3700-fold purification was achieved. Polyacrylamide gel electrophoresis in the presence of sodium dodecyl sulfate and polyethylene glycol, of average m.w. 400 or 1,500, was found particularly useful for this purpose.

N91-22686# Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Biophysics. AVIDIN BIOTIN TECHNOLOGY Abstract Only EUGENIUS BAYER and MEIR WILCHEK. In its 8th International Symposium on Affinity Chromatography and Biological Recognition: Program and Abstracts 1 p 3 Nov. 1989 Copyright Avail: NTIS HC/MF A07

The application of avidin-biotin technology, originally designed to facilitate and improve purification and localization procedures for biologically active macromolecules, has led to major advances in immobilized diagnosis and other new applications of affinity targeting, crosslinking and immobilization studies, cell cytometry, affinity purification, drug delivery, bioaffinity sensors, fusogenic sensors and hybridoma technology. Biotin, coupled to low- or high-molecular weight molecules, can still be recognized by avidin, so that mediation through the avidin-biotin complex often leads to a dramatic enhancement in signal and/or sensitivity levels. In recent years, there has been a tendency to replace egg-white avidin with the bacterial cognate, streptavidin, which is a nonglycosylated, neutral protein with a similarly high affinity constant for binding biotin, and which is free of the egg-white protein's oligosaccharide moiety and basicity. A number of new biotin-containing reagents and additional avidin- and streptavidin-conjugated probes have been designed. Modification of some of the disadvantageous properties of the egg-white glycoprotein is being attempted, since it is much less expensive than the bacterial protein. Determination of the structural and functional requirements for the high-affinity avidin-biotin interaction is being attempted, with the aim of improving its application and better understanding other lower-order affinity interactions.


In addition to radio labeling, four types of labels are used in immunoassay technology: particles, enzymes, fluorophores and chemiluminophores. Of these labels, the lanthanide chelates, e.g., europium, can yield higher specific activities than commonly used radioisotopes, and have different fluorescence emission wavelengths, which can be used to discriminate between the different ligand sites (glutamate, glycine) and the channel was maintained. The possible immobilization of MAbs via anti-Fc immunoglobulins has also been considered. In some cases, a marked increase in immobilized MAb activity was recorded when the available amino groups of the antibody were reversibly blocked with dimethylmaleic anhydride before coupling with a chemically reactive carrier. MAbs were found to differ markedly in their response to the various reagents and procedures used. An assay has been developed to monitor the amount of non-specifically adsorbed proteins, and procedures have been developed to reduce non-specific adsorption, which could lead to severe contamination of the product protein. Polyethylene glycol, of average m.w. 400 or 1,500, was found particularly useful for this purpose.
flourescence; use of the principles of time-resolution enables the
fluence ce of these chelates to be distinguished from the inherent
fluence ce of biological materials, which has a very short half-life,
the order of nanoseconds. Consequently, the use of lanthanide
chelates as labels in immunoassay procedures permitted the
in-house development of sensitive, competitive type immunoassays
for the direct measurement of hapitens, two-site biontin-avidin
interaction-based immunoassays for macromolecules and non-separation immunoassays for urinary steroid metabolites, for
the delineation of the fertile period in women and for use in in-vitro
fertilization programs. The principle of two-site immunoassays is
being applied to mapping the antigenic epitopes of peptide
hormones. The data obtained from two-site binding assays were
used to generate computer-simulated three-dimensional representations of the antigenic sites in human growth hormone
and variants that are recognized by the various monoclonal
antibodies. This technique will be applied to proteins whose x-ray
structures are known, in order to compare electron density of
proteins, as represented by x-ray crystallography, with the
computer-generated three-dimensional representation of the
antigenic surface of macromolecules. ISA

51 LIFE SCIENCES (GENERAL)

N91-22687# Weizmann Inst. of Science, Rehovoth (Israel). Dept.
of Biophysics.

HIGH PERFORMANCE THIOPHILIC ADSORPTION FOR
ANTIBODY PURIFICATION Abstract Only
BERNARD NOPPER, FORTUNE Kohen, and MEIR WILCHEK
In its 8th International Symposium on Affinity Chromatography and
Biological Recognition: Program and Abstracts 1 p 3 Nov. 1989
Copyright Avail: NTIS HC/MF A07

Thiophilic adsorption chromatography, as developed by Porath
and colleagues (1985), was modified and transferred to the high
performance liquid chromatography (HPLC) mode on silica beads.
The modification involves the introduction of an additional thiocyst
near the silica site of the ligand. This was accomplished by
opening the epoxy ring on epoxy silica with sodium hydroxosulfite.
This reaction enabled the introduction of a thiol group on the silica.
The thiol silica was used to react with divinyl sulfone and mercaptoethanol to yield the thiophilic adsorbent which was named
3S silica. The 3S-adsorbent is of high capacity and is suitable for
the fast and single-step purification of all subclasses of monoclonal
and polyclonal antibodies. Other epoxy- or thiol-containing polymers
were converted to 3S-adsorbents and were found to be very
efficient in antibody purification. Due to their broad specificity, the
3S-thiophilic adsorbents are an inexpensive substitute for protein
to circumvent these difficulties; it enables proteins to be eluted
from affinity columns by addition of deionized water. The method
from affinity columns by addition of deionized water. The merits of affinity-repulsion chromatography are discussed and some of its potential applications are
presented. ISA

N91-22689# Bar-Ilan Univ., Ramat-Gan (Israel). Dept. of
Chemistry.

BIOMATERIAL INTERACTIONS WITH ORGANIZED SURFACES
Abstract Only
SHMUEL MARGEL and D. Y. SOGAH In Weizmann Inst. of
Science, 8th International Symposium on Affinity Chromatography and
Biological Recognition: Program and Abstracts 1 p 3 Nov.
1989
Copyright Avail: NTIS HC/MF A07

The contact between polymeric surfaces and blood may induce
thrombosis, complement activation or electrolyte depletion. The
factors controlling this interaction are not well understood. An
approach to elucidating the influence of various functional groups
on the interaction of biomaterials with surfaces has been developed.
It involves studying the interaction of defined peptides and cells
with organized, close-packed monolayer surfaces composed of a
variety of functional groups, e.g., -CH2OH, -CO2Me, -CH3 and
-CF3, and the omega position. These surfaces were prepared
through the self-adsorption of alpha, amphiphilic lipids of
the type "SiCH(CH2)1-x (where x = CH3, CH2CO2Me, CF3, etc.)
to oil appropriate solid substrates. Characterization of these surfaces
by techniques, such as ESCA, ellipsometry, FTIR-ATR and surface
tension measurements, demonstrated that they are composed of
fully extended molecules that cover most, if not all, of the solid
substrates. The main conclusions are: that endothelial cells attach
themselves and grow on the monolayer surfaces, according to
the following decreasing order: -CH2OH, -CO2Me, -CH3 and
-CF3 and that the adsorption of proteins at the interface between the
water solution and the monolayer surfaces depends on both the surface
and the protein. The degree of adsorption at the surfaces
descends in the order: -CH3, -CF3, -CO2Me, -CH2OH. The degree
of adsorption also increases with increasing protein
hydrophobicity. ISA

N91-22690# Technion - Israel Inst. of Tech., Haifa. Dept.
of Biomedical Engineering.

OXIDATIVE PROCEDURE FOR ACTIVATION OF
HYDROXYL-CONTAINING POLYMERIC CARRIERS Abstract
Only
ROSA AZHARI, A. SEIDEL, L. BAUCH, S. SIDEMAN, and NOAH
LOTAN In Weizmann Inst. of Science, 8th International Symposium
on Affinity Chromatography and Biological Recognition: Program
and Abstracts 1 p 3 Nov. 1989
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Immobilized bioactive materials have reached wide use in a
variety of biotechnological processes. They are prepared using
appropriate carriers (soluble or insoluble). The most frequently used
of these carriers are the ones containing hydroxy groups. Many
procedures have been suggested for activation of
hydroxy-containing carriers. The most efficient ones involve the
use of cyanogen bromide, carbonyldiimidazole (CDI), sulfonyl
chloride or fluorescein-5-maleimide (FM). These methods, however, have limitations concerning either the
stability of the bond formed, the cost of the reagents, or the
convenience of the procedure involved. In this report, a convenient
and efficient method for activation of hydroxy-containing polymeric
carriers is presented. It involves the dimethyl sulfoxide-acetic
anhydride oxidation (DAO) of the hydroxy groups on the polymeric
carriers, converting them into aldehyde groups. Bioactive materials, carrying an amine moiety, can then be attached to the activated matrix, via an imine linkage. The suggested activation is carried out under mild conditions. The use of the DAO procedure to activate a soluble polysaccharide (inulin), an insoluble polysaccharide (Sepharose) and a modified ceramic carrier (gycrol modified containing controlled pore glass) was investigated. It was found that the degree of oxidation is related to the duration of the reaction. Thus, when inulin was used as carrier, oxidation periods of five and 48 hours produced 0.3 and 1.6 mmole aldehyde/gr product, respectively. Efficiency of the DAO procedure was assessed using Sepharose as carrier. Thus, under chosen conditions, 3.8 mg tyramine were bound per gr product. This value is similar to that obtained under optimal conditions using FMP activation (4 mg/gr .product), and higher than when using CDI (1.8 mg/gr product).

The above reagents show the same order of efficiency when immobilizing an enzyme, namely beta-glucosidase.  

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EUPHERIT C AS A CARRIER FOR HPLC-BASED IMMUNO-PURIFICATION OF ANTIGENS AND ANTIBODIES

Abstract Only  

GIDEON FLEMINGER, TAMAR WOLF, ERAN HADAS, and BEKA SOLOMON  

In Weizmann Inst. of Science, 8th International Symposium on Affinity Chromatography and Biological Recognition: Program and Abstracts 1 p 3 Nov. 1989  

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Investigating the applicability of Eupergit C (EC) immobilized antibodies and antigens to immunopurification, various enzymatically active proteins were used as antigens, and corresponding monoclonal antibodies mAbs were selected which did not inhibit the enzymatic activity of these antigens. Binding of the antigen by the matrix-immobilized antibody could thus be monitored by direct measurement of the enzymatic activity of the matrix-bound immunocomplex. This approach made possible the determination of the antigen binding activity of the conjugated antibodies at very high sensitivity. An immunopurification system, based on the EC-immobilized antibodies was found to be highly selective, reproducible and stable. EC beads of 30 u (C30N) were found to be most suitable for high performance liquid chromatography (HPLC) purification, demonstrating high antigen (or antibody) binding activity by the corresponding immobilized antibody (or antigen) and high peak performance. EC beads of 150 u, were found to be more suitable for conventional (non-HPLC) immuno-affinity purifications. EC beads of 1 u (C12) had lower capacity for protein binding to the matrix but antibodies bound to this matrix show same antigen binding activity than the 30 u and the 150 u beads, apparently owing the non-porous nature of this matrix. EC is characterized by high chemical and mechanical stability and stable protein-matrix linkage. Thus, an immunoaffinity purification cycle which included loading of an antigen-containing solution on a column at neutral pH and elution at higher pH may be repeated many times. This was shown with an immunopurification of a human decidua protein (HDP71) which was purified from seminial plasma by C30N-immobilized specific mAbs, using a HPLC system equipped with an autoinjector. Over 200 cycles of purification were applied without any loss in column capacity or performance.

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REDUCTION OF NONSPECIFIC ADSORPTION OF SERUM PROTEINS TO EUPHERIT C AND AGAROSE

Abstract Only

GIDEON FLEMINGER, TAMAR WOLF, BEKA SOLOMON, and ERAN HADAS  

In Weizmann Inst. of Science, 8th International Symposium on Affinity Chromatography and Biological Recognition: Program and Abstracts 1 p 3 Nov. 1989  

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In an attempt to reduce non-specific adsorption of proteins to insoluble matrices during affinity chromatography, the effect of polyethylene glycol (PEG) on protein adsorption to Eupergit C (EC) and to agarose was studied. Oxyrane-blocked EC was prepared by reaction of the matrix with 2-mercaptoenthanol (2-ME). Serum samples (0.01-1.0 ml) were applied to columns packed with the 2-ME-blocked EC (2-M3-EC) or non-modified agarose. The amount of protein adsorbed onto the columns and eluted with SDS/urea solution or with 0.2 M ammonium acetate buffer, pH 10.00, was determined by monitoring the absorbance at 280 nm. In these studies, it was found that addition of PEG (400 or 1500) to the PBS buffer during the loading step of the serum reduced the amount of protein adsorbed to 2-M3-EC by about 90 percent. This effect was attributed to the increase in hydrophilicity of the matrix by the presence of PEG. A 'memory effect' was also observed: when PEG was removed from the matrix, its effect in reducing adsorption was still retained for 3-5 additional loading/elution cycles. In contrast to EC, when PEG was included in the loading buffer of serum onto the agarose column, protein adsorption increased by about 6-fold and no 'memory effect' was observed. Covalent binding of diaminio PEG 1500 to EC and to epoxy-activated Sephrose resulted in modified matrices which showed a very low degree of protein adsorption even when PEG was eliminated from the loading buffer. Inclusion of PEG into the loading buffer during immunopurification process of a serum protein (lgG) or seminal plasma protein (human decidual protein HDP71) as well as the purification of these proteins on PEG-modified EC resulted in a marked improvement in the purity of these proteins eluted from the respective columns.

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ENZYMATIC OXIDATION OF MONOCLONAL ANTIBODIES BY IMMOBILIZED DI-FUNCTIONAL ENZYME COMPLEXES

Abstract Only

BEKA SOLOMON, RELA KOPPEL, FIDI SCHWARTZ, and GIDEON FLEMINGER  

In Weizmann Inst. of Science, 8th International Symposium on Affinity Chromatography and Biological Recognition: Program and Abstracts 1 p 3 Nov. 1989  

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The above reagents show the same order of efficiency when immobilizing an enzyme, namely beta-glucosidase.  

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ADIPIC DIHYDRAZIDE-EUPHERIT C: A NEW DERIVATIVE FOR ORIENTED IMMOBILIZATION OF MONOCLONAL ANTIBODIES

Abstract Only

BEKA SOLOMON, ERAN HADAS, and GIDEON FLEMINGER  

In Weizmann Inst. of Science, 8th International Symposium on Affinity Chromatography and Biological Recognition: Program and Abstracts 1 p 3 Nov. 1989  

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Eupergit C (EC) is a cross-linked synthetic copolymer based on methacrylamide, N-methylene bisacrylamide and monomers containing high numbers of oxyrane groups which function as reactive moieties for the covalent binding of proteins via their
Amino, thio and hydroxy groups. Some biologically active proteins (e.g., certain monoclonal antibodies) are partially or completely inactivated after immobilization onto the matrix as a result of improper orientation of the immobilized molecule or restriction induced by multi-point attachment of the protein molecule to the surface of the matrix. This was exemplified by the binding to EC of a series of anti-carboxypeptidase A (CPA) antibodies which are characterized after immobilization by low antigen binding activity. An alternative approach to the binding of the same mAbs to EC via the carbohydrate moieties was modification of oxazine groups to hydrazide or amino groups. Treatment of EC with hexamethylene diamine (HMD) or adipic acid dihydrazide (ADH) led to new derivatives suitable for an oriented immobilization of mAbs in particular and glycoproteins in general. Binding of mAbs to hydrazide modified carrier was carried out by a multi-step procedure including oxidation of the mAbs by sodium periodate, removal of excess of reagent and coupling of the protein to the modified carrier. Owing to the stable chemical composition of EC, a single step oxidation procedure was developed where oxidation of antibodies and binding to the matrix are performed concomitantly. Highly active antibody preparations were thus obtained which possessed about 10-100 fold higher antigen binding activity than the same antibodies immobilized on unmodified EC via their amino groups. ADH-EC proved to be an excellent carrier for one- or multi-step coupling of oxidized mAbs, owing to its high chemical stability and high binding capacity. Author (ISA)

N91-22695*# Tel-Aviv Univ. (Israel). Dept. of Biotechnology. ENHANCED ACTIVITY OF IMMOBILIZED DIMETHYLALEC ANHYDRO-MINAPPROX-PROTECTED POLY- AND MONOCOCONAL ANTIBODIES Abstract Only ERAN HASADAS, RELA KOPPEL, FID SCHWARTZ, OSNAT RAVIV, and GIDEON FLEMINGER In Weizmann Inst. of Science, 8th International Symposium on Affinity Chromatography and Biological Recognition: Program and Abstracts 1 p  3 Nov. 1989 Copyright Avail: NTIS HC/MF A07

Imobilization of different antibodies onto solid supports usually results in partial or even complete loss of activity of the immobilized antibodies. Activity of some immobilized antibodies may be impaired even if the molecule is immobilized via sites which are close to its active site. Such interference is unlikely when the site of interaction of the protein with carrier is remote from the active site of the protein. Another possible mechanism for loss of activity of immobilized antibodies is improper intramolecular mobility, thereby which may follow multi-point attachment of the antibody to the carrier. Such effect would be dependent upon the number and distribution of reactive groups on the protein and on the carrier. Europerg C is a polymethylethacylamide based carrier which is characterized by high content of reactive oxazine groups. The high density of reactive groups serves to increase the binding capacity of Europerg C to a high extent, and thereby immobilization of antibodies. The application of reversible blocking of free amines with dimethyalec anhydroide (DMA) in order to reduce multipoit attachment of antibodies to the carrier and thus improve the activity of the immobilized antibodies was investigated. The results obtained demonstrated a marked improvement in activity of immobilized poly- and monoclonal antibodies which were coupled to the matrix, following blocking of their free amines with DMA. Author (ISA)

N91-22696*# BioTechnology General, Rehovot (Israel). Dept. of Biochemistry. CHAPS BOOSTS THE RECOVERY OF HYDROPHOBIC MEMBRANE PROTEINS FROM VARIOUS CHROMATOGRAPHY MEDIA Abstract Only NACHUM REISS, IRIS YOSHIPE, ALON BOGIN, and MOSHE M. WERBER In its 8th International Symposium on Affinity Chromatography and Biological Recognition: Program and Abstracts 1 p  3 Nov. 1989 Copyright Avail: NTIS HC/MF A07

Hydrophobic groups are usually involved in the structure of matrices for various chromatographic methods. These groups cause non-specific interactions with proteins, and especially hydrophobic proteins, reducing their recovery during purification. Another detrimental effect is that the elution profile of the separated proteins may be shifted from that expected from their physico-chemical properties relevant to the chromatographic matrix in use. From the first chromatographic step, established by Muira et al. (1987), for the purification of membranal ADPase in the presence of Triton X-100, the recovery of ADPase activity was found to be very low, due to both irreversible binding to the DEAE-Sepharose matrix and sensitivity to the detergent. To overcome these problems, Triton X-100 was replaced with the zwitterionic detergent CHAPS, which was used at a concentration of 0.3 percent or more in all the purification steps: ion exchange chromatography (DEAE-Sepharose), hydrophobic chromatogy (phenyl-Sepharose), metal chelate affinity chromatography (imino-diaceitic cid-agarose) and molecular sieving (Superose 12). These concentrations of CHAPS boosted the recovery of ADPase activity from 20-30 percent at each step to 80-100 percent, and enabled the purification of significant amounts of the membranal protein. Author (ISA)


The Centrifuge Facility is a major element of the biological research facility for the implementation of NASA’s Life Science Research Program on Space Station Freedom using nonhuman species (small primates, rodents, plants, insects, cell tissues, etc.). The Centrifuge Facility consists of a variable gravity Centrifuge to provide artificial gravity up to 2 earth G’s; a Holding System to maintain specimens at microgravity levels; a Glovebox System and a Service Unit for servicing specimen chambers. The following subject areas are covered: (1) Holding System; (2) Centrifuge System; (3) Glovebox System; (4) Service System; and (5) system study summary. Author


The 1990 version of the course enrolled a total of 22 students including three tenured faculty members for the first time. Digital Equipment Corporation provided the course with 25 DECstation 5000/200T which provided more than ample computer capability. Each student was assigned to their own workstation which assured access to computing resources at all times. The range of course projects undertaken in the computer lab this year was also excellent (see Appendix A). In general it was found that students were able to advance their models considerably further than in previous years. This particularly reflects two years of experience teaching students how to use the GENESIS simulator, and also reflects the fact that a growing number of students have already had some experience with neural simulations (and even GENESIS) before entering the course.


Chemical and enzymatic studies on the coenzyme NAD+ and its reduced form NADH are reported. In combination with specific enzymes (dehydrogenases) the coenzyme is involved in the reversible stereospecific dehydrogenation of many substrates. Many reactions are on the coenzyme, but the relation between enzyme and coenzyme is also elucidated by modifying
the enzyme structure in its active site. Using molecular mechanics a number of mutated HLADH's are simulated in order to select those amino acid residues which substantially affect the coenzyme geometry. The methodology developed may be helpful in selecting targets for site directed mutagenesis in order to genetically engineer HLADH so as to optimize the interaction of the apo-enzyme and coenzyme.

ESATechnical Sciences, Helsinki and Jenny and Antti Wihuri

N91-23028# National Aeronautics and Space Administration.

DOE

N91-23002# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

CONDUCTANCES, CURRENTS, AND PH REGULATION IN EXCITABLE CELLS Ph.D. Thesis - Helsinki Univ. of Technology

N91-22701# Helsinki Univ. (Finland). Div. of Physiology.

ROLE OF BICARBONATE IN THE ACTIONS OF GAMMA-AMINOBUTYRIC ACID (GABA) ON MEMBRANE CONDUCTANCES, CURRENTS, AND PH REGULATION IN EXCITABLE CELLS Ph.D. Thesis - Helsinki Univ. of Technology

JUHA VOIPIO Helsinki, Finland Finnish Academy of Technical Sciences 1990 69 p Sponsored by Finnish Academy of Technical Sciences, Helsinki and Jenny and Antti Wihuri Foundation


Ion selective microelectrodes and a two or three microelectrode voltage or current clamp were used to examine the effects of inhibitory neurotransmitter Gamma Amino Butyric Acid (GABA) on intracellular pH (pH(i)) extracellular surface pH (pH(s)) intercellular chloride activity (a(i)Cl) as well as on membrane potential, current and conductance in crayfish muscle fibers and the Stretch Receptor Neurone (SRN). In the muscle, a near saturating concentration of GABA induced the following channel mediated, HCO3-(a)(Cl) dependent effects: a depolarizing inward current, a rise in (a)(Cl) and (pH(i)) and a fall in (pH(s)). Substitution of 30 mmol/l of Cl-(a)(Cl) by HCO3-(a)(Cl) brought about a (pH(i)) dependent positive deviation of the reversal potential of the GABA induced current (E(GABA)) from the equilibrium-potential of Cl-(a)(Cl). Experiments on the SRN gave very similar results. Measurements of (E(GABA)) yielded a value of about 0.3 for the relative permeability of HCO3-(a)(Cl) versus Cl-(a)(Cl) in the GABA channel. Experiments with carboxylate anions indicated that the effective diameter of the GABA gated channel in the muscle fiber is about 0.5 nm which is close to the value measured in mammalian GABA(A) channels. The present results show that the widely accepted equivalence of E(CL) and E(GABA) is not valid under physiological conditions, and that there is a bidirectional link between actions of GABA and regulation of pH. Application of linear cable theory as well as thermal design of electrometer amplifiers are also discussed.

ESAN91-22702# Los Alamos National Lab., NM.

GRUNEISEN-STRESS INDUCED ABLATION OF BIOLOGICAL TISSUE


(DES1-009957; LA-UR-91-905; CONF-910123-19) Avail: NTIS HC/MF A03

The objective of biomedical applications of lasers is frequently to remove tissue in a controlled manner. However, for ablation induced by thermal- or photo-decomposition, damage to surrounding tissue may be excessive in some instances. Tissue can also be ablated by a hydrodynamic process referred to as front surface spallation, in which a thin layer next to a free surface is heated to levels, below vaporization but, so rapidly that it cannot undergo thermal expansion during laser heating. This generates a stress pulse, which propagates away from the heated region, with an initial amplitude that can be calculated using the Gruneisen coefficient. As the pulse reflects from the free surface, a tensile tail can develop of sufficient amplitude, exceeding the material strength, that a layer will be spalled off, taking much of the laser-deposited energy with it. Because tissue is generally a low strength material, this process has the potential of producing controlled ablation with reduced damage to the remaining tissue. However, to achieve these conditions, the laser pulse length, absorption depth and fluence must be properly tailored. This paper presents hydrodynamic calculations and analytical modeling relating to both stress- and thermal-induced ablation as a function of laser and tissue properties to illustrate the potential benefits of stress induced ablation. Also, guidance is given for tailoring the exposure parameters to enhance front surface spallation.

DOE

N91-22700# Stockholm Univ. (Sweden). Inst. of Physics.

METALS IN BIOLOGY: TECHNICAL DETAILS OF QUANTUM CHEMICAL AB INITIO CALCULATIONS ON FERROUS AND FERRIC IRON-BIS-GLYOXAL AND IRON-BIS-DITHIOLENE


Quantum chemical laboratory investigations aiming at a study of the binding between metal and ligand in biosystems, and electronic aspects governing biochemical reactions, including charge transfer, are addressed. The influence of an aqueous or other surrounding medium must be considered for small model complexes in vacuum. The first step of a stepwise approach, first to study the central complex as the laser changes, and then to introduce some kind of discrete model of the surrounding, is discussed. Results obtained for iron complexes with either oxygen or sulfur as ligand forming atoms are presented.

ESA

52 AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

A91-33158 MEDICAL SUPPORT OF FLIGHTS ON HIGH-MANEUVERABILITY AIRCRAFT (OPYT MEDITINSKOGO OBESPECHENII POLETOV NA VYSOKOMANEVRENNYKH SAMOLETAKH)


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This paper considers the type of clinical and laboratory tests specifically required for determining the physiological functions of flight personnel operating high-maneuverability aircraft and the pilot's ability to fly such aircraft. Results of analyses on 20 pilots, carried out immediately after such flights, showed unfavorable changes in the cardiovascular and respiratory systems of pilots. It was found that, as a result of flying high-maneuverability aircraft,
the self-assessment factor decreased, the heart rate increased, the
duration of exhalation decreased, and the orthostatic index
heart activity indices increased. In addition, the values of systolic
and diastolic arterial pressure increased, the delay time of inhalation
decreased, and the respiratory capacity decreased. Only some of
these parameters were found to recover completely by the day
following the flight.

I.S.

A91-33164

USE OF PLANT PREPARATIONS VALDAI AND AL'TAIR FOR
INCREASING THE FUNCTIONAL CAPABILITY OF AN
ATHLETE [ISPOL'ZOVANIE PREPARATOV RASTIT'EL'NOGO
PROISKHOZHdeniA 'VALDAI' I 'AL'TAIR' DLIA
POVYSHeniA FUNKTsional'NYKH VOZMOZhnosti\i
SPORTSMENA]
A. S. SOLODKOV, S. S. MIKHAILOV, D. N. DAVIDENKO, T. A.
ZINCHENKO, and E. A. FAKTOR (Gosudarstvennyi Institut
Fizicheskoi Kul'tury, Leningrad, USSR) Fiziolohiia Cheloveka (ISSN

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The effect of plant preparations Valdai and Al'tair on the
physiological state, the ingeabolism, and the dark capacity of an
athlete was investigated by measuring various physiological,
biochemical, and work-capacity indexes before the treatment and
5 and 10 days after the beginning of 10-long treatments either
with two daily 20-g doses of Valdai or with single 30-g daily doses
of Al'tair. Results of tests showed that both treatments increased
work capacity of the subjects. This was due to a more economical
use of functional reserves, as well as to an increased mobilization
of these reserves. It is suggested that both Valdai and Al'tair act
as adaptogens, preparing the organism to a rapid mobilization of
functional reserves.

I.S.

A91-33166

CHANGES IN SEVERAL HORMONAL AND IMMUNE
PARAMETERS IN HUMANS UNDER LOW-TEMPERATURE
CONDITIONS [IZMENENIIA NEKOTORYKH GORMONAL'NYKH
I IMMUNNYKH POKAZATELEI CHELOVEKA V USLOVIIAKH
NIZKIIKII TEMPERATUR]
T. V. PETROVA, I. P. BOBROVNIKSKII, and IU. A. GOLTSEV
Fiziologiiia Cheloveka (ISSN 0131-1646), vol. 17, Jan.-Feb. 1991,
p. 158-163. In Russian. refs
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Changes induced in the hormonal and the immune systems by
physical exercises combined with low temperature conditions were
investigated in two groups of subjects by analyses of blood and/or
urine concentrations of insulin, cortisol, cAPM, cGMP, 2-beta-microglobulin. The subjects of the first group were participants in a 26-day-long ski trip during which temperature was between -25 and -40 C, and the daily caloric supply was 3500 kcal. Subjects of the second group were maintained for 20 days in shelters at temperatures between 0 and 7 C, except the 18th day, when the subjects executed a fast 6-km march in a winter forest; the daily caloric supply of this group was 1600 kcal. Results of periodic biochemical analyses showed that, regardless of the levels of physical activity and caloric supply, the blood concentration of insulin subjects decreased after the exposure to cold. However, results of cortisol, cortisol/insulin ratio, and immunoglobulin analyses indicated that adaptation mechanisms were activated both by the cold factor and by physical loads.

I.S.

A91-33167

BLOOD CIRCULATION IN THE LIVER AND THE KIDNEYS
DURING LOCAL DECOMPRESSION OF THE ABDOMINAL
CAVITY [KROVOOBRAshcheniE PECHEHI I POCHEKH VO
VREMIA LOKAL'NOI DEKOMPRESSII BRUSHNOI OBLASTI]
V. E. KATKOV, V. V. CHESTUKHIN, A. E. ERMOLENKO, V. V.
RUMIANTSEV, A. V. MASLENNIKOV et al. Fiziolohiia Cheloveka (ISSN

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The effect of the local negative pressure (LNP) on blood flow in the liver and the kidneys of human subjects was investigated using thermodilution or radioisotope-dilution methods. It was found that an application of LNP caused a pressure fall in both the liver and the kidney veins; at the same time, the blood flow tended to decrease in the liver vein and to increase in the kidney veins. The acid-alkali indicators in the blood flowing from these veins remained relatively unchanged. It is suggested that in the local blood flow observed in the liver vein may be caused by blood accumulation due to LNP in the vessels of the skin and of subcutaneous tissues.

I.S.

A91-33168

PSYCHOPHYSIOLOGICAL CHARACTERISTICS OF SUBJECTS
WITH DIFFERENT RESISTANCES TO OVERHEATING IN THE
INITIAL PERIOD OF ADAPTATION TO A HOT CLIMATE
[PSIKHOFIZIOLOGICHESKIE OSOBNENNOSTI LITS S
RAZLICHNOII USTOICHIVOST'IU K PEREGREVANIIU V
NACHAL'NYI PERIOD ADAPTATSII K USLOVIAM ZHARKOGO
KLIMATA]
V. P. KOVALENKO, V. P. NATALENKO, and S. T. POSOKHOVA
(Voenno-Meditsinskii Akademia, Leningrad, USSR) Fiziologiiia

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A new commercially available device (Finapres) which allows the continuous monitoring of blood pressure has been evaluated against measurements taken intraarterially. It was found that Finapres tends to underestimate both systolic and diastolic blood pressures, and differs significantly from, but correlates well with, intraarterial line measurements. In general, the slope of the relationship between Finapres and intraarterial values is close to unity. It is important that the arm is supported in a way that prevents any local tissue compression in the forearm. Finapres follows the changes in blood pressure induced by exposure to +Gz well, but may not give reliable absolute values. This device is able to give useful information on blood pressure in subjects exposed to +Gz on the man-carrying centrifuge, with a minimum of discomfort.

Author
During exercise to fatigue in 4200 m environment, Quechua natives accumulate plasma lactate to concentrations that are only one-third to one-half the values observed in lowlanders. The phenomenon of low lactate accumulation despite hypobaric hypoxia is known as the lactate paradox. It is suggested that the lactate paradox is either a developmentally or a genetically fixed metabolic characteristic of Quechua people that maximizes the amount of ATP obtained per mole of carbon substrate catabolized. The plasma metabolic data indicate that a substantial improvement in energetic efficiency of muscle work at submaximal rates minimizes the need for anaerobic sources of ATP. As plots of power output vs metabolic power input did not extrapolate to the origin, it is concluded that exercise in both groups sustains a significant ATP expenditure not convertible to mechanical work, but that this expenditure is downregulated in Andean natives by unexplained mechanisms. O.G.

A91-33318 EXERCISE ENDURANCE AND ARTERIAL DESATURATION IN NORMOBARIC HYPOXIA WITH INCREASED CHEMOSENSITIVITY

GORDON G. GIESBRECHT, A. PUDDY, M. AHMED, M. YOUNES, and N. R. ANTHONSEN (Manitoba, University, Winnipeg, Canada) Journal of Applied Physiology (ISSN 0161-7567), vol. 70, April 1991, p. 1770-1774. Medical Research Council of Canada-supported research. refs Copyright

The possibility of enhancing exercise endurance under normobaric hypoxia by increasing hypoxic ventilatory sensitivity with almitrine bismesylate (ALM) has been investigated. Resting subjects breathed an inspired O2 fraction of 10.4-13.2 percent, which lowered arterial O2 saturation (SaO2) to 80 percent. It was found that saturation did not differ from placebo (PL) during air breathing but significantly exceeded SaO2 with PL, by 3.4 percent during resting hypoxia, by 4 percent at the start of exercise, and by 5.9 percent at exhaustion. During air breathing, ventilation was not affected by ALM and during hypoxic rest and exercise; rather it was slightly increased. Endurance time with ALM was 20.6 + or - 0.9 min and with PL it was 21.3 + or - 0.9 min. O.G.

A91-33319 EFFECTS OF LOWER LIMB UNLOADING ON SKELETAL MUSCLE MASS AND FUNCTION IN HUMANS


A model developed to simulate effects of microgravity on skeletal muscle mass and function is described. Six healthy men were subjected to unilateral lower limb unloading, allowing ankle, knee, and hip joint mobility. They performed concentric or eccentric quadriceps actions at different angular velocities. In response to unloading, concentric and eccentric peak torque (PT) and angle-specific torque (AST) across speeds decreased (P less than 0.05) by 22 and 16 percent, respectively. Muscle cross-sectional area (CSA) and radiological density (RD) decreased (P less than 0.05) by 7 and 6 percent, respectively. PT, AST, CSA, and RD returned to normal after 7 weeks of recovery. No changes were seen in the control limb except for a 6 percent decrease (P less than 0.05) in RD. Since reductions in muscle mass and strength were of similar magnitude to those produced by bed rest, it is suggested that this model could serve to simulate the effects of microgravity on skeletal muscle mass and function. O.G.

A91-33774 RELATIONSHIP OF NUTRITION TO DISEASE AND PERFORMANCE. II

R. GEORGE TROXLER (Southwest Research Institute, San Antonio, TX) Aeromedical and Training Digest, vol. 5, April 1991. Copyright

The performance of individuals suffering from various nutrition-related conditions (such as obesity, dehydration, syndromes due to excessive caffeine consumption as well as to the withdrawal from caffeine, and alcoholism) is discussed, together with specific physiological disorders and/or diseases associated with these conditions. Suggestions of corrective measures for each of these nutritional disorders are proposed. Special attention is given to the composition of in-flight meals tailored to correct specific nutrition-related conditions. I.S.

A91-33828 PHYSIOLOGICAL CHARACTERISTICS OF COUPLING BETWEEN CARDIAC EXCITATIONS AND CONTRACTIONS IN YOUNG ATHLETES DURING ADAPTATION SHIFTS CAUSED BY PHYSICAL LOADS [FIZIOLOGICHESKIE OSOBNOSTI SOPRiazHENIIA VOZBUZHDEHII I SOKRASHCHENII SERDTS A I IUNYKH SPORTSMENOV PRI ADAPTATIONONYKH SDVIGAH POD VLIIANIIEM FIZICHESKOII NAGRUIZKII]


CAUSES OF RESPIRATORY HYPOCAPNIA AND ITS EFFECTS ON PILOT AND ASTRONAUT PERFORMANCE [WPLYW ZABURZONEJ WENTYLACJI PLUC NA SPRAWNOSC PILOTA I ASTRONAUTY]


EFFECT OF DISTURBED LUNG VENTILATION ON PILOT OR ASTRONAUT PERFORMANCE [WPLYW OBNIZONEGO CISNENIA PARCJALNEGO TLENU NA ZACHOWANIE SIE WYBRANYCH FUNKCJI UKLADU ODDECHOWEGO]


THE EFFECT OF REDUCED OXYGEN PARTIAL PRESSURE ON CERTAIN FUNCTIONS OF THE RESPIRATORY SYSTEM [WPLYW OBNIZONEGO CISNENIA PARCJALNEGO TLENU NA ZACHOWANIE SIE WYBRANYCH FUNKCJI UKLADU ODDECHOWEGO]

PHYSICAL CONDITIONING WITH THE AIM OF IMPROVING THE ACCELERATION TOLERANCE OF PILOTS [PRZYGOTOWANIE KONDYCYJNE PILOTOW ZWIEKSZAJACE TOLERANCJE PRZYSPIESZEN]

JAN MARKS (Wojskowy Instytut Medycyny Lotniczej, Warsaw,

52 AEROSPACE MEDICINE
THE CHANGE IN CATECHOLAMINE LEVEL IN THE CONSCIOUSNESS IN FIGHTER PILOTS SUBJECTED TO cycle of adrenaline and noradrenaline in the rat brains. B.J.

CONNAISSANCE EN VOL DES PILOTES DE CHASSE SOUS [INTERPRETATION BIOMECANIQUE DES PERTES DE RAPID-ONSET-RATE +Gz ACCELERATION (STRONG JOLT)]

BIOMECHANICAL INTERPRETATION OF IN-FLIGHT LOSS OF CONSCIOUSNESS IN FIGHTER PILOTS SUBJECT TO RAPID-ONSET-RATE +Gz ACCELERATION (STRONG JOLT) (INTERPRETATION BIOMECANIQUE DES PERTES DE CONNAISSANCE EN VOL DES PILOTES DE CHASSE SOUS L’EFFET DE L’APPLICATION D’UNE ACCELERATION +Gz D’INSTALLATION RAPIDE /FORT JOLT/)

PIERRE QUANDIEU (DRET, Centre de Recherches de Medecine Aerospatiale, Breigny-sur-Orge, France), DANIEL GAFFIE (ONERA, Chatillon, France), and PHILIPPE LIEBAERT (DRET, Paris, France) Academie des Sciences, Comptes Rendus, Serie II - Mecanique, Physique, Chimie, Sciences de la Terre et de l’Univers (ISSN 0764-4450), vol. 312, no. 3, Jan. 31, 1991, p. 185-190. In French. DRET-supported research.

Results are reported from a mathematical modeling study of +Gz-induced loss of consciousness (GLOC) in fighter pilots. Stresses on the brain (considered as a viscoelastic mass), pressure in the cerebrospinal fluid, and blood flow in the brain veins and arteries are modeled separately. The derivation of the model equations is outlined, and preliminary results are presented in graphs. The findings support the hypothesis that loss of consciousness is due to sudden cranial hypertension. T.K.
Similarly, the baroreflex was unaffected by hypobaric hypoxia when the R-R interval prolongations were expressed in percentage of the R-R intervals immediately prior to the neck suction. These data indicate that reduced ambient pressure per se has no influence on the carotid baroreflex control of heart rate. 

Author

**A91-35419**

**DECOMPRESSION SICKNESS: RISK FACTORS AND THE MONOPLACE CHAMBER - A CASE REPORT**

WALTER L. RUSH and SALIMI A. WIRJOSEMITO (USAF, Medical Center, Wright-Patterson AFB, OH) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 62, May 1991, p. 414-417. refs

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This paper presents a case report which illustrates the principles involved in the use of monoplace chambers for the treatment of decompression sickness (DCS), as well as the concerns regarding their use expressed by Kindwall et al. (1988) and Moon (1988). The report defines a new risk factor (menstrual phase) and illustrates the risks associated with the immediate postchamber flight period. The roles of monoplace and multiplace chambers in DCS treatment are discussed, highlighting the importance of the capacity to provide air breaks.

I.S.

**A91-35420**

**ACURACY OF OXYHEMOGLOBIN SATURATION MONITORS DURING SIMULATED ALTITUDE EXPOSURE OF MEN WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE**

WILLIAM J. MEHM, JAMES W. DOOLEY (U.S. Army, Institute of Pathology, Washington, DC), THOMAS A. DILLARD, KRISHNAN R. RAJAGOPAL (U.S. Army, Walter Reed Army Medical Center, Washington, DC), Uniformed Services University of the Health Sciences, Bethesda, DC), and BENJAMIN W. BERG (U.S. Army, Walter Reed Army Medical Center, Washington, DC) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 62, May 1991, p. 418-421. U.S. Army-supported research. refs

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This paper reports a case of left hemidiaphragmatic paralysis in an instructor pilot and his later recuperation. This incident was provoked by a failure in the anti-G suit, which remained inflated in an instructor pilot and his later recuperation. This incident was provoked by a failure in the anti-G suit, which remained inflated after the immediate postchamber flight period. The roles of monoplace and multiplace chambers in DCS treatment are discussed, highlighting the importance of the capacity to provide air breaks.

I.S.

**A91-35421**

**A CASE OF HEMIDIAPHRAGMATIC PARALYSIS AFTER AN ANTI-G SUIT FAILURE**

J. M. MORENO VAZQUEZ, J. E. CAMPILLO ALVAREZ (Extremadura, Universidad, Badajoz, Spain), J. L. GARCIA ALCON (Ejercito del Aire, Talavera AFB, Spain), F. FUENTES OTERO, and L. MURGA OPORTO (Infanta Cristina Hospital, Badajoz, Spain) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 62, May 1991, p. 422-424. refs

Copyright

This paper reports a case of left hemidiaphragmatic paralysis in an instructor pilot and his later recuperation. This incident was provoked by a failure in the anti-G suit, which remained inflated after the aircraft completed the maneuver that had originated the inflation. The spontaneous recuperation of both the respiratory functional test and the neurophysiological pattern are consistent with a type II Seidman's axonotmesis of the phrenic nerve. Considering the short time of regeneration (6 months), this lesion must have involved the distal portion of the phrenic nerve.

Author

**A91-35422**

**MODAFINIL - THE UNIQUE PROPERTIES OF A NEW STIMULANT**

TERENCE J. LYONS (USAF, Human Systems Div., Brooks AFB, TX) and JONATHAN FRENCH (USAF, School of Aerospace Medicine, Brooks AFB, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 62, May 1991, p. 432-435. refs

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Modafinil, a novel stimulant which has several remarkable features that distinguish it from other stimulants, has been developed by Lafon, a French pharmaceutical company. Unlike the amphetamines, for example, modafinil is reported to have minimal peripheral side effects at therapeutic doses. It also appears to have a low abuse potential, does not interfere with normal sleep, and does not seem to produce tolerance. It improves vigilance especially in sleep-deprived subjects. It has been used clinically for up to 3 years in the treatment of narcolepsy and idiopathic hypersomnia. It could be an ideal replacement for amphetamine in short-term operations in which fatigue might threaten the successful completion of a mission. It is recommended that military laboratories experienced in studying sustained performance include modafinil or perhaps a more selective alpha 1 receptor agonist in their investigations.

Author

**A91-35423**

**PHYSIOLOGICAL ADAPTATION TO LIVING AND WORKING IN SPACE**

WILLIAM K. DOUGLAS AIAA Student Journal (ISSN 0001-1460), vol. 28, Summer 1990, p. 12-14. refs

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Changes in human physiology as a result of exposure to the space environment are briefly reviewed. Problems discussed include changes in fluid volume, skin, cardiovascular system; the motion sickness phenomenon; the effects of radiation; and psychological stress.

O.G.

**N91-21704**

**# National Aeronautics and Space Administration, Washington, DC.**

**RADIATION HEALTH RESEARCH, 1986 - 1990**


(Contract NASW-4292) (NASA-TM-4270; NAS 1.15:4270) Avail: NTIS HC/MF A06 CSCL 06R

A collection of 225 abstracts of radiation research sponsored by NASA during the period 1986 through 1990 is reported. Each abstract was categorized within one of four discipline areas: physics, biology, risk assessment, and microgravity. Topic areas within each discipline were assigned as follows: Physics - atomic physics, nuclear science, space radiation, radiation transport and shielding, and instrumentation; Biology - molecular biology, cellular radiation biology, tissue, organs and organisms, radioprotectants, and plants; Risk assessment - radiation health and epidemiology, space flight radiation health physics, inter- and intraspecies extrapolation, and radiation limits and standards; and Microgravity. When applicable subareas were assigned for selected topic areas. Keywords and author indices are provided.

Author

**N91-21705**

**Imatran Voima Oy, Helsinki (Finland).**

**THE PHYSIOLOGICAL EFFECTS OF 50/60 Hz ELECTROMAGNETIC FIELDS: STANDARDS AND GUIDELINES**


The Tampere University of Technology has started a study, The Physiological Effects of 50/60 Hz Electromagnetic Fields. The research is being financed by Imatran Voima Oy, Finnish Work Environment Fund and Tampere University of Technology. One of the objectives of this study is to examine standards and guidelines of different countries, concerning exposure to 50/60 Hz electric and magnetic fields. In German standard DIN VDE 0848, Safety in electromagnetic fields, the limit of exposure to 50/60 Hz electric fields is 20 kV/m and the limit of exposure to 50/60 Hz magnetic fields is 5 mT. IRPA (International Radiation Protection Association) has compiled the interim guidelines on limits of exposure to 50/60 Hz electric and magnetic fields. In these interim guidelines continuous occupational exposure during the working day should be limited to rms unperturbed electric field strengths not greater than 10 kV/m and to rms magnetic densities not greater than 0.5 mT. The duration of short-term occupational exposure to electric fields between 10 and 30 kV/m may be calculated from the formula I \( t \leq 80/E \). Short-term occupational exposure to rms magnetic densities may not exceed 5 mT. Members of public should not be exposed on a continuous basis to unperturbed rms electric field strengths exceeding 5 kV/m or to
magnetic flux density exceeding 0.1 mT. When the limits were compared with the measured values of electromagnetic fields, it was found that in Finland occupational exposure during the working day doesn't exceed the limits. The general public exposure doesn't exceed the limits either. Comparing the results of the studies with electromagnetic fields existing in Finland, it could be noticed, that short-term exposure doesn't cause health risks in Finland. Scientific studies don't indicate, that the continuous exposure causes health risks, neither, that the continuous exposure can't cause health risks.

N91-21706# Naval Biodynamics Lab., New Orleans, LA.
PHYSIOLOGY DATA ACQUISITION SYSTEM DESCRIPTION
MARK L. LOTZ 1 Oct. 1990 51 p
(AD-A231088; NBDL-90R004) Avail: NTIS HC/MF A04 CSCL 06/4
This technical report describes the Physiology Data Acquisition System used at NAVBIODYNLAB to acquire, record, and reproduce physiological responses from human research volunteers subjected to short duration accelerations. The system is used to acquire data such as electrocardiograms, electromyograms, and somatosensory evoked responses. The impact accelerations are produced by horizontal and vertical accelerators. This report describes the systems used for physiology data acquisition during experiments performed on the horizontal and vertical accelerators. The equipment used and the interconnection of the equipment are discussed in detail. GRA

N91-21707# Naval Air Development Center, Warminster, PA.
Air Vehicle and Crew Systems Technology Dept.
ENHANCING TOLERANCE TO ACCELERATION (+Gz) STRESS: THE HOOK MANEUVER Final Report, 1-14 Aug. 1990
JAMES E. WHINNERY and DUANE C. MURRAY 20 Aug. 1990 17 p
(AD-A231094; NADC-90086-60) Avail: NTIS HC/MF A03 CSCL 06/10
Anti-G straining maneuvers (AGSM) have been utilized by aircrew to enhance tolerance to +Gz stress and reduce the potential for +Gz-induced loss of consciousness (G-LOC). Based on many years of teaching individuals to perform an optimum AGSM, one particular technique has proven to be especially useful. This technique is referred to as the Hook maneuver. We strongly prefer not giving a particular name (such as M-1 or L-1) to the AGSM when training aircrew. The Hook maneuver simply emphasizes the proper mechanics for physiological enhancement of tolerance. Experience with training a large number of tactical aircrew on the centrifuge has proven the Hook maneuver to be an extremely effective teaching tool which is easily understood, rapidly mastered, and easily remembered. A description of the Hook maneuver has been requested by many interested groups and is described in this manuscript. It should be emphasized that the optimum AGSM for an individual aviator in a given aerial combat situation is the one that is most effective for him in that situation. GRA

N91-21708# Federal Aviation Administration, Washington, DC.
Office of Aviation Medicine.
INHALATION TOXICOLOGY. 11: THE EFFECT OF ELEVATED TEMPERATURE ON CARBON MONOXIDE TOXICITY
DONALD C. SANDERS and BOYD R. ENDECOTT Dec. 1990 18 p
(AD-A231185; DOT/FAA/AM-90-16) Avail: NTIS HC/MF A03 CSCL 06/11
Laboratory rats were exposed (1) to experimental concentrations of carbon monoxide in air at ambient temperature, (2) to elevated temperature atmospheres from 40 to 60 C, and (3) to selected carbon monoxide (CO) concentrations at the elevated temperatures in (2). The incapacitating potency of each of the environments was evaluated by measurements of time-to-incapacitation (t sub i) as a function of CO concentration and/or temperature; incapacitation was defined operationally as loss of ability to walk inside a motor-driven, rotating cage enclosed in an exposure chamber. Comparison of data from the combined (CO + elevated temperature) exposures and exposures to CO and elevated temperatures alone indicated than incapacitation occurred earlier when CO inhalation was combined with a whole-body, elevated temperature environment than was observed for the same exposure parameters applied individually. No evidence for a synergistic effect was noted. An empirical equation was derived that allows the calculation of a predicted t sub i for combinations of CO and temperature within the rangers utilized in the experimental exposures. GRA

N91-21709# Naval Air Development Center, Warminster, PA.
Air Vehicle and Crew Systems Technology Dept.
JOHN E. DEATON, MICHAEL HOLMES, NORMAN WARNER, and EDWARD HITCHCOCK 4 Sep. 1990 23 p
(AD-A231269; NADC-90055-60) Avail: NTIS HC/MF A03 CSCL 05/9
There is currently a lack of data on the operator's ability to perform flight and weapon systems management functions under a high-G environment. The ability to correctly track enemy targets and respond with appropriate countermeasures is dependent upon the operator's ability to perform both perceptual/motor and cognitive functions. At the present, not enough information is available to determine how these two functions operate under high-G. GRA

JAMES T. WEBB, ROBERT W. KRUTZ, JR., and GENE A. DIXON Jun. 1990 26 p Revised
(Contract F33615-85-C-4503) (AD-A231355; USAFSAM-TP-88-10R) Avail: NTIS HC/MF A03 CSCL 06/4
Four major protocols, one of which includes five studies, have been initiated or completed in the 5-year period from 1983 to 1988. The studies have resulted in numerous publications which are listed as the references for this review. The purpose of this review is to provide an accessible summary of these extensive efforts and document the history of their accomplishments. The cross-reference information contained in this review is intended to simplify data accession within both published and data base records. A listing of the abbreviated title, protocol approval information, sponsorship information, computer database (HYPOB) retrieval numbers/titles, dates of exposure, and information about subjects, prebreath, and exposure parameters for each study is followed by the published abstracts from each publication. GRA

SCOTT A. STARKS 1991 61 p
(Contract NAG2-870) (NASA-CR-188098; NAS 1.26:188098) Avail: NTIS HC/MF A04 CSCL 06/16
Interdisciplinary investigations in support of project DI-MOD are discussed. The following subject areas were covered: (1) potential extensions of Project DI-MOD to additional sites in Central America; (2) human migration patterns and their impact on malaria transmission; and (3) an investigation into possible computer-based approaches to the analysis of remotely sensed multispectral data. Author
INDEX OF MATERIAL SAFETY DATA SHEETS: TOXIC SUBSTANCES REGISTRY SYSTEM
Apr. 1991 696 p
(NASA-GP-23-1; NAS 1.2:23-1) Avail: NTIS HC/MF A99 CSCL 06/5

The Material Safety Data Sheets (MSDSs) listed in this index reflect product inventories and associated MSDSs which have been submitted to the Toxic Substance Registry database maintained by the Base Operations Contractor at the Kennedy Space Center. The purpose of this index is to provide a means to access information on chemicals associated with toxic and otherwise hazardous chemicals stored and used at the Kennedy Space Center.

Author

N91-22705# Cambridge Univ. (England). Dept. of Experimental Psychology

JOHN D. MOLTON Jul. 1990 29 p
(Contract DAJ4A-88-M-0125) (AD-A231772; R/D-8231-RB-09) Avail: NTIS HC/MF A03 CSCL 05/8

This report reviews, analyzes, and summarizes experimental literature on 'sleep learning.' Findings are as follows: (1) Serious methodological flaws were found in all reported positive results. There is no evidence that semantic learning occurs when verbal material is presented to sleeping subjects. (2) A critical, but open-minded, test of sleep learning has not been done. Recommendations are made for an appropriate experiment. (3) If new material is presented to the sleeping subject, there is danger that it may interfere with normal nighttime processing of earlier daytime experiences.

GRA

N91-22706# Army Aeromedical Research Lab., Fort Rucker, AL

CODING MANUAL FOR THE US ARMY AVIATION EPIDEMIOLOGY DATA REGISTER
THOMAS J. BURKE and RENEE KINGSLEY Jan. 1991 59 p
(AD-A231685; USAARL-91-4) Avail: NTIS HC/MF A04 CSCL 05/9

The U.S. Army Aviation Epidemiology Data Register (AEDR) is an automated database which allows electronic storage, analysis, and retrieval of information of the Flying Duty Medical Examination (FDME). The FDME consists of a completed Report of Medical History (standard form (SF) 93), Report of Physical Examination (SF 88), Report of Electrocardiogram SF 520) with the electrocardiogram tracing, and for certain classes of FDME, additional information on lifestyle factors and family history. The clinical, administrative, and research functions of the AEDR.

Author

N91-23031# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

MECHANICAL RESPONSE TISSUE ANALYZER FOR ESTIMATING BONE STRENGTH
SARA B. ARNAUD, CHARLES STEELE, and ANTHONY MAURIELLO (GaItScan Inc., Ridgewood, N.J.) in National Aeronautics and Space Administration, Technology 2000, Volume 1 p 83-88 Mar. 1991
Avail: NTIS HC/MF A18 CSCL 14/2

One of the major concerns for extended space flight is weakness of the long bones of the legs, composed primarily of cortical bone, that functions to provide mechanical support. The strength of cortical bone is due to its complex structure, described simplistically as cylinders of parallel osteons composed of layers of mineralized collagen. The reduced mechanical stresses during space flight or immobilization of bone on Earth reduces the mineral content, and changes the components of its matrix and structure so that its strength is reduced. Currently, the established clinical measures of bone strength are indirect. The measures are based on determinations of mineral density by means of radiography, photon absorptiometry, and quantitative computer tomography. While the mineral content of bone is essential to its strength, there is growing awareness of the limitations of the measurement as a true predictor of fracture risk in metabolic bone diseases, especially limitations of the measurement as the sole predictor of fracture risk in metabolic bone diseases, especially osteoporosis.

Other experimental methods in clinical trials that more directly evaluate the physical properties of bone, and do not require exposure to radiation, include ultrasound, acoustic emission, and low-frequency mechanical vibration. The last method can be considered a direct measure of the functional capacity of a long bone since it quantifies the mechanical response to a stimulus delivered directly to the bone. A low frequency vibration induces a response (impedance) curve with a minimum at the resonant frequency, that a few investigators use for the evaluation of the bone. An alternative approach, the method under consideration, is to use the response curve as the basis for determination of the bone bending stiffness Ei (E is the intrinsic material property and i is the cross-sectional moment of inertia) and mass, fundamental mechanical properties of bone.

Author

N91-23032# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

ADAPTATION OF NASA TECHNOLOGY FOR THE OPTIMIZATION OF ORTHOPEDIC KNEE IMPLANTS
D. A. SARAVANOS, P. J. MRAZ (Case Western Reserve Univ., Cleveland, OH.), and D. A. HOPKINS in National Aeronautics and Space Administration, Technology 2000, Volume 1 p 89-98 Mar. 1991
training and evaluation; and psychiatric research.

sensomotor type (controlling several types of equipment situated in an open area). The work regimen consisted of 24-hr-long work shifts followed by 72-hr-long rest periods. Results obtained from a study on the screen, the hand image is moved and the degree of structure restoration of this image is graded. Results showed that, when the densities of random dot in the hand image and in the noise image were very similar, the degree of structure restoration was high. In a case of large visual angle, the degree of structure restoration was low. Motion perception was affected both by the size of a dot (spatial frequency) and by the moving speed (temporal frequency).

A91-34825#

ON THE HUMAN VISUAL SYSTEM - FUNDAMENTAL EXPERIMENTS OF THE HUMAN MOTION PERCEPTION

HIROMITSU HAMA, KAZUMI YAMASHITA (Osaka City University, Japan), and HITOSHI TAKADA Osaka City University, Faculty of Engineering, Memoirs (ISSN 0078-6659), vol. 31, Dec. 1990, p. 219-227. refs

A method is described for the analyzing human motion perception by using moving random dot patterns. In the procedure, subjects are confronted with two pictures formed by random dot patterns, one forming a significant image ('the hand image') and the other forming noise image. Displaying the two images at once on the screen, the hand image is moved and the degree of structure restoration of this image is graded. Results showed that, when the densities of random dot in the hand image and in the noise image were very similar, the degree of structure restoration was high. In a case of large visual angle, the degree of structure restoration was low. Motion perception was affected both by the size of a dot (spatial frequency) and by the moving speed (temporal frequency).

A91-34906

HUMAN ERROR AVOIDANCE TECHNIQUES; PROCEEDINGS OF THE 2nd CONFERENCE, HERNDON, VA, SEPT. 18, 19, 1989

Conference sponsored by SAE. Warrendale, PA, Society of Automotive Engineers, Inc., 1989, 102 p. For individual items see A91-34907 to A91-34918. (SAE P-229) Copyright

The proceedings concentrate on the development of a national plan for addressing future aviation human-factor needs, the behavioral characteristics of effective crew leaders, leader personality as it relates to crew effectiveness, and the role of professional standards in cockpit resource management. The effectiveness of cockpit resource-management training is evaluated, along with human factors and information transfer. Human-performance factors in aircraft accident investigations, pilot hiring criteria, and cockpit resource-management concepts in flight training and checking are discussed. The ergonomic integrated flight deck, error-tolerant avionics and displays, and workload and automation are considered.

A91-34907

DEVELOPMENT OF A NATIONAL PLAN FOR ADDRESSING FUTURE AVIATION HUMAN FACTORS NEEDS


Human-factor research and development efforts in the United States aimed at the alleviation of human-performance problems in all types of aircraft, in the air-traffic control environment, and in the interaction of the two environments are reviewed. The application of automation and advanced technology is outlined, and emphasis is placed on empirical investigations utilizing high-fidelity simulation techniques. Aviation-system monitoring, research in the field of aviation human-performance factors and its measurements, and information transfer are discussed. The design of controls, displays, and workstations is addressed, along with personnel training, and certification and validation standards for aircraft or air-traffic control systems.

A91-34918

COLUMBUS ASTRONAUT TRAINING IN THE CREW TRAINING COMPLEX AT DLR


The Crew Training Complex (CTC) that is being built at DLR, (Cologne, Germany) is described together with the elements of the training program for European astronauts. Special attention is given to the individual CTC facilities and their use, the typical training flow, the overall astronaut training sequence, and the Columbus/Herms crew preparation.

I.S.
EVALUATING THE EFFECTIVENESS OF COCKPIT RESOURCE MANAGEMENT TRAINING


The concept of providing flight crews with intensive training in crew coordination and interpersonal skills (cockpit resource management training - CRM) is outlined with emphasis on full mission simulator training (line-oriented flight training - LOFT). Findings from several airlines that have instituted CRM and LOFT are summarized. Four types of criteria used for evaluating CRM programs: observer ratings of crew behavior, measures of attitudes regarding cockpit management, self-reports by participants on the value of the training, and case studies of CRM-related incidents and accidents are covered. Attention is focused on ratings of the performance of crews during line flights and during simulator sessions conducted as a part of LOFT. A boomerang effect - the emergence of a subgroup that has changed the attitudes in the opposite direction from that desired is emphasized. V.T.

BEHAVIORAL CHARACTERISTICS OF EFFECTIVE CREW LEADERS


The behaviors of effective versus less effective captains as they form and lead their crews in line operations are analyzed. The research examines real work groups in a actual organization with a specific and consequential task to perform and is based on a normative model of work group effectiveness. Selection of captains is outlined, as well as data collection over the course of six months of crew and cockpit observations including over 300 hours of direct crew observations and 110 hours of actual flight time. Common characteristics of the effective leaders as well as the deviations of the less effective are described, and organizational implications are assessed. The concept of 'shells' depicted as a series of concentric circles moving outward from the group's task execution at the center is introduced and discussed. V.T.

THE ROLE OF PROFESSIONAL STANDARDS IN COCKPIT RESOURCE MANAGEMENT (CRM)


The paper examines the role of professional standards peer-group committees in dealing with the 'boomerang' effect when the pilot reacts contradictory to CRM training and emerges with a negative change in attitudes. It is pointed out that there is a general agreement that pilot peer pressure exerted through their own professional standards committees (PSC) may provide an effective interim method of dealing with the problem of such an aberrant behavior in the cockpit. The success of such committees is determined by the pilot group's voluntary dedication to overcoming personality conflicts and other stress factors that affect flight safety. The involvement of the Air Line Pilots Association PSC in a dispute between the union leadership and management is discussed. V.T.

AMERICAN AIRLINES' PILOT HIRING CRITERIA


An approach aimed at enhancements of individual's performance as pilot-in-command as his career progresses to the captain position is outlined, and characteristics desirable for future captains, including strong career motivation toward the field of aviation, ability to solve problems by logical reasoning, mature personality free from neurotic symptoms, and ability to perform well under stress are listed. A centralized pilot-selection process consisting of four phases is described. In phase one, the personnel department screens applications for basic qualifications; in phase two, the selected applicants are given a personal interview; in phase three, a test battery designed for screening applicants for the desirable characteristics is administered; and in phase four, the applicants are rank ordered based on a composite score derived from the various elements of the process. V.T.

COCKPIT RESOURCE MANAGEMENT


A cockpit-resource-management program at Delta Airlines is reviewed. In the first phase of the program, a one and a half day workshop is presented to pilots and other personnel. In the next stage, crew-resource-management directions coupled with continued emphasis on good cockpit discipline, a strong training effort, and continued reinforcement of resource-management skills will be implemented. The achievements of the CRM steering committee at Delta are outlined, and attention is given to a workshop devoted to team issues and followed by a full-length high-impact LOFT session, designed to place the crew into difficult scenarios requiring a high level of CRM skills. Focus is placed on crew dynamics, communications, decision dynamics, and crew effectiveness. V.T.

CRM CONCEPTS IN FLIGHT TRAINING AND CHECKING


The paper concentrates on three major areas of flight training and checking where CRM principles are incorporated: annual recurrent training with LOFT, annual recurrent with proficiency check, and transition and upgrade. Realistic scenarios and noninvolvement by the instructor are emphasized for LOFT, and it is noted that the problems should not be very easy but at the same time should not be so difficult that they induce crew failure regularly. The annual proficiency check is considered to be one of the best vehicles for the reinforcement of CRM skills. Focus is placed on transition and upgrade training where pilots are most likely to make behavior and attitude changes. The rating ride and the role of the instructor are discussed. V.T.

VISUAL SENSITIVITY TO SPATIALLY SAMPLED MODULATION IN HUMAN OBServers

JEFFREY B. MULLIGAN (NASA, Ames Research Center, Moffett Field, California, University, La Jolla) and DONALD I. A. MACLEOD (California, University, La Jolla) IN: Human error avoidance techniques; Proceedings of the 2nd Conference, Herndon, VA, Sept. 18, 19, 1989. Warrendale, PA, Society of Automotive Engineers, Inc., 1989, p. 69-72. (SAE PAPER 892611) Copyright

The paper concentrates on three major areas of flight training and checking where CRM principles are incorporated: annual recurrent training with LOFT, annual recurrent with proficiency check, and transition and upgrade. Realistic scenarios and noninvolvement by the instructor are emphasized for LOFT, and it is noted that the problems should not be very easy but at the same time should not be so difficult that they induce crew failure regularly. The annual proficiency check is considered to be one of the best vehicles for the reinforcement of CRM skills. Focus is placed on transition and upgrade training where pilots are most likely to make behavior and attitude changes. The rating ride and the role of the instructor are discussed. V.T.

National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA. VISUAL SENSITIVITY TO SPATIALLY SAMPLED MODULATION IN HUMAN OBSERVERS

J. A. MULLIGAN (NASA, Ames Research Center, Moffett Field, California, University, La Jolla) and D. I. A. MACLEOD (California, University, La Jolla) IN: Human error avoidance techniques; Proceedings of the 2nd Conference, Herndon, VA, Sept. 18, 19, 1989. Warrendale, PA, Society of Automotive Engineers, Inc., 1989, p. 69-72. (SAE PAPER 892611) Copyright

Thresholds were measured for detecting spatial luminance modulation in regular lattices of visually discrete dots. Thresholds
for modulation of a lattice are generally higher than the correponding threshold for modulation of a continuous field, and the size of the threshold elevation, which depends on the spacing of the lattice elements, can be as large as one log unit. The largest threshold elevations are seen when the sample spacing is 12 min arc or greater. Theories based on response compression cannot explain the further observation that the threshold elevations due to spatial sampling are also dependent on modulation frequency: the greatest elevations occur with higher modulation frequencies. The idea that this is due to masking of the modulation frequency by the spatial frequencies in the sampling lattice is considered.

N91-21711# Air Force Human Resources Lab., Brooks AFB, TX.
A conceptual approach is presented for measuring the program performance of the Air Force Flight Training Program (FTP). There are five sections: The introduction provides the background information on FTP; the second section addresses twenty-five points addressed by Stoker, Hunter, Kanto, Quebe, and Siem (1987) and establishes the general construction of the program performance model; the second section addresses the effectiveness of the FTP in relation to graduation rates; the efficiency section develops the cost for each of the FTP options; the fourth section, on performance, presents a way to compare the efficiency and effectiveness of each program; and the concluding section provides a summary of the benefits to be derived from use of one of the four option.

N91-22707# Stanford Univ., CA. Dept. of Psychology.
The present report summarizes two projects. The first project, which focuses on riskless choice, involves a series of experiments that demonstrate the phenomenon of loss aversion: losses and disadvantages have greater impact on preference than gains and advantages. The second project, which focuses on status quo or reference level, and that changes of reference point often lead to reversals of preference. To account for these observations, we develop a reference-dependent theory of individual choice, which explains such effects by a deformation of the preference map about the reference point. Implications of loss aversion to both individual and aggregate behavior are explored.

N91-22710# Army Research Inst. for the Behavioral and Social Sciences, Alexandria, VA.
In late 1986, the U.S. Army Aviation Center (USAAVNC) redesigned the Initial Entry Rotary Wing (IERW) course for aviator candidates. The new training is called IERW Multitack (IERW-MT) and became operative in May 1988. The research problem for the U.S. Army Research Institute Aviation R&D Activity (ARIARDA) was to develop tests and procedures for selecting aviator candidates for one of four helicopters prior to training day 100. ARIARDA simultaneously pursued two avenues of research. On the one hand, available test instruments were considered and evaluated for their potential to discriminate among aviators. On the other hand, groups of Subject Matter Experts (SMEs) developed criticality-rated aviator candidate abilities and traits for specific operational helicopters. Extensive literature reviews and liaison with sister services and other agencies were accomplished. Four test instruments were evaluated for use. The underlying abilities, traits, and skills these batteries purported to measure matched the abilities, traits, and skills identified as necessary by the SMEs for each of the helicopters. Upon selection of the subjects contained in the ARIARDA experimental test battery, high-time aviators were given the experimental battery to develop scoring profiles for specific aircraft and to generate the data for the statistical analyses that resulted in the Preliminary Multi-Track Classification Algorithm.
54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

A91-33274

COMBAT EDGE - A TEST SUBJECT PERSPECTIVE


Copyright

The current version of G-protection equipment known as the Combined Advanced Technology Enhanced Design G-Ensemble (COMBAT EDGE) is described, and the results of man-rating tests conducted on the USAF/SAM centrifuge are presented. The acceleration levels used in the man-rating tests included a gradual onset rate of 0.1 G/s to +3 Gz; a rapid onset rate (ROR) of 3-4 G/s to +5, +7, and +9 Gz, with plateaus lasting for 15 s each; and a ROR of +5 to +9 Gz Simulated Aerial Combat Maneuver using 10-s plateaus. The lessons learned from the tests are discussed.

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

provide 0.30 caliper AP insert plates for ballistic protection, jettable armor plates for in-water capability, pockets for survival items, lift capability, and flotation capability.

I.S.
A91-34916
THE ERGONOMIC INTEGRATED FLIGHT DECK
JEAN-JACQUES SPEYER (Airbus Industrie, Blagnac, France) and
OPERATING PROCEDURES AND TRAINING, AND PILOT PERFORMANCE ARE
CRT-COLOR SELECTION. THE RELATIONSHIP BETWEEN EQUIPMENT DESIGN,
ON A FIRE- SWITCH DESIGN, GRAPHIC NAVIGATION-DATA DISPLAY, AND
DEMONSTRATING THE APPROACH ARE OUTLINED: ONE IS RELATED TO SYSTEMS
DESIGN GUIDELINES AND CONTRIBUTES TO FEWER REVISIONS AND LESS
AUTOMATION AND SPACE INSTITUTE, 1990, P. 28-37. MINISTERE DE
EDUCATION DU QUEBEC-SUPPORTED RESEARCH. REFS
A91-34917
ERROR TOLERANT AVIONICS AND DISPLAYS
DELMAR M. FADDEN (AIAA, Washington, DC; IEEE, New York; 
SAE PAPER 892613) COPYRIGHT
OPERATING PROCESSES, HUMAN PERFORMANCE, AND EQUIPMENT CAPABILITIES ARE ANALYZED FROM THE POINT OF VIEW OF HUMAN-ERROR REDUCTION AND TOLERANCE. IT IS SHOWN THAT A TASK ANALYSIS INITIATED BEFORE THE DETAILED DESIGN WORK IS BEGUN IMPROVES THE UTILITY OF DESIGN GUIDELINES AND CONTRIBUTES TO FEWER REVISIONS AND LESS BACKTRACKING IN THE LATTER PHASES OF DESIGN. THREE CASE HISTORIES DEMONSTRATING THE APPROACH ARE OUTLINED: ONE IS RELATED TO SYSTEMS COMPONENTS AND THE OTHER TWO ARE RELATED TO DISPLAYS. FOCUS IS PLACED ON A FIRE-SWITCH DESIGN, GRAPHIC NAVIGATION-DATA DISPLAY, AND CRT-COLOR SELECTION. THE RELATIONSHIP BETWEEN EQUIPMENT DESIGN, OPERATING PROCESSES AND TRAINING, AND PILOT PERFORMANCE ARE EMPHASIZED.
V.T.
A91-34918
WORKLOAD AND AUTOMATION
JEAN-JACQUES SPEYER (Airbus Industrie, Blagnac, France) and 
COPYRIGHT
CURRENT AND FUTURE GENERATIONS OF TRANSPORT AIRCRAFT ARE CHARACTERIZED BY A HIGH LEVEL OF AUTOMATION. THIS AUTOMATION IS INTENDED TO ASSIST THE FLIGHT CREW AND MAKE IT POSSIBLE FOR A CREW OF TWO PERSONS TO OPERATE THESE AIRCRAFT FOR ALL TYPES OF FLIGHTS, INCLUDING THOSE OF EXTREMELY LONG DURATION. WHILE ONE OF THE DESIGN GOALS OF AUTOMATION IS TO REDUCE CREW WORKLOAD, LITTLE IS KNOWN ABOUT THE TRUE RELATIONSHIP BETWEEN WORKLOAD AND AUTOMATION. THIS PAPER DISCUSSES THE APPROACHES TAKEN BY AIRBUS INDUSTRIE WHEN DESIGNING INCREASING LEVELS OF AUTOMATION INTO THEIR AIRCRAFT. IT ALSO ADDRESSES THE AIRBUS PROGRAM OF WORKLOAD RESEARCH AND THE NEED TO DIRECT SPECIFIC ATTENTION TO THE RELATIONSHIP BETWEEN WORKLOAD AND AUTOMATION.
A91-34929#
COORDINATE CONTROL OF MULTIPLE SPACE MANIPULATORS
M. NAHON and J. ANGELES (McGill University, Montreal, Canada) IN: CASI CONFERENCE ON ASTRONAUTICS, 6TH, OTTAWA, CANADA, NOV. 19-21, 1990. PROCEEDINGS. OTTAWA, CANADIAN AERONAUTICS AND SPACE INSTITUTE, 1990, P. 28-37. MINISTERE DE L'EDUCATION DU QUEBEC-SUPPORTED RESEARCH. REFS
(CONTRACT NSERC-A-4532)
THE CONTROL OF MULTIARMED ROBOTIC SYSTEMS IS INHERENTLY MORE COMPLEX THAN THAT OF SINGLE-ARM SYSTEMS. WHEREAS A SINGLE MANIPULATOR CAN BE CONTROLLED PURELY THROUGH POSITIONS OR VELOCITIES, MULTIPLE MANIPULATORS HANDLING A COMMON PAYLOAD MUST ALSO BE CONTROLLED IN TERMS OF FORCES. IN THIS PAPER, THE PROBLEM OF FINDING FORCE SETPOINTS FOR THE CONTROLLER IS FORMULATED AS A CONSTRAINED OPTIMIZATION PROBLEM WHERE THE CONSTRAINTS ARE PROVIDED BY THE DYNAMICS EQUATIONS AND THE ACTUATOR CAPABILITIES. A NUMBER OF POTENTIAL OBJECTIVE FUNCTIONS WHICH MAY BE MINIMIZED ARE REVIEWED INCLUDING THE 'INTERNAL FORCE', A NORM OF THE VECTOR OF ACTUATOR TORQUES, AND POWER LOSSES IN THE SYSTEM. THESE ARE THEN COMPARED FOR A TASK IN WHICH THE SPECIAL PURPOSE DEXTRUS MANIPULATOR MOVES A PAYLOAD IN THE ABSENCE OF GRAVITY. IT IS CONCLUDED THAT THE ACTUATOR TORQUE CRITERION APPEARS TO OFFER THE WORST COMPROMISE IN PERFORMANCE, WHILE THE MINIMUM INTERNAL FORCE AND MINIMUM POWER LOSS CRITERIA EACH HAVE THEIR ADVANTAGES.
A91-34932#
AN ACTIVE TACTILE PERCEPTION SYSTEM
E. PETRIU, M. GREENSPAN, F. GELINAS (Ottawa, University, Canada), W. MCMATH, AND S. K. YEUNG (CANADIAN SPACE AGENCY, OTTAWA, Canada) IN: CASI CONFERENCE ON ASTRONAUTICS, 6TH, OTTAWA, CANADA, NOV. 19-21, 1990. PROCEEDINGS. OTTAWA, CANADIAN AERONAUTICS AND SPACE INSTITUTE, 1990, P. 59-67. REFS
A ROBOTIC TACTILE SYSTEM FOR THE ACTIVE PERCEPTION OF THREE-DIMENSIONAL OBJECTS SURFACES WHICH ARE LARGER THAN THE TACTILE PROBE DIMENSIONS IS STUDIED. THE LOCAL CUTANEOUS DATA PROVIDED BY THE TACTILE SENSOR ARRAY INTEGRATED WITH A ROBOT ARM'S JAWS IS UTILIZED TO GENERATE THE TOPOLOGICAL REPRESENTATION OF OBJECTS FROM A FEW TOUCHES. THE SPDM VISION SYSTEM IS USED TO GENERATE THE RELATIVE LOCATION OF PERCEIVED OBJECTS. AN ACCOUNT IS PRESENTED OF THE DESIGN FEATURES AND OPERATIONAL CAPABILITIES OF THE ARTIFICIAL VISION SYSTEM (AVIS) EMPLOYED BY THE CANADIAN SPACE STATION PROGRAM'S SPECIAL PURPOSE DEXTRUS MANIPULATOR (SPDM) IN ITS TRACKING, CAPTURING, HANDLING, BERTHING, AND TOOL-MANIPULATION OPERATIONS. A COMPARISON OF THE PERFORMANCE OF SPDM-VISION-ASSISTED OPERATIONS WITH THOSE OF THE SPACE STATION REMOTE MANIPULATOR SYSTEM SHOWS THAT THE SPDM OPERATIONS IN GENERAL, AND ITS MAINTENANCE AND ASSEMBLY OPERATIONS IN PARTICULAR, INVOLVE AN ADDITIONAL DIMENSION OF TASK COMPLEXITY THAT MUST BE MATCHED BY AN AVS PERFORMANCE. ALTERNATIVE FUTURE CONCEPTS IN THE FIELD OF SPDM-RELATED VISION ARE DISCUSSED.
O.C.
A91-34956#
A CONCEPT FOR A SUPERVISED AUTONOMOUS ROBOT
A TELEROBOTICS SYSTEM CONCEPT FOR THE MOBILE SERVICING SYSTEM (MSS) IS INTRODUCED. MAIN FUNCTIONS OF THE TELEROBOTICS SYSTEM INCLUDE ASSEMBLY AND MAINTENANCE OF THE SPACE STATION FREEDOM (SSF); LOADING/UNLOADING FROM THE SPACE SHUTTLE; AND RETRIEVAL AND DEPLOYMENT OF THE SHUTTLE. THE FUNCTIONAL RESPONSIBILITY DIVISION BETWEEN AN OPERATOR AND THE SYSTEM IS INTENDED TO PROVIDE AN EFFECTIVE OPERATIONAL SOLUTION AND TO ADDRESS THE PROBLEMS OF TIME DELAYS AND BANDWIDTH RESTRICTIONS. ATTENTION IS ALSO GIVEN TO THE FUNCTIONAL AND PHYSICAL ARCHITECTURES OF THE SYSTEM, THE OPERATIONAL SCENARIO FOR MAINTENANCE OF THE SSF, AND THE PROCEDURES FOR CHANGING AN ORBITAL REPLACEMENT UNIT ON THE MSS OR SSF.
O.G.
A91-35153
PERFORMANCE MEASURES OF TELEOPERATION USING AN EXOSKELETON DEVICE
Copyright
A study was conducted to evaluate performance of a man-machine interface system consisting of a human wearing a passive exoskeleton device. This experiment obtained some crude measures of human response characteristics treating the exoskeleton device as a complicated sensor array. A Fitt's law paradigm was used to help evaluate human performance. Fitt's law is commonly used in human performance studies and it characterizes human response in terms of speed-accuracy tradeoffs that occur as humans perform tasks. Empirical data were collected during tests involving five subjects running using five levels of speed-accuracy tasks. The results are analyzed.
I.E.

A91-35154
STABILITY AND PERFORMANCE OF ROBOTIC SYSTEMS WORN BY HUMANS
Copyright
The dynamics and control of robotic systems worn by humans are analyzed. General models for the human, the extender, and the interaction between the human and the extender are developed. The stability of the system of human, extender, and object being manipulated is analyzed, and the conditions for stable maneuver are derived. An expression for the extender performance is defined to quantify the force augmentation. The tradeoff between stability and performance is described. The theoretical predictions are verified experimentally.
I.E.

A91-35894
PARAMETRIC CLASSIFICATION OF SEGMENTS IN OCULAR NYSTAGMUS
CLAUDIO G. REY and HENRIETTA L. GALIANA (McGill University, Montreal, Canada) IEEE Transactions on Biomedical Engineering (ISSN 0018-9294), vol. 38, Feb. 1991, p. 142-148. Research supported by NSERC and Fonds de Recherches en Sante du Quebec. refs
Copyright
A method for nystagmus classification that uses system identification techniques is presented. A system is formulated whose input is head position and whose output is eye position. This system is approximated with an autoregressive with exogenous input model which relates the input and output (transfer function) regardless of the temporal profile for the sensory stimulation. The system is then identified using a least squares criteria and three indicators are produced. From these a flag that marks slow and fast phases as well as blinks is produced. Bad data segment classification is remarkably insensitive to recording noise. The method is more robust than previous techniques. Operator intervention is minimal. The method should be applicable for all types of ocular nystagmus. Results are given in the context of the vestibuloocular reflex. How this method can be applied for optokinetic or pursuit nystagmus is discussed.
I.E.

N91-21712# Federal Aviation Administration, Washington, DC, NATIONAL PLAN FOR AVIATION HUMAN FACTORS, VOLUME 1
Nov. 1990 51 p Prepared in cooperation with Computer Technology Associates, Inc., Rockville, MD
(PB91-100339; PB91-100321) Avail: NTIS HC/MF A04; also available in set of 2 reports as PB91-100321 CSCL 05/8
The scope, objectives and an overview of the National Plan for Human factors is presented. The development of the plan, implementation and application to the National Aerospace System, the institutionalization of human factors and general recommendations are also discussed.
Author

N91-21713# Federal Aviation Administration, Washington, DC, NATIONAL PLAN FOR AVIATION HUMAN FACTORS, VOLUME 2
Nov. 1990 850 p Prepared in cooperation with Computer Technology Associates, Inc., Rockville, MD
(PB91-100347; PB91-100321) Avail: NTIS HC/MF A99; also available in set of 2 reports as PB91-100321 CSCL 05/8
Detailed descriptions of the technical agenda, the flightdeck plan, aircraft maintenance plan, airway facilities maintenance plan, air traffic control plan, and flightdeck/air traffic control plan are reported.
Author

N91-21714# Battelle Columbus Labs., Mountain View, CA, HUMAN FACTORS IN AVIATION: TERMINAL CONTROL AREA BOUNDARY CONFLICTS
Air-to-air conflicts in the vicinity of Terminal Control Area (TCA) boundaries were studied to obtain a better understanding of the causal dynamics of these events with particular focus on human factor issues. The study dataset consisted of 381 Instrument Flight Rules/Visual Flight Rules (IFR/VFR) traffic conflicts in airspace layers above TCA ceiling and below TCA floors; 213 reports of incursions in TCA terminal airspace by VFR aircraft, of which 123 resulted in conflicts; and an additional set of reports describing problems with Air Traffic Control (ATC) services in and around TCAs. Results and conclusions are detailed.
Author

N91-21715# Food and Agriculture Organization of the United Nations, Rome (Italy), INTERNATIONAL DOCUMENT ON FOOD IRRADIATION
(DE91-615879; AECS/IB-4; CONF-8812044) Avail: NTIS HC/MF A02
This international document highlights the major issues related to the acceptance of irradiated food by consumers, governmental and intergovernmental activities, the control of the process, and trade. The conference recognized that: Food irradiation has the potential to reduce the incidence of foodborne diseases. It can reduce post-harvest food losses and make available a larger quantity and a wider variety of foodstuffs for consumers. Regulatory control by competent authorities is a necessary prerequisite for introduction of the process. International trade in irradiated foods would be facilitated by harmonization of national procedures based on internationally recognized standards for the control of food irradiation. Acceptance of irradiated food by the consumer is a vital factor in the successful commercialization of the irradiation process, and information dissemination can contribute to this acceptance.
DOE

MARY M. DONOHUE-PERRY Jul. 1990 31 p (Contract F33615-89-C-0532)

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Potential compatibility problems found with the Protective Integrated Hood Mask (PIHM) and the Aviator’s Night Vision Imaging System (ANVIS) were evaluated. The PIHM is worn under a standard HGU-55/P helmet and is designed to protect USAF aircrew members in a chemical environment. Visual acuity through ANVIS/PIHM, ANVIS horizontal and vertical intensified field of view while wearing PIHM, and distortion and transmissivity of the PIHM visor were determined. Acuity through ANVIS with and without PIHM was assessed under quarter moon and starlight illumination. Acuity was tested using 20 and 90 percent contrast Landolt C targets depicted in one of four orientations. ANVIS/PIHM viewing resulted in acuity reductions of approximately 6 percent for both contrast levels at quarter moon illumination. No acuity loss was present at starlight illumination. Tests of horizontal and vertical ANVIS intensified fields of view resulted in no significant losses when PIHM was donned.

An evaluation was conducted to determine potential compatibility problems found while wearing the Protective Integrated Hood Mask (PIHM) with the Aviator’s Night Vision Imaging Systems (ANVIS). The PIHM is worn under a standard HGU-55/P helmet and is designed to protect USAF aircrew members in a chemical environment. ANVIS is mounted in the front of the PIHM visor using a special bracket. The evaluation consisted of tests performed at Pope AFB, NC using qualified C-130E crewmembers. Examinations of horizontal and vertical intensified fields of view, cockpit lighting capability, and a limited intensification of field of view while wearing PIHM, and distortion and transmissivity of the PIHM visor were determined. Acuity through ANVIS with and without PIHM was assessed under quarter moon and starlight illumination. Acuity was tested using 20 and 90 percent contrast Landolt C targets depicted in one of four orientations. ANVIS/PIHM viewing resulted in acuity reductions of approximately 6 percent for both contrast levels at quarter moon illumination. No acuity loss was present at starlight illumination. Tests of horizontal and vertical ANVIS intensified fields of view resulted in no significant losses when PIHM was donned.
liner, and testing session variables. Also, the main effect of liner type did not reach significance, but the main effects of glove and of session did. The subjects’ performance improved across sessions and was better when the 0.36-mm gloves were torn than when the 0.64-mm gloves were used. Although the subjects expressed a definite preference for the thinner butyl gloves, they did not consistently choose one cotton liner as being superior to the other. When forced to select the one liner that they preferred, 8 of 12 subjects chose the string-knit version.


Findings are presented from site visits to two operational systems (OUTS and TRACKFINDER), which are predecessors to the objective TRACKWOLF system under development. The purpose of the site visits was to obtain lessons learned, operator workload estimates, and critical high-driver tasks. These data were used as a baseline for comparing operator capabilities and as a precursor to use in TRACKWOLF operational tests. Findings indicated significant frustration with equipment operations and communication capability of OUTS and TRACKFINDER. This was also revealed by a high rating on the workload scale (NASA-Task Load Index) on frustration and temporal demand subfactors. Over 50 per cent of the tasks were judged high workload and difficult cognitive load for operators. Results have been provided to proponent combat developer and trainer personnel.


Current methods of developing user interfaces for IRIS workstation application programs are inefficient. In order to help speed the development of complex graphics programs, IRIS workstation users need a toolkit that will assist in the design and implementation of user interfaces for graphics programs. This project presents the preliminary work on an interface generator for the Silicon Graphics, Inc. IRIS workstation. The NPS Interface Builder (NPS IB) is designed to speed the creation of application programs by allowing a user to define an interface graphically rather than by writing C code. The program provides on-screen editing, facilitated by a number of program features. NPS IB can be used to develop the basic framework of a graphics program, or can be used to enhance the capabilities of an already existing graphics application.

N91-22249# MATRA Espace, Toulouse (France). KNOWLEDGE BASED FRAMEWORK FOR MAN-SYSTEM INTERACTION IN SPACE CONTROL CENTRES FRANCOISE CARRE, PASCAL RICHARD, NATHALIE CARN, and NATHALIE AUSSENAC (Centre National de la Recherche Scientifique, Toulouse, France) In ESA, Ground Data Systems for Spacecraft Control p 373-378 Oct. 1990 Copyright Avail: NTIS HC/MF A99

An object oriented approach used in developing a model of controlled systems, both in spacecraft and in ground segments is discussed. This model is to be used as a kernel for a variety of applications based on artificial intelligence techniques. Operations within a space control center that can be improved by artificial intelligence techniques are outlined. A model based approach for artificial intelligence presupposes emphasis being placed on the knowledge acquisition step. The integration of artificial intelligence techniques in the operational environment is discussed.

N91-22270# Computer Resources International A/S (Denmark). Space Div. THE DESIGN OF ERROR TOLERANT INTERFACES

ERIK HOLLNAGEL In ESA, Ground Data Systems for Spacecraft Control p 511-514 Oct. 1990

The principles involved in the design of Error Tolerant Interfaces (ETI) are outlined. An ETI is characterized as being robust against the deficiencies and inaccuracies of man-machine interaction that may result from temporary capacity reduction of the operator and from impediments of human reliability in general. An ETI is able to absorb and compensate for degraded input and to provide output in a form of presentation which can be interpreted correctly even under suboptimum working conditions. This is significant in the case of work under stressed conditions or high time pressures, on the ground or in orbit, as a countermeasure to the adverse effects of reduced human reliability.


Modern engineering workstation computers, with multiple high resolution color monitors, employing multwindow software to manage the organization of the display, provide an ideal platform for the implementation of spacecraft monitoring and control systems. The prototype Meteosat advanced operations workstation which demonstrates many of the man-machine interface features which such a system can provide, including interactive graphical status displays, is described. The user interface draws together the requirements of the online tasks performed by spacecraft operators and the offline analysis functions performed by spacecraft engineers, enabling a single system to support both classes of user.


The development of progressively more intelligent interactive design aids is described. The first generation of the Computer Human Interaction Models (CHIMES) methodology and toolset identifies problems in an in an ongoing or prospective design. The second generation, CHIMES-2, provides the designer with intelligent assistance in formulating modifications to correct identified problems. The approaches used in development of the CHIMES-2 capabilities and knowledge bases are outlined. Implementation of the phase 1 prototype is described. Future directions include integration with other design tools, implementation of a design library, and further theoretical work. The final objective of the research and development effort is a total workstation environment for the designer of computer human interfaces for spacecraft control.


The software infrastructure developed for the management of the man-machine interface of the Spacecraft Control and Operation System (SCOS) over a network of workstations is described. The software provides multimission facilities for the configuration management of the desktops of user categories, for privileges and activities monitoring and control, for data presentation and
user input interpretation and for handling distributed applications. The facilities ease the implementation integration and operation activities of the man-machine interface designers and application programmers of the spacecraft control systems and guarantee a standard 'look and feel' for end users. ESA

**N91-22284**# Marcel Computer Systems Ltd., Darmstadt (Germany, F.R.).

MSCC CONSOLE DEMONSTRATOR PROJECT
P. Petrelli and M. DREXLER (Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen, Germany, F.R.) In ESA, Ground Data Systems for Spacecraft Control p 597-600 Oct. 1990 Copyright Avail: NTIS HC/MF A99

The Columbus ground data systems will employ a number of new technologies including advanced graphical user interfaces, networked workstations and Ada. Each of these new technologies present new challenges to engineers and managers. In order to reduce the technical risk and to control life cycle costs, a pilot project is proposed to develop a control room demonstration console. The Manned Space Laboratories Control Center (MSCC) console demonstrator is a prototype of the console to be used in the MSCC ground data system during Columbus. It has two-operator positions with access to the existing MSCC voice, video and data facilities. The console workstations are networked to a simulator which will generate telemetry data for display at the Console demonstrator Man Machine Interface (MMI). Development of the MSCC console demonstrator provides important information about the MMI and networking design. It also serves as a testbed for new technologies. ESA

**N91-22712**# Air Force Inst. of Tech., Wright-Patterson AFB, OH. School of Systems and Logistics.


This thesis investigated differences in organizational efficiency and effectiveness for users of graphical user interfaces and text-based interfaces on personal computers in Air Forces offices. Areas of interest included amount of time required to learn the basic system, amount of time required to learn new application, users' ratings of user-friendliness, users' perceptions of the extent that their system help them perform their job, the number of software packages used on the job by users of each system, user satisfaction, responsible authorities' ratings of quality of output, and the relationship between user job experience level and interface used on the job. A literature review revealed no similar studies within the Department of Defense to date. Two populations across two organizations were identified for survey studies within the Department of Defense to date. Two populations across two organizations were identified for survey administration—users of graphical user interfaces and users of text-based interfaces. A total of 700 surveys were out with 454 returned for a response rate of 64.9 percent. The results of the study indicated that for the organizations surveyed, graphical user interfaces offer significant advantages in each of the areas investigated. Finally, the results of the study revealed that less experienced users tend to use graphical interfaces over text-based systems in greater numbers while civilian users were more likely to use text-based systems. GRA

**N91-22713**# Bristol Univ. (England). Dept. of Aerospace Engineering.


Current crew flying helmets are considered unsatisfactory by their users. By circulating a questionnaire among aircrew, a new specification was produced with the emphasis placed on their opinions and wishes. Apart from comfort criteria, fast jet and helicopter aircrew require differing helmet designs. For helicopter aircrew, protection and noise reduction are of greatest importance. Fast jet aircrew require above all a helmet which will not adversely affect their lookout capability either due to bulk, balance, weight, or field of view obstruction. In their opinion, protection is not of paramount importance. Helmet mounted systems are accepted as an operational requirement but present methods are considered unsatisfactory and system integration is a necessity. ESA

**N91-22714**# Tel-Aviv Univ. (Israel). Dept. of Interdisciplinary Studies.

AUTOMATED ANALYSIS OF FOOT-GROUND PRESSURE PATTERNS M.S. Thesis ARIE ROSEN GART Sep. 1988 103 p (ITN-91-85092) Copyright Avail: Tel-Aviv Univ., Exact Sciences Library, Ramat Aviv 69978, Israel

The Footprint instrument, which uses an optical interference sandwich to elucidate underfoot pressure distribution, provides a pictorial representation of the data; a measurement process is needed to determine the load forces numerically. This project aimed to develop a computerized, online image processing system for Footprint instrumental data, and to develop tools for offline analysis of foot ground-pressure (FGP) patterns, as related to foot structure. The processing algorithms were designed with particular attention to computation time economy. The main process implements image processing methods for the measurement of the interference fringes which form the FGP pattern. Appropriate conversion rules enabled these measurements to be translated into force; from the force distribution are computed the parameters which determine the foot-structure characteristics. To avoid the need to locate the centers of the approximately 150 fringes forming the FGP pattern, the system acquires an a priori knowledge of the standing plate and applies it during the measurement process. This approach reduces the measurement time for each pattern below 30 seconds, during which the following parameters are computed: force distribution; total load; load on each foot; contact area; average pressure; longitudinal arch; load and stress ratio for the forefeet and heels; and the points of peak load at the heels (sharpness). A utility program provides offline computation of the following additional parameters: FGP centroid; centroid of each foot or any FGP segment; and average pressure in a selected segment. ISA

**N91-23029**# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.


A visual display was developed for people with substantial hearing loss in either one or both ears. The system consists of three discreet units; an eyeglass assembly for the visual display of the origin or direction of sounds; a stationary general purpose noise alarm; and a noise seeker wand. Author


Advancements in man-machine interfaces and control technologies used in space telerobotics and teleoperators have potential application wherever human operators need to manipulate multi-dimensional spatial relationships. Bilateral six degree-of-freedom position and force cues exchanged between the user and a complex system can broaden and improve the effectiveness of several diverse man-machine interfaces. Author
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SPACE BIOLOGY

Includes exobiology; planetary biology; and extraterrestrial life.

A91-35941* Salk Inst. for Biological Studies, San Diego, CA.
ORIGIN OF FATTY ACID SYNTHESIS - THERMODYNAMICS AND KINETICS OF REACTION PATHWAYS
ARTHUR L. WEBER (Salk Institute for Biological Studies, San Diego, CA). Journal of Molecular Evolution (ISSN 0022-2844), vol. 32, 1991, p. 93-100. refs
Copyright
The primitiveness of contemporary fatty acid biosynthesis was evaluated by using the thermodynamics and kinetics of its component reactions to estimate the extent of its dependence on powerful and selective catalysis by enzymes. Since this analysis indicated that the modern pathway is not primitive because it requires sophisticated enzymatic catalysis, an alternative pathway of primitive fatty acid synthesis is proposed that uses glycolaldehyde as a substrate. In contrast to the modern pathway, this primitive pathway is not dependent on an exogenous source of phosphoanhydride energy. Furthermore, the chemical spontaneity of its reactions suggests that it could have been readily catalyzed by the rudimentary biocatalysts available at an early stage in the origin of life.

A91-35947* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
PREBIOTIC CHEMISTRY IN CLOUDS
VERNE R. OBERBECK (NASA, Ames Research Center, Moffett Field, CA), JOHN MARSHALL (Arizona State University, Tempe), and THOMAS SHEN (SETI Institute, Moffett Field, CA). Journal of Molecular Evolution (ISSN 0022-2844), vol. 32, 1991, p. 296-303. refs
Copyright
The chemical evolution hypothesis of Woese (1979), according to which prebiotic reactions occurred rapidly in droplets in giant atmospheric reflux columns was criticized by Scherer (1985). This paper proposes a mechanism for prebiotic chemistry in clouds that answers Scherer's concerns and supports Woese's hypothesis. According to this mechanism, rapid prebiotic chemical evolution was facilitated on the primordial earth by cycles of condensation and evaporation of cloud drops containing clay condensation nuclei and nonvolatile monomers. For example, amino acids supplied by, or synthesized during entry of meteorites, comets, and interplanetary dust, would have been scavenged by cloud drops containing clay condensation nuclei and would be polymerized within cloud systems during cycles of condensation, freezing, melting, and evaporation of cloud drops.

N91-22715*# National Aeronautics and Space Administration. Washington, DC.
PUBLICATIONS OF THE EXOBIOLOGY PROGRAM FOR 1989: A SPECIAL BIBLIOGRAPHY
(Contract NASW-4324) (NASA-TM-4269; NAS 1.15:4269) Avail: NTIS HC/MF A03 CSCL 06/3
A listing of 1989 publications resulting from research supported by the Exobiology Program is presented. Research supported by the Exobiology Program is explored in the following areas: (1) cosmic evolution of biogenic compounds; (2) prebiotic evolution; (3) early evolution of life; (4) and evolution of advanced life. Pre-mission and pre-project activities supporting these areas are supported in the areas of solar system exploration and search for extraterrestrial intelligence. The planetary protection subject area is included here because of its direct relevance to the Exobiology Program.

N91-22716*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
DEVELOPMENTAL ADAPTATIONS TO GRAVITY IN ANIMALS
ALAN R. HARGENS Feb. 1991 23 p
(NASA-TM-102228; A-89232; NAS 1.15:102228) Avail: NTIS HC/MF A03 CSCL 06/2
Terrestrial animals have adapted to a constant gravitational stress over millions of years. Tissues of the cardiovascular system and lumbar spine in tall species of animals such as the giraffe are particularly well adapted to high and variable vectors of gravitational force. Swelling of the leg tissues in the giraffe is prevented by a variety of physiological mechanisms including (1) a natural 'antigravity suit', (2) impermeable capillaries, (3) arterial-wall hypertrophy, (4) variable blood pressures during normal activity, and (5) a large-capacity lymphatic system. These adaptations, as well as a natural hypertension, maintain blood perfusion to the giraffe's brain. The intervertebral disk is another tissue that is uniquely adapted to gravitational stress. Tall and large terrestrial animals have higher swelling pressures than their smaller or aquatic counterparts. Finally, the meniscus of the rabbit knee provides information on the effects of aging and load-bearing on cartilaginous tissues. Such tissues within the joints of animals are important for load-bearing on Earth; these connective tissues may degenerate during long-duration space flight.

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