

NASA SP-7011 (415)
June 1996

AEROSPACE MEDICINE AND BIOLOGY



A CONTINUING BIBLIOGRAPHY WITH INDEXES



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Introduction

This issue of *Aerospace Medicine and Biology, A Continuing Bibliography with Indexes* (NASA SP-7011) lists 13 reports, articles, and other documents recently announced in the NASA STI Database.

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.

Two indexes—subject and author are included.

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53 Behavioral Sciences 3

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

54 Man/System Technology and Life Support 4

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

55 Space Biology 5

Includes exobiology; planetary biology; and extraterrestrial life.

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Typical Report Citation and Abstract

ON MICROFICHE

- ↓
- ACCESSION NUMBER** → N96-10751# Sandia National Labs., Albuquerque, NM. ← **CORPORATE SOURCE**
- TITLE** → **Minimizing phylogenetic number to find good evolutionary trees**
- AUTHORS** → Goldberg, Leslie Ann; Goldberg, Paul W.; Phillips, Cynthia A.; Sweedyk, Elizabeth (California Univ., Berkeley, CA.); and Warnow, Tandy (Pennsylvania Univ., Philadelphia, PA.) ← **AUTHORS' AFFILIATION**
- PUBLICATION DATE** → 1995 26 p Presented at the 1995 Symposium on Combinatorial Pattern Matching, Helsinki, Finland, 4-7 Jul. 1995 Sponsored by California Legislative Grant
- CONTRACTS/GRANTS** → Contract(s)/Grant(s): (DE-AC04-94AL-85000; NSF CCR-94-57800)
- REPORT NO.(S)** → Report No.(s): (DE95-011893; SAND-95-0831C; CONF-9507123-1) Avail: CASI HC A03/MF A01 ← **AVAILABILITY AND PRICE CODE**
- ABSTRACT** → Inferring phylogenetic trees is a fundamental problem in computational-biology. We present a new objective criterion, the phylogenetic number, for evaluating evolutionary trees for species defined by biomolecular sequences or other qualitative characters. The phylogenetic number of a tree T is the maximum number of times that any given character state arises in T. By contrast, the classical parsimony criterion measures the total number of times that different character states arise in T. We consider the following related problems: finding the tree with minimum phylogenetic number, and computing the phylogenetic number of a given topology in which only the leaves are labeled by species. When the number of states is bounded (as is the case for biomolecular sequence characters), we can solve the second problem in polynomial time. We can also compute a fixed-topology 2-phylogeny (when one exists) for an arbitrary number of states. This algorithm can be used to further distinguish trees that are equal under parsimony. We also consider a number of other related problems.
- SUBJECT TERMS** → DOE
Algorithms; Biological Evolution; Chemical Evolution; Genetics; Molecular Biology

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 415)

JUNE 1996

51 LIFE SCIENCES (GENERAL)

N96-19950 Sandia National Labs., Albuquerque, NM.
**CCEMD: Center for Computational Engineering
Molecular Dynamics: Theory and user's guide. Version
2.2**

Judson, R.; Barsky, D.; Faulkner, T.; McGarragh, D.; Melius, C.; Meza, J.; Mori, E.; Plantenga, T.; and Windemuth, A.;
18 Sep. 1995 51 p Limited Reproducibility: More than
20% of this document may be affected by microfiche quality
Contract(s)/Grant(s): (DE-AC04-94AL-85000)
Report No.(s): (DE96-000869; SAND-95-8258) Avail:
CASI HC A04

CCEMD (Center for Computational Engineering Molecular Dynamics) is a general purpose molecular dynamics program written in the C language, built on top of the MD program of Windemuth and Schulten. CCEMD can perform molecular dynamics, gradient minimization, genetic algorithm-based conformation searching, and ligand-protein docking. This report documents the algorithms used and provides a users' guide for the code.

DOE

C (programming Language); Molecular Dynamics; Optimization;

N96-21198* Cornell Univ., Ithaca, NY.
**Plant Transpiration and its Sensitivity to Increasing CO2
Concentration at Leaf, Canopy and Regional Scales
Ph.D. Thesis**

Zhan, Xiwu; et al 1 Jan. 1995 386 p
Report No.(s): (NIPS-96-34040) Avail: Univ. Microfilms
Order No. DA9511865

This thesis assembles simulation models for plant transpiration and uses these models to investigate the sensitivity of transpiration rates to the elevation of atmospheric CO2 concentration at leaf, canopy, and regional scales. The leaf transpiration model assembly (LTMA) simulates stomatal conductance, leaf net photosynthesis, leaf boundary layer conductance, mass and energy transfer, and leaf energy balance. The stomatal conductance model and the leaf photosynthesis model are selected from two candidate stomatal

models and four candidate biochemical photosynthesis models, based on the comparison of the model results with literature-surveyed observations. Integration of the LTMA for all the leaves within a plant canopy, with the modeled canopy structure, wind speed profile, radiation distribution, and soil surface fluxes, produces a canopy evapotranspiration model assembly (CEMA). Coupling the CEMA with an atmospheric boundary layer model, a larger model assembly (REMA) for simulating the evapotranspiration from a region covered with a homogeneous canopy is obtained. From the outputs of the LTMA, it is found that in response to a doubling of atmospheric CO2 concentration the modeled leaf transpiration rate will be reduced by around -23.0% for C3 plants and -26.6% for C4 plants. The simulated reduction in stomatal conductance resulting from the CO2 doubling is 37.0% for C3 plants and 37.7% for C4 plants. The difference of the responses of stomatal conductance and leaf transpiration to CO2 changes is found to be the results of the leaf boundary layer damping effect and the leaf temperature feedback effect. The CO2 sensitivity of canopy evapotranspiration is found to be smaller still than that of leaf transpiration: the corresponding percentage changes with a CO2 doubling are -15.7% and -16.1% respectively for C3 and C4 canopies. The cause is found to be the extension of the air within the canopy to the leaf boundary layers. The temperature feedback and the water vapor feedback mechanisms between the atmospheric boundary layer and the land surface fluxes produce the result that the percent change with a CO2 doubling for regional evapotranspiration is -8.7% for C3 plants and -13.0% for C4 plants. Implications of the results of the models have been discussed.

Dissert. Abstr.

Biogeochemistry; Canopies (vegetation); Carbon Dioxide Concentration; Environment Models; Evapotranspiration; Plants (botany); Transpiration;

N96-21258*# Search for Extraterrestrial Intelligence Inst., Moffett Field, CA.

Definition of exobiology experiments for future Mars missions Progress Report, 15 Jan. 1995 - 14 Jan. 1996

Mancinelli, Rocco L.; et al 14 Jan. 1996 10 p

Contract(s)/Grant(s): (NCC2-479)
Report No.(s): (NASA-CR-200257; NAS 1.26:200257;
NIPS-96-08795) Avail: CASI HC A02/MF A01

During the past year we have concentrated on two objectives. The first objective is ongoing and is to define the experimental parameters that are necessary to conduct autonomously a mineralogical analysis of the Martian surface in situ using differential thermal analysis coupled with gas chromatography (DTA/GC). The rationale in support of this objective is that proper interpretation of the mineralogical data from the DTA/GC can be used to better describe the present and past environments of Mars, leading to a better assessment of the probability of life evolving on Mars. To meet these objectives we have analyzed a number of samples collected from nature using the DTA/GC. One of the more significant findings was that in samples of desert varnish we detected magnetite and maghemite that may serve as potential biomarkers applicable to DTA/GC analyses of Martian surface material during landed missions. The second objective follows from the first and is to better understand microbe-environment interactions by determining the response of microbes to changes in their environment, including extreme desiccation and solar UV-radiation. The rationale behind this is to develop hypotheses regarding what may have happened to life that may have arose on Mars, and microbial life that may get to the surface of Mars via spacecraft, or meteors from Earth. To accomplish this objective we have exposed microbes, collected from NaCl and gypsum-halite crystals, to the space environment aboard the ESA-German Biopan facility for 15 days. The most significant finding was that these microbes survived the exposure better than others. Derived from text

Aerospace Environments; Exobiology; Extraterrestrial Life; Mars (planet); Mars Surface; Mineralogy; Ultraviolet Radiation;

52 AEROSPACE MEDICINE

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

N96-19917# Bell Telephone Labs., Inc., Murray Hill, NJ.
Progress report for ONR contract N00014-94-C-0015 CDRL A001

Yuste, Rafael; and Tank, David W.; 22 Feb. 1995 5 p
Contract(s)/Grant(s): (N00014-94-C-0015)
Report No.(s): (AD-A299925) Avail: CASI HC A01/MF A01

Our main goal for the next year is to perform optical recordings with single-cell resolution of a population of neurons in the adult cortical slice. These experiments did not work initially because of the failure of calcium indicators

to label populations of adult neurons. Nevertheless, preliminary experiments by us and a number of groups suggest that extracellular injections of dextrans coupled to calcium indicators can be used to label populations of neurons in a variety of Systems. Other possible approaches are the use of calcium indicators with less acetoxymethyl esters or the use of a new generation of voltage-sensitive dyes that can be transported retrogradely or that have much larger signals than previous ones. These different strategies appear to us very promising solutions to the problem.

DTIC

Cerebral Cortex; Medical Science; Neurons; Optical Measurement; Optical Properties; Problem Solving; Signal Processing;

N96-19961# Army Research Inst. of Environmental Medicine, Natick, MA.

Skin blood flow measured by laser-doppler flowmetry and venous occlusion plethysmography: Methodological considerations

Kolka, Margaret A.; and Stephenson, Lou A.; Sep. 1995 35p

Report No.(s): (AD-A300340) Avail: CASI HC A03/MF A01

Cutaneous laser-Doppler flowmetry use includes assessing thermoregulatory effector function and evaluation of clinical and pathologic conditions of the skin circulation. Skin blood flow (SkBF) on the forearm was measured simultaneously by venous occlusion plethysmography (VOP) and laser-Doppler flowmetry (LDF) during leg exercise. Fifteen subjects were studied at $T(a) = 300$ or 350 C for 30 minutes at 50 to 75% peak $V(\text{sub O}_2)$. LDF was measured using the Med Pacific LD6000, the TSI Laserflo(R) BPM403A or Laser flow BPM(sup 2)(R) with no local heating of the forearm. After the initial vasoconstriction with exercise onset, SkBF increased linearly during the exercise transient. During steady-state exercise, a non-linear relationship between LDF and VOP was observed in all experiments as SkBF measured by VOP continued to increase as SkBF measured by LDF became stable. Second order regression coefficients of LDF and VOP data were r greater than or equal to 0.92 for 13 experiments and r greater than or equal to 0.88 for four experiments. These data suggest that LDF may be limited by the anatomically small area for skin blood flow measurement. Alternately, VOP may detect greater arteriolar and resistance vessel vasodilation which occurred later in exercise. These observations are limited to leg exercise under conditions where skin temperature averaged 33-35 C.

DTIC

Aerospace Medicine; Blood Flow; Clinical Medicine; Flow Measurement; Laser Doppler Velocimeters; Occlusion; Plethysmography; Regression Analysis; Skin (anatomy); Vasoconstriction; Vasodilation;

N96-19962# Cambridge Univ., Cambridge (England). Dept. of Experimental Psychology.

Acquisition and processing of information during states of REM sleep and slow-wave sleep Final Report, Sep. 1984 - May 1988

Mollon, J. D.; Oct. 1995 29 p

Contract(s)/Grant(s): (DAJA45-89-M-0125)

Report No.(s): (AD-A300352; ARI-RN-96-01) Avail: CASI HC A03/MF A01

Review, analysis, and summary of experimental literature on 'sleep learning'. Findings include: (1) Serious methodology flaws found in all reported positive results. 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 made for an appropriate experiment; (3) If novel material is presented to the sleeping subject, there is danger that it may interfere with normal nighttime processing of earlier, daytime experiences; and (4) It is possible that external stimuli could be used to prompt and direct information processing during sleep to favor one set of material in preference to others. This could apply to skill learning as well as declarative memory with considerable potential relevance to soldier training.

DTIC

Cognition; Education; Information Processing (biology); Military Operations; Personnel; Rapid Eye Movement State; Sleep; Waves;

N96-20177# Analytic Sciences Corp., San Antonio, TX.

Theoretical studies on short-pulse ocular damage Interim Report, Mar. - Aug. 1994

Wang, Lihong; Aug. 1995 28 p

Contract(s)/Grant(s): (F33615-92-C-0017)

Report No.(s): (AD-A299126; AL/OE-TR-1995-0122)

Avail: CASI HC A03/MF A01

A theoretical analysis has been performed for the phase transitions from liquid to gas on the boundary of a spherical particle, submerged in a fluid such as water or ocular media, that is heated by absorption of sub-nanosecond laser pulses. This analysis was based on the conservation of mass and it utilized the general heat conduction equation for the principle of conservation of energy and the basic hydrodynamic equation for the incompressible fluid for the expression of conservation of momentum.

DTIC

Damage Assessment; Eye (anatomy); Injuries; Phase Transformations; Pulsed Lasers;

N96-20514# Technische Univ., Delft (Netherlands). Faculty of Aerospace Engineering.

Ventilation modelling of the human lung Ph.D. Thesis

Dejongh, F. H. C.; 25 Apr. 1995 205 p

Report No.(s): (PB96-104468; ISBN-90-5623-014-X)

Copyright Avail: CASI HC A10/MF A03

The respiration and ventilation of the human lung has been investigated. After a general introduction in chapter 1, the principles of theoretical lung models are explained in chapter 2. In chapter 3 convection due to pressure differences (caused by muscle action) in the human lung is considered. Chapter 4 deals with the convection-diffusion equation which describes the gas species transport in the lung. High frequency ventilation (far above the physiological frequencies) is considered in chapter 5. In appendix A the detailed construction of lung models is described and examples are given for adult, neonatal, and IRDS lung models following a Weibel or a Hansen-Ampaya structure. Appendix B deals with surfactant, a surface tension reducing agent which covers the alveolar area thereby stabilizing the alveoli. Appendix C gives the background of the mathematical model used to determine, discretize, and solve the convection-diffusion equation. Appendix D gives the computer program listings in FORTRAN 77 of the discretized convection-diffusion equation with the effective diffusion coefficient implemented. Appendix E covers the fractal aspect of the lung.

Derived from text

Air Flow; Biological Models (mathematics); Convection-diffusion Equation; Lungs; Respiration; Ventilation;

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N96-20502# Georgia Inst. of Tech., Atlanta, GA.

Individual differences in the generation and processing of performance feedback Final Report, Jun. 1992 - Oct. 1994

Herold, David M.; Parsons, Charles K.; and Rensvold, Roger B.; Sep. 1995 39 p

Contract(s)/Grant(s): (MDA903-92-K-0107; DA PROJ. B74-F)

Report No.(s): (AD-A299049; ARI-RN-95-46) Avail: CASI HC A03/MF A01

In this paper, we identify domain-specific measures of individual differences in feedback propensities. In a series of studies, we identify the primary dimensions, psychometric characteristics, and construct validation evidence for internal ability, internal propensity, and external propensity for feedback. Confirmatory factor analysis supports the three-dimensional representation. Correlations between the new scales and existing differences of personality are consistent with theoretical predictions. Research that has used the new

scales to predict feedback-related behavior and performance is described. Theoretical and practical extensions of the current work are discussed.

DTIC

Factor Analysis; Human Performance; Psychometrics;

N96-21302*# Battelle Columbus Labs., Mountain View, CA. Aviation Safety Reporting System Program Office.

Airport ramp safety and crew performance issues

Chamberlin, Roy; Drew, Charles; Patten, Marcia; and Matchette, Robert; et al 1 Jan. 1995 7 p Presented at the Eighth International Symposium on Aviation Psychology, OH, United States

Report No.(s): (NASA-CR-200157; NAS 1.26:200157; NIPS-96-06255) Avail: CASI HC A02/MF A01

This study examined 182 ramp operations incident reports from the Aviation Safety Reporting System (ASRS) database, to determine which factors influence ramp operation incidents. It was found that incidents occurred more often during aircraft arrival operations than during departure operations; incidents occurred most often at the gate stop area, less so at the gate entry/exit areas, and least on the ramp fringe areas; and reporters cited fewer incidents when more ground crew were present. The authors offer suggestions for both airline management and flight crews to reduce the rate of ramp incidents.

Author

Aircraft Safety; Airfield Surface Movements; Airline Operations; Flight Crews; Human Performance; Parking; Ramps (structures);

N96-21303*# Battelle Columbus Labs., Mountain View, CA. Aviation Safety Reporting System Program Office.

What ASRS incident data tell about flight crew performance during aircraft malfunctions

Sumwalt, Robert L.; and Watson, Alan W.; et al 1 Jan. 1995 7 p Presented at the Eighth International Symposium on Aviation Psychology, OH, United States

Report No.(s): (NASA-CR-200158; NAS 1.26:200158; NIPS-96-06256) Avail: CASI HC A02/MF A01

This research examined 230 reports in NASA's Aviation Safety Reporting System's (ASRS) database to develop a better understanding of factors that can affect flight crew performance when crew are faced with inflight aircraft malfunctions. Each report was placed into one of two categories, based on severity of the malfunction. Report analysis was then conducted to extract information regarding crew procedural issues, crew communications and situational awareness. A comparison of these crew factors across malfunction type was then performed. This comparison revealed a significant difference in ways that crews dealt with serious malfunctions compared to less serious malfunctions. The authors offer recommendations

toward improving crew performance when faced with inflight aircraft malfunctions. Author

Aviation Psychology; Emergencies; Flight Crews; Flight Safety; Human Performance; Malfunctions;

N96-21347* Indiana State Univ., Terre Haute, IN.

The effect on aircraft positional awareness when taught by a flight simulator versus a special overhead transparency as measured by a student achievement test Ph.D. Thesis

Greenlaw, Byron William; et al 1 Jan. 1993 61 p Report No.(s): (NIPS-96-08947) Avail: Univ. Microfilms Order No. DA9506170

Practices expected to be a part of the cooperating teachers' responsibilities during student teaching can impact the success of the experience for the student teacher. Specialized preparation in supervision is not typically required for cooperating teachers. Seven areas of supervisory practices were identified for this study: orientation; establishing relationships; observation; planning; guiding teaching; supervisory conference; and evaluation. The questions studied were whether perceptions of cooperating and student teachers regarding the cooperating teachers' application of the areas of supervisory practice differed, whether the importance of these areas assigned by the cooperating and student teachers differed, and whether cooperating teachers perceived training in these practices as beneficial. Sixty-seven cooperating teachers and 63 student teachers were surveyed for survey items related to each area of supervisory practice. Chi-square tests were used to analyze the responses of the cooperating and student teachers regarding the application of supervisory practices. Significant differences were found in the frequencies of responses in two areas of supervisory practice, planning and evaluation. No significant differences were found in the remaining five areas.

Dissert. Abstr.

Achievement; Education; Flight Simulators; Motion Perception; Position (location); Psychological Tests; Statistical Tests;

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing. For related information see also 16 Space Transportation.

N96-19968# Naval Aerospace Medical Research Lab., Pensacola, FL.

Performance-based occupational strength testing for candidate Navy pilots/naval flight officers Annual Report, 15 Nov. 1994 - 1 Aug. 1995

Pokorski, T. L.; Meyer, L. G.; Ortel, B. E.; Tant, C. L.; and Horrigan, D. J.; 15 Aug. 1995 91 p

Report No.(s): (AD-A300435) Avail: CASI HC A05/MF A01

Successful operation of aircraft in normal and emergency situations is critical to completing mission requirements as well as to the safety of aircrew and equipment. On average, the upper body strength of females is about 50-60 percent of males. No strength standards are currently in place to assure individuals are capable of actuating foot and hand controls. This study will determine strength critical aircraft tasks, develop criterion tasks that replicate critical tasks and can be used as a screening tool, develop a field screening test battery, and develop a remedial physical conditioning program. Data collected thus far indicate a definite need for this type of research. Results have shown the Navy aviation candidate population is similar to the general population in that significant strength differences were seen between males and females. A screening device has been designed and is being built. Notion analysis data for all critical aviation tasks has been collected. Over 426 subjects have been tested thus far to develop a strength database and another 300 subjects will be tested in the near future. Pending future funding, work will continue in FY96 and products will be transitioned to the fleet as they are finished.

DTIC

Criteria; Flight Safety; Military Aircraft; Military Operations; Mission Planning; Navy; Physical Fitness; Physiological Tests; Pilot Performance;

55 SPACE BIOLOGY

Includes exobiology; planetary biology; and extraterrestrial life.

No abstracts in this category.

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