NASA-CR-188,174

NASA-CR-188174
19910016600

A Reproduced Copy

Reproduced for NASA

by the

Center for AeroSpace Information

(NASA-CR-188174) THE 1989 NASA-ASEE SUMMER FACULTY FELLOWSHIP PROGRAM IN AERONAUTICS AND RESEARCH Final Report (Maryland Univ.) 70 p CSCL 05B

N91-25914 --THRU-- N91-25941 Unclas G3/82 0012590

MARYLAND

Electrical Engineering Department

UNIVERSITY OF MARYLAND, COLLEGE PARK, MD 20742

FINAL REPORT
OF
THE 1989 NASA-ASEE
SUMMER FACULTY FELLOWSHIP PROGRAM
in
AERONAUTICS AND RESEARCH

at

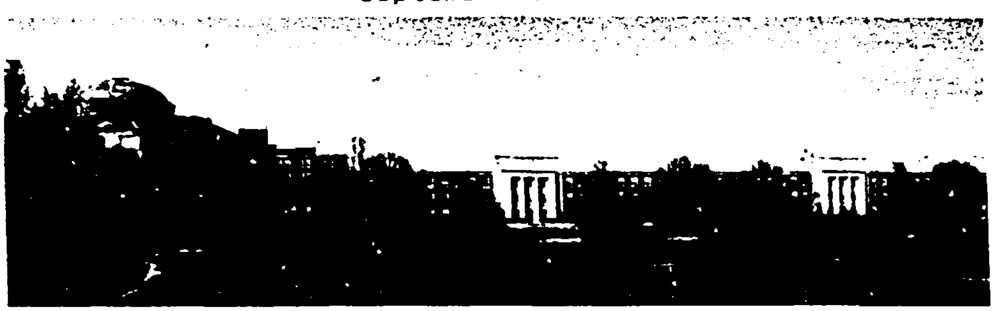
THE GODDARD SPACE FLIGHT CENTER
GREENBELT, MARYLAND

TRAINING GRANT NTG-21-002-254
to
THE UNIVERSITY OF MARYLAND
COLLEGE PARK, MARYLAND

Prepared by
Harold R. Boroson
University of Maryland

in association with
Gerald A. Soffen
Goddard Space Flight Center
and
Dah-Nien (Dan) Fan
Howard University

September 1989



COLLEGE OF ENGINEERING: GLENN L. MARTIN INSTITUTE OF TECHNOLOGY

N91-25914#

FINAL REPORT

OF

THE 1989 NASA-ASEE
SUMMER FACULTY FELLOWSHIP PROGRAM

in

AERONAUTICS AND RESEARCH

at

THE GODDARD SPACE FLIGHT CENTER

GREENBELT,MARYLAND

TRAINING GRANT NTG-21-002-254

to

THE UNIVERSITY OF MARYLAND
COLLEGE PARK, MARYLAND

Prepared by
Harold R.Boroson
University of Maryland

in association with
Gerald A. Soffen
Goddard Space Flight Center
and
Dah-Nien (Dan) Fan
Howard University

September 1989

CONTENTS

Page

APPENDICES

I. SUMMARY

1. General

The 1989 NASA-ASEE Summer Faculty Fellowship Program (SFFP) at the Goddard Space Flight Center (GSFC) was conducted during the ten (10) week period nominally from June 5, 1989 to August 11, 1989. Twenty-six (26) Faculty members participated in this years program. The research projects they pursued had been agreed to prior to their arrivals by means of discussions or telephone conversations with their colleagues. Orientation lectures, tours of GSFC, educational and social activities, and a series of special seminars were established for the Fellows. The University of Maryland (U. OF MD) provided the administrative support for the 1989 program at GSFC under the terms of the NASA Training Grant NTG 21-002-254, with assistance and support from Prof. Fan at Howard University. This summer marked the twenty-first year of participation by the U. OF MD in support of this program.

2. Participants

Fellows' names, ranks, institutions and their 1989 Colleagues at GSFC and Wallops Island are listed in Appendix No.1. Some statistics on this years Summer Faculty Fellows are shown below:

o No. of Invited Returnees from the 1988 SFFP at GSFC	15
o No. of First-year SFFs	11
	26
o No. at GSFC, Greenbelt, MD	24
o No. at Wallops Flight Facility, Wallops Island, VA	2
o No. from local institutions	11
o No. of non-local Fellows	15
o No. from engineering or computer science departments	10
o No. from science or mathematics departments	15
o No. from other departments (Health Services Adm.)	1
o No. from Historically Black Colleges and Universities	6
o No. in Space and Earth Science Directorate	17
o No. in Engineering Directorates	8
o No. in Resource Analysis Office	1

Minority Representation

	Second Year Fellows	First Year Fellows
Female - white	-	-
Female - black	-	-
Female - oriental	-	-
Male - black	2	2
Male - oriental	-	2
Male - hispanic	-	-
Total Minorities	2	4
Total Fellows	15	11

Age Distribution

Age Group	Applicants	First Year Fellows	Second Year Fellows	Total Fellows
26-30	9	3	-	3
31-35	10	1	3	4
36-40	14	2	3	5
41-45	11	2	3	5
46-50	7	1	4	5
51-55	9	-	1	1
56-60	6	2	1	3
61-76	3	-	-	-

Additional statistical data on the Fellows and on the total list of new applications can he found in Appendix 2.

3. Research Productivity

Without exception all of the Fellows and Colleagues who filled out evaluation forms of Appendices 3 and 4, stated that the Summer Faculty Fellowship Program was very successful.Both groups of evaluators stated that the 10 week period for first year Fellows (or even the 20 weeks for the returning second year Fellows) was too short. Most second year Fellows had already established continuing relationships with their colleagues and most of the first year Fellows were rapidly approaching that situation. Many proposals were already in process,and a large percentage of Fellows would continue their NASA research efforts after leaving the program. This continued effort is taking several forms:

- joint colleague-fellow efforts to complete technical papers
- continued research on an informal basis,
- continued research on a project funded basis for the remainder of the summer,
- direct funded hiring for future summers for SFFP alumni,
- candidates for NRC Research Associate positions during faculty sabbaticals,
- consultant,
- one year contract, and
- one NRC/NAS Senior Fellowship - one year.

Some data on this years documented output includes:

- eleven (11) research proposals to NASA have or are to be submitted by SFFS.
- twenty (20) papers or journal articles have been accepted for publication or are being reviewed or finalized
- seven (7) NASA Technical Reports have been completed.
- one Fellow expects to use his summer research in his Ph.D. thesis.
- one Fellow arranged a memo of understanding between GSFC and his university for several projects and as a user site.
- two (2) Fellows have arranged to continue their research on a no cost basis but using NASA loaned equipment
- one Fellow arranged a graduate fellowship for one of his graduate students.
- one fellow has arranged for future summer support outside of the SFFP program.

4. Educational Activities

The educational activities were planned to occupy approximately 10 % of the time that a Fellow spends at the GSFC during the 10 week period of 1989. These activities are listed in Appendix 5 and include:

o. An orientation lecture on the history of GSFC and a discussion of current programs.
o. A guided tour of GSFC for Fellows.
o. Guided tours of GSFC for the families of the Fellows.
o. Invitations to attend regularly scheduled GSFC weekly seminars and other special presentations.
o. Seminars consisting of research presentations by Fellows and some of their colleagues.
o. A presentation on "how to apply to NASA for Grants", by Ms. Genevieve E. Wiseman, University Program Office at GSFC
o. Discussion by Dr. Gerry Soffen on the Graduate Student Research Program and the Research Associate Program.
o. Round Table discussion on other types of NASA appointments/-grant arrangements for faculty members or graduate students.

5. Social Activities

The primary social function was the traditional annual SFFP picnic which was held during the second week of the program. It was sponsored by the Electrical Engineering Department of the University of Maryland. Fellows and Colleagues and their families were invited along with other GSFC personnel who over the past years, had considerable contact with the program, and who had contributed to its success - such as George Abid and Jerry Hodge. Other key NASA and GSFC administrators were invited to enhance the visibility of the SFFP.

Fellows who were interested were provided with identification letters that enabled them to make full use of the U. of Md facilities as visiting faculty members.

Fellows met over bag lunches on Fridays prior to the 1:00 p.m. seminars.

6. Administrative Support

Second Year Fellows

Invitations to return for a second summer were originally sent to seventeen (17) of the eighteen (18) 1988 First Year Fellows. One had already dropped out of the program during the 1988 summer due to personal reasons. Fifteen (15) of the remaining seventeen (17) 1988 First Year Fellows accepted the offers. One offer was also made to a 1987 First Year Fellow who had re-applied, but at the last minute he had to decline the offer.

First Year Fellows

The U. OF MD received sixty-nine (69) first year applications.

Of the applications received, 48 had indicated GSFC as their first choice. The ratio of applications (69) for first year appointments to the number of awards (11) was 6.3. The next table presents the application data For the past 10 years.

APPLICATIONS

Year	GSFC First Choice	GSFC Second Choice
1989	48	21
1988	59	85
1987	68	105
1986	71	102
1985	69	110
1984	78	132
1983	92	144
1982	102	73
1981	54	81
1980	48	108
1979	66	84
1978	56	84

All eleven (11) of the selected Firstyear Fellows came from the group who had picked GSFC as their first choice.

The pertinent data from each application was entered into a spread sheet format as received.

Full copies of the spread sheets were then sent to all of the Directorates. A full set of all applications was available in the GSFC co-directors office for anyone to peruse. Potential colleagues were selected within each organization and these individuals telephoned any applicant they thought would make a productive match. The Directorates then prioritized their selections (paired with a colleague) and returned this list to the co-directors. The co-directors allocated slots to the requesting Directorates based upon such factors as the size of each Directorate, the numbers of returning or Second Year Fellows already assigned, minority participation, and current project priorities. An overall GSFC first priority list of ten (10) men and one (1) woman (of five that applied) was then assembled along with several backup selections. Each selected applicant was phoned by the university co-director to obtain an informal acceptance prior to the issuance of a Formal offer letter. Any GSFC selectees who had not indicated GSFC as their first choice were not phoned without first checking with their first choice center to minimize inter-center competition. Once the original twenty-six positions were informally filled, selection letters were mailed out on March 5, 1989. Also letters of regret were sent to most of the remaining applicants. These letters did include a faint hope clause in case some of the original selectees changed their minds. A few of the back-up choices did not receive any letter at that time, and several of these individuals did in fact receive formal offer letters as earlier selectees did decline. Regret letters were finally sent out to the remaining stand-by applic a n t s after the 26 selections had been completed.

Housing

Housing assistance was again a difficult problem. Assistance was obtained from the Math, Physical Science & Engineering Division office at the U. OF MD where a list is kept of Maryland personnel who wish to rent out their homes or apartments for the summer. Their listing included the names of four appartment complexes who provided short term rentals. One of these turned out to be very reasonable and satisfactory. All of this information, ads from the Washington Post and three separate "Appartment Finders Guides" were sent to all Fellows who indicated a need for housing. Copies of maps of the area were also furnished so that subdivision names could be located. Lists of Fellows and their home phone numbers were supplied to all Fellows since some had indicated a desire to share accommodations.

Information Packet

A 40 page Information-Packet on the SFFP at GSFC was handed to each of the Fellows as they arrived. The packet also included a letter to the colleague (see appendix 6) along with invitations to the picnic, and a NASA-ASEE brochure for the colleague. Fellows were each given the latest NASA Research and Technology Report and a copy of the new NASA-ASEE color brochure.

Stipend Payment and Travel Reimbursement

Checks, for forty percent (40%) of the total stipend for the summer, were delivered to all but two late arriving Fellows by June 8, 1989. A second check for forty percent (40) was distributed by June 30,1989. The remaining twenty percent (20%) was paid on the Fellows last day of participation. Only one round-trip was authorized between GSFC and the home institution for non-local Fellows. Travel costs between Wallops Island and GSFC that were required by the program were also authorized for the Fellows assigned to Wallops Island. Relocation allowances were paid to those Fellows residing more than fifty (50) miles from GSFC.

Interviews and On-Site Visits

The GSFC co-director met with first year Fellows at least once, individually, during the 10 week period. The university co-director met most of the Fellows at the main gate as they arrived. He made informal routine or drop in visits at their work sites and was available to all Fellows, in an office at GSFC, to handle problems, travel claims etc.

Program Evaluation

SFFs at Goddard were required to fill out a three page evaluation questionnaire covering 15 items. Some of the information derived from these questionnaires has been incorporated into this report. Colleagues were also asked to evaluate their Fellows on an evaluation form that was distributed in mid-July. On July 19, 1989 an additional evaluation was received from ASEE. All of the Fellows were able to complete these forms prior to their departures. Fellows were given the option of having their NASA-ASEE certificates mailed to them via their University Administrators, or to accept them directly. Most of the Fellows chose the second option.

8. <u>Recommendations</u>

a. Hold a prospective colleague meeting prior to the arrival of the Fellows to explain the goals and procedures of the program.
b. Encourage colleagues to send more reports and data to Fellows considerably in advance of their reporting dates.
c. Provide more attention to new Fellows, introduce them to other NASA researchers, secretaries and technicians. Explain locked key arrangements and computer resources. Consider PC rentals for work areas that are short of computers. Explain NASA organizational structure and indicate areas of GSFC doing similar work.
d. Make an effort to have more colleagues participate in the weekly seminars.
e. Encourage the Engineering Directorates to take a more visible position in the program and to establish a listing of research needs prior to the time the co-directors try to match applicants with positions.
f. Extend the program to twelve (12) weeks.
g. Provide Fellows with mailing addresses and phone numbers in May.
h. Improve housing assistance, use of "Apartment Finder", and try to co-locate Fellows.
i. Suggest "3rd year" Fellows to NASA H.Q. and ASEE.
j. Bring in outside speakers.
k. Provide Fellows with schedules of regular GSFC seminars.
l. Provide a typist for the Fellows for the 10-week period.
m. Increase the social program.
o. Produce a brochure for GSFC on all types of high school, college, graduate school, and faculty employment possibilities.

II. RESEARCH REPORTS

The twenty-six (26) Fellows prepared twenty-seven work summaries (one worked on two distinctly separate projects).The research reported on in the following summaries may be documented elsewhere in reports, journal articles, and/or papers presented at appropriate meetings.

N91

25915

UNCLAS

N91-25915

Work Summary
1989 NASA/ASEE Summer Faculty Fellowship Program
NASA/Goddard Space Flight Center

Infrared/Submillimeter Optical Properties Data Base

Phillip W. Alley
Department of Physics and Astronomy
SUNY at Geneseo
Geneseo, NY 14454

NASA Colleague
James B. Heaney
Code 717.1
Optics Research Section

This second summer's project was a continuation of the previous summer project. The general goal remained to build a data base containing optical properties, such as reflectance, transmittance, refractive index, in the far infrared to submillimeter wavelength region. This data base would be limited to selected crystalline materials and temperatures between 300K and 2K. The selected materials were: the fluorides of barium, calcium, lithium, lead, and strontium; the bromides of potassium and thallium; the carbides of silicon and tungsten; and the materials of KRS5, KRS6, diamond, and sapphire.

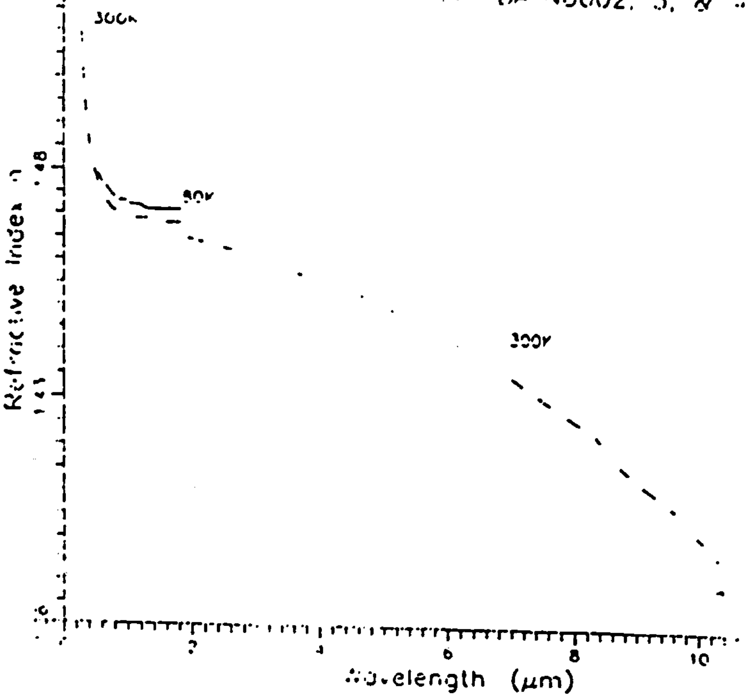
Last summer, barium fluoride was selected as prototype material for building the data base. This summer the literature search, preparation of the data for barium fluoride was completed. In addition the literature search for data related to the compounds mentioned above was completed. The current status is that barium fluoride is in a form suitable for a NASA internal publication. The papers containing the data on the other materials have been xeroxed and they are ready to be reduced.

On the reverse side, the top figure is a sample combination of data for the index of refraction at 300 K. The lower figure shows the transmittance vs wavelength at 300 K and 80 K. These figures are a sample of many which have been developed.

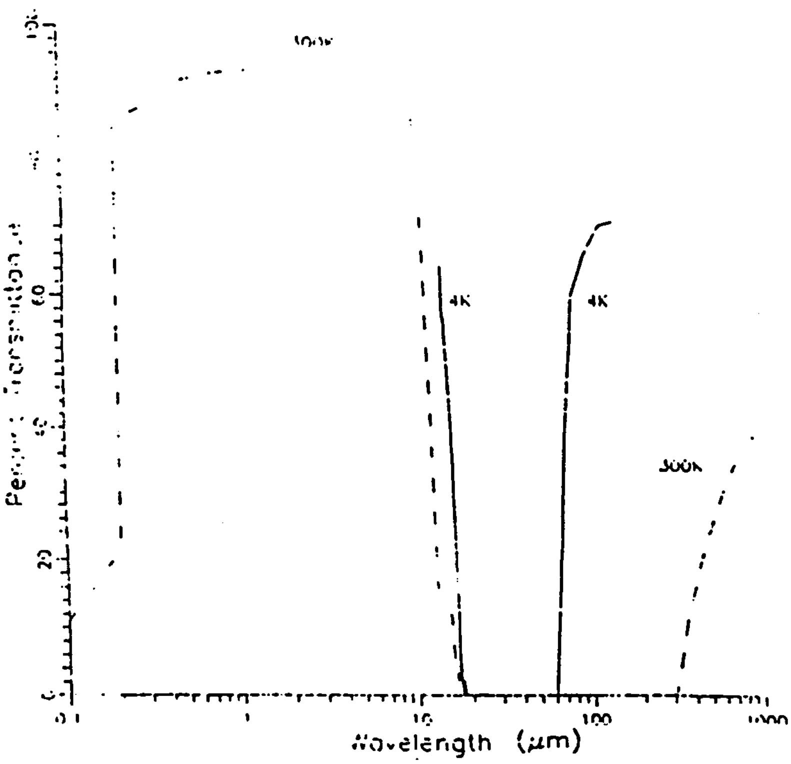
Since barium fluoride has been studied more than most of the materials listed above, it is clear that additional measurements should be made to "fill in" the gaps present in both temperature and wavelength data. This information is of particular interest to those designing or using apparatus operating in the wavelength region from the far infrared to submillimeter.

Last summer's work was used to aid in obtaining RTOP funding for to start investigating the properties of the above mentioned materials.

Barium Fluoride Index of Refraction
300K Dashed 80K Solid
Files BAFN0002, 3, & 4



Barium Fluoride Transmittance
300K dashed 4K solid
Files BAFT300 & BAFT0004



N91

25916

UNCLAS

N91-25916

Work Summary of the 1989 Summer Faculty
Fellowship Program Performed at Goddard Space Flight Center

Mass Balance Investigation of Alpine Glaciers Through Landsat TM Data

Klaus J. Bayr
Department of Geography
Keene State College
Keene, New Hampshire 03431

NASA Colleague: Dr. Dorothy Hall, Code 624

An analysis of Landsat Thematic Mapper (TM) data of the Pasterze Glacier and the Kleines Fleisskees in the Austrian Alps was undertaken and compared with meteorological data of nearby weather stations. Alpine or valley glaciers can be used to study regional and worldwide climate changes. Alpine glaciers respond relatively fast to a warming or cooling trend in temperature through an advance or a retreat of the terminus. In addition, the mass balance of the glacier is being affected.

Last year two TM scenes of the Pasterze Glacier of August 1984 and August 1986 were used to study the difference in reflectance. This year - in addition to the scenes from last year - one MSS scene of August 1976 and a TM scene from 1988 were examined for both the Pasterze Glacier and the Kleines Fleisskees. During the overpass of the Landsat on August 6,1988 ground truthing on the Pasterze Glacier was undertaken by myself. The results indicate that there was considerable more reflectance in 1976 and 1984 than in 1986 and 1988. The climatological data of the weather stations Sonnblick and Rudolfshuette were examined and compared with the results found through the Landsat data. There were relations between the meteorological and Landsat data: the average temperature over the last 100 years showed an increase of .4 degrees Centigrade, the snowfall was declining during the same time period but the overall precipitation did not reveal any significant change over the same period. With the use of an interactive image analysis computer, the Landsat scenes were studied. The terminus of the Pasterze Glacier retreated 348 m and the terminus of the Kleines Fleisskees 121 m since 1965.

This approach using Landsat MSS and TM digital data in conjunction with meteorological data can be effectively used to monitor regional and worldwide climate changes. A paper on the findings was prepared for publication.

ORIGINAL PAGE IS
OF POOR QUALITY

N91

25917

UNCLAS

N91-25917

Work Summary

1989 NASA/ASEE Summer Faculty Fellowship Program
NASA Goddard Space Flight Center

Monte Carlo Simulation of Particle Acceleration at Astrophysical Shocks

Roy K. Campbell
Department of Physics
Southwestern Adventist College
Keene, Texas 76059

NASA Colleague
Frank C. Jones
Laboratory for High Energy Astrophysics

'Particle acceleration is one of the most important topics in plasma and cosmic-ray physics'[1]

We have developed a Monte Carlo code for the simulation of particle acceleration at astrophysical shocks. The code is implemented in Turbo Pascal on a PC. It is modularized and structured in such a way that modification and maintenence are relatively painless.

Monte Carlo simulations of particle acceleration at shocks follow the trajectories of individual particles as they scatter repeatedly across the shock front, gaining energy with each crossing.[2] The particles are assumed to scatter from magnetohydrodynamic (MHD) turbulence on both sides of the shock. A scattering law is used which is related to the assumed form of the turbulence, and the particle and shock parameters. High energy cosmic ray spectra derived from Monte Carlo simulations have the observed power law behavior just as the spectra derived from analytic calculations based on a diffusion equation. This high energy result is not sensitive to the scattering law used. In contrast with Monte Carlo calculations diffusive calculations rely on the initial injection of supra-thermal particles into the shock environment. Monte Carlo simulations are the only known way to describe the extraction of particles directly from the thermal pool.[3] This has been the triumph of the Monte Carlo approach.

The question of acceleration efficiency is an important one in the shock acceleration game. Are supernova shock waves efficient enough to account for the observed flux of high energy galactic cosmic rays? The efficiency of the acceleration process depends on the thermal particle pick-up and hence the low energy scattering in detail. One of the goals of this work is the self-consistent derivation of the accelerated particle spectra and the MHD turbulence spectra. Presumably the upstream turbulence, which scatters the particles so they can be accelerated, is excited by the streaming accelerated particles and the needed downstream turbulence is convected from the upstream region. We plan to modify the present code to include a better description of particle scattering (pitch-angle instead of hard-sphere) and an iterative procedure for treating the self-excitation of the MHD turbulence.

[1] Terasawa, A., and M. Scholer, *Science, 244*, 1050 (1989).
[2] Ellison, D.C., F.C. Jones, and D. Eichler, *J. Geophys., 50*, 110 (1981).
[3] Forman, M.A., and G.M. Webb, *Geophys. Monographs, 34*, 91 (1985).

N91

25918

UNCLAS

N91-25918

Work Summary of the 1989 Summer Faculty Fellowship Program Performed at Goddard Spaceflight Center

Transportable Telemetry Workstation

Aaron S. Collins
Department of Electrical and Computer Engineering
Clemson University
Clemson,SC 29634

NASA Colleague: James Chesney, Code 521

The goal for the summer's effort was to complete the design of a prototype for a Transportable Telemetry Workstation. The Macintosh II is used to provide a low-cost system which can house real-time cards mounted in the NuBus inside the Macintosh II plus provide a standardized User Interface on the Macintosh II console. Prior to a telemetry run, the User will be able to configure his real-time telemetry processing functions from the Macintosh II console. During a telemetry run, the real-time cards will store his telemetry data directly on a hard disk while permitting him to view the data on the Macintosh II console in various selectable formats. The User will view the cards in terms of the functions they perform and the selectable paths through the cards; he will not be required to become involved directly in hardware issues except in terms of the functional configuration of the system components.

The TTW will accept telemetry data from an RS422 serial input data bus, pass it through a frame synchronizer card and on to a real time controller card via a telemetry backplane bus. The controller card will then route the data to a hard disk through a SCSI interface, and/or to a User Interface on the Macintosh II console by way of the Macintosh II NuBus. The three major components to be designed, therefore, are the TTW Controller Card, the TTW Synchronizer Card, and the NuBus/Macintosh II User Interface.

Both the TTW Controller Card and the TTW Synchronizer Card have a mezzanine which contains a Motorola MC68020 microprocessor along with 256K bytes of RAM, an RS232 interface, and a boot ROM for the real-time operating system, PDOS, along with application software. The Synchronizer Card also contains several custom VLSI telemetry processing chips which were developed at Goddard, and the card has the ability to output its processed data over one of three 9-bit telemetry busses. The three 9-bit telemetry busses are part of a 120-pin telemetry backplane which interconnects the NuBus cards. This will permit other cards to be added in the future with considerable flexibility in their interconnections.

Design and prototyping of this state-of-the-art, transportable, low-cost, easy-to-use multiprocessor telemetry system is continuing. Other functions are planned for the future.

N91

25919

UNCLAS

N91-25919

Work Summary of the 1988 Summer Faculty Fellowship Program Performed at Goddard Spaceflight Center

Continental Shelf Fish Production Estimation from CZCS Chlorophyll Data

Richard L. Iverson
Department of Oceanograhpy
Florida State University
Tallahassee, Florida 32306

NASA Colleague: Dr. Wayne Esaias, Code 671

A method for ocean fish production estimation was proposed for development. The method was to use data acquired with the Coastal Zone Color Scanner, and now processed into chlorophyll concentrations by the GSFC Ocean Sciences Division, in combination with fish production and primary production data acquired from different ocean areas. A linear relation eixits between annual fish production and annual phytoplankton carbon production for a wide range of coastal ocean environments. Therefore I proposed to explore the use of several exisiting algorithms which relate primary production to CZCS chlorophyll data as input to the fish production regression model.

A equation relating phytoplankton production to CZCS chlorophyll was obtained by Eppley (1984) using chlorophyll data obtained from field samples, equivalent to chlorophyll data obtained from CZCS imagery, and primary production data obtained from ship-board observations in a wide variety of coastal and open ocean environments. This equation was modified with additional data and was successfully tested by us using CZCS data and field chlorophyll and phytoplankton production data obtained from northeastern North American continental shelf waters and Atlantic open ocean waters. The equation estimated phytoplankton annual carbon production levels observed in coastal waters of northeastern North America. The modified Eppley(1984) relation also estimated phytoplankton annual carbon production in the Sargasso Sea within the confidence limits of a mean value obtained from ship-board time-series observations. This substantiates the use of the Eppley (1984) equation for oceanic waters that provide about 90 % of total ocean primary production.

The modfied Eppley production formula applied to CZCS chlorophyll data obtained from several northeastern North American coastal environments gave phytoplankton annual carbon production values similar to the values used in the fish production regression equation. This suggests that CZCS chlorophyll data can be used to estimate annual fish production in coastal ocean environments.

N91

25920

UNCLAS

N91-25920

WORK SUMMARY
1989 NASA/ASEE Summer Faculty Fellowship Program
NASA/GSFC
"Low temperature Measurement of the
Vapor Pressures of Planetary Molecules."

George F. Kraus
Biology & Physical Science Department
Charles County Community College
LaPlata, Md. 20646

NASA Colleague
John E. Allen, Code 691
Laboratory for Extraterrestrial Physics

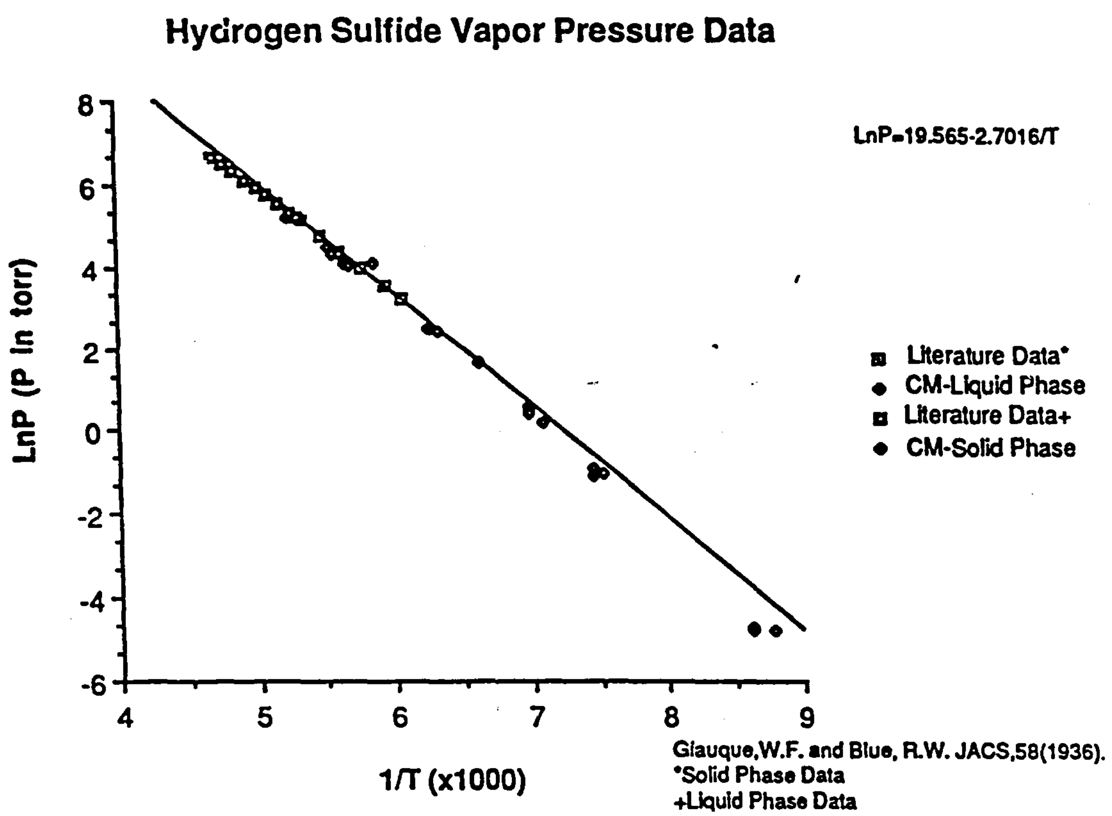
Interpretation of planetary observations and proper modeling of planetary atmospheres are critically dependent upon accurate laboratory data for the chemical and physical properties of the constituents of the atmospheres. It is important that these data are taken over the appropriate range of parameters such as temperature, pressure, and composition.

Availability of accurate, laboratory data for vapor pressures and equilibrium constants of condensed species at low temperatures is essential for photochemical and cloud models of the atmospheres of the outer planets. In the absence of such data, modelers have no choice but to assume values based on an educated guess. In those cases where higher temperature data are available, a standard procedure is to extrapolate these points to the lower temperatures using the Clausius-Clapeyron equation.

Last summer we measured the vapor pressures of acetylene (C_2H_2), hydrogen cyanide (HCN), and cyanoacetylene (HC_3N) using two different methods. At the higher temperatures we used 1 torr and 10 torr capacitance manometers. To measure very low (about 10^{-7} torr) pressures we used a novel technique which is based on the infrared absorption of thin films(TFIR). (See 1988 summary for details).

This summer we measured the vapor pressure of acetylene using the TFIR method. We measured the vapor pressure of hydrogen sulfide (H_2S) using capacitance manometers.

Our results for H_2S agree with literature data over the common range of temperature. At the lower temperatures our data lie slightly below the values predicted by extrapolation of the Clausius-Clapeyron equation. Our thin film infrared (TFIR) data for acetylene lie significantly below the values predicted by extrapolation. We hope to bridge the gap between the low end of our CM data and the upper end of our TFIR data (about 10^{-4} to 10^{-6} torr) in the future using a new spinning rotor gauge.


Hydrogen Sulfide Vapor Pressure Data
LnP=19.565-2.7016/T
Literature Data*
CM-Liquid Phase
Literature Data+
CM-Solid Phase
LnP (P in torr)
8
6
4
2
0
-2
-4
-6
4
5
6
7
8
9
1/T (x1000)
Giauque,W.F. and Blue, R.W. JACS,58(1936).
*Solid Phase Data
+Liquid Phase Data

N91
25921
UNCLAS

N91-25921

Work Summary of the 1989 Summer Faculty
Fellowship Program Performed at Goddard Space Flight Center

Ecological Applications of High Resolution Spectrometry

William T. Lawrence
Terrestrial Ecology Division
Center for Energy & Environment Research
GPO Box 3682, Univ. Puerto Rico
San Juan, PR 00936
NASA Colleague: Dr. James Smith, Code 623

Future directions of NASA's space program plans include a significant effort at studying our planet as a system of interrelated ecosystems. As part of NASA's Earth Observing System (Eos) Program a series of space platforms will be launched and operated to study the earth with a variety of active and passive instruments.

Several of the Eos instruments [ie HIRIS, MODIS] will be capable of imaging the planet's surface reflectance in a large number of very narrow portions (or bands) of the solar spectrum. After the development of appropriate algorithms, this reflectance information will be used to determine key parameters about the structure and function of terrestrial and aquatic ecosystems and the pattern and processes of those systems across large areas of the globe. My interests lie in the ecological and global change-related aspects of applications of these instruments.

The collaborative work I have started at NASA Goddard is focussed on developing algorithms applicable to terrestrial systems that will permit the inference of ecological processes from high resolution spectrometry data, similar to that to be forthcoming from the Eos mission. The first summer was spent working with tropical soils and relating their reflectance characteristics to particle size, iron content, and color. I also began work on the reflectance characteristics of the same soils as suspended sediment, with the idea of using this data to not only quantify the concentration, but also the source of erosion with remotely-sensed reflectance data.

This summer I have switched my emphasis to vegetation and have begun working with the Forest Ecosystem Dynamics Project in the Earth Resources Branch where both optical and radar characteristics of a mixed conifer/hardwood forest in Maine are being studied for use in an ecological modeling effort. A major series of aircraft overflights will take place throughout the summer. My part in this project includes use of laboratory and field spectrometers to measure the spectral reflectance of a hierarchy of vegetation from individual leaves to whole canopies for eventual modeling of their nutrient content using reflectance data. I hope to be able to approximate key leaf/canopy parameters including chlorophyll, nitrogen, phosphorus, water content, and leaf specific weight using high resolution spectrometry alone. I will also make measurements of carbon exchange across the landscape for input to a spatial modeling effort to gauge production within the forest. A Geographic Information System approach will be used to associate these data, images and other collateral information for the forest into a database with a common projection suitable for spatial modeling. In early July I travelled to Maine to both familiarize myself with the study sites and acquire initial data on vegetation nutrient contents at peak season. This data will be compared with like data collected in early September at the time of the radar and optical measurements of the forest canopy to give an idea of the seasonal change in the canopy.

N91
25922
UNCLAS

N91-25922

Work Summary of the 1989 Summer Faculty
Fellowship Program Performed at the Wallops Flight Facility
of the Goddard Space Flight Center

Land Altimetry using Satellite Data from the GEOSAT Sea Altimeter

Philip E. Luft
Department of Mathematical Sciences
Salisbury State University
Salisbury, Maryland 21801

NASA Colleague: Chester L. Parsons, Code 672.0

This work proposes and assesses several techniques for performing land altimetry with data from the GEOSAT sea altimeter, and recommends changes in future RADAR altimeters. Please refer to the report of work done in the summer of 1988, which this continues.

(1) The first technique tried was to cross-correlate each waveform with the preceding one. Then the position giving the maximum correlation was taken as the correct placement of the new waveform in its data window. The resulting altitude profile was slightly more variable than that of the on-board tracker over flat rock (Salar de Uyuni), so apparently successive (average) waveforms are too dissimilar to correlate.

(2) When cross-correlation failed, I tried to compensate for averaging. Raw waveforms are averaged in groups of 100 and it is these average waveforms which are available for ground processing. But while the 100 are being received, the window position is moved in time, at different constant rates for the first 50 and last 50. Assuming an unchanging waveform and a single window rate for the 100, I deconvolved to obtain first and last waveforms. Averaging their half-height arrival times gave an altitude profile similar to the median (5) and centroid (6) methods below. The variability of *this* altitude profile suggests that even raw waveforms in a group of 100 may be too dissimilar to correlate.

In other techniques, the pulse was judged to have arrived when one of these criteria was met:

(3) The wave amplitude meets a certain absolute *threshold*.
(4) The wave amplitude meets a certain relative threshold.
(5) A certain fraction of the *area* of the waveform has passed.
(6) The *centroid* of the waveform has passed.

(Methods (5) and (6) were applied after truncating background noise front and rear.) All methods gave altitude profiles at least as variable as the on-board tracker, and all were biased at least 0.5 meter to low altitudes, except the threshold detector. The threshold detector can be filtered spatially (along the ground track) to resemble the on-board tracker, and perhaps it could be implemented without feedback.

For operating over land, I recommend changes in future altimeters:

(a) The window should not move while raw waveforms are being averaged.
(b) Some of the raw waveforms should be telemetered to earth for study.
(c) Placing the waveform in the window should allow for shape variety.
(d) Some form of threshold detector might be used to find the signal and place it.

N91

25923

UNCLAS

N91-25923

WORK SUMMARY OF THE 1989 SUMMER FACULTY

Fellowship Program Performed at Goddard Space Flight

Center

Image Data Compression Investigation

Carlos Myrie
Department of Electrical Engineering
Morgan State University
Baltimore, MD 21239

NASA Colleague: Dr. James Tilton, Code 636

Nasa continuous communications system growth has increased the demand for image transmission and storage. My summer assignment involved conducting research and analysis on various lossy and lossless advanced data compression techniques or approaches used to improve the efficiency of transmission and storage of high volume satellite image data such as pulse code modulation (PCM), differential PCM (DPCM), transform coding, hybrid coding, interframe coding and adaptive technique. In this presentation, I will review the fundamentals of image data compression utilizing two techniques which are pulse code modulation (PCM) and differential PCM (DPCM) along with an application utilizing these two coding techniques.

N91
25924
UNCLAS

N91-25924

Work Summary
1989 NASA/ASEE Summer Faculty Fellowship Program
NASA/Goddard Space Flight Center

"Nitrogen Abundances from UV Lines of HgMn and Standard Late-B Stars"

Dr. Scott W. Roby
Dept. of Earth Sciences
S.U.N.Y. College at Oswego
Oswego, NY 13126

NASA Research Colleague:
Dr. David S. Leckrone, Code 681
Laboratory for Astronomy
& Solar Physics

A recent survey by Roby (1987) discovered that the relatively weak, high excitation lines of N I near 7468 and 8680Å were undetectable in the majority of HgMn stars (one type of the chemically-peculiar Ap stars), leading to upper limits on the N abundance of roughly ten times below that of the solar N abundance. Standard stars with similar temperatures (10,000-13,000K) did exhibit these same N I lines and were found to have roughly solar N abundances.

Our project for this summer (continuing from last summer) was to redetermine N abundances in two HgMn stars and four standard stars using the strong, low excitation lines of N I found in the ultraviolet. The observational data consisted of high quality, high resolution, co-added International Ultraviolet Explorer spectra which had been previously collected and reduced by D. Leckrone and S. Adelman.

Examination of the spectra plus considerations of signal/noise and severe line blending led to the choice of three promising N I lines located at 1742.7, 1745.3, and 1411.9Å. The atomic data for these lines (*gf* values, radiative damping, and Stark broadening) were calculated last summer using the best laboratory measurements found in a search of the relevant literature.

The chosen N lines turned out to be blended significantly with Fe II lines (blending is so severe in the UV that a typical "single" feature contains, on the average, three atomic lines). To obtain the abundances for N we computed synthetic spectra to match the observed spectra. The synthetic spectra were calculated using line-blanketed model atmospheres, stellar parameters, and abundances for the other elements based upon previous work by S. Adelman. The N abundance was then adjusted to give the best fit of the observed line profiles. In the 2 HgMn stars, we again find the N I lines to be undetectable, but the stronger intrinsic strength of the new lines yield more stringent upper limits than those obtained previously.

The following changes and improvements were made to the project started last summer. Model atmospheres and abundances were updated in two stars where new results had been reported. An additional N I line and an additional standard star were added to the program. More care was given to the placement of the continuum, including the tentative identification of 2 suspected lines of Fe II (not contained in our previous linelists). A line opacity model was developed for a missing feature adjacent to the N I line at 1745.2Å, leading to a 25% improvement in the N abundance determined from this line.

Figure 1 shows the N I fit at 1745.2Å for the standard star, Theta Leo. The solid line shows the observed spectrum, the overlapping dashed line shows the best fit N I abundance, and the dotted line (where the N I abundance has been increased by a factor of 2, or 0.3 dex in log abundance) shows the sensitivity of the fit. In Fig. 2 we see that the same N I line is totally absent in the HgMn star, Iota CrB and only the Fe II blending feature remains. The solid line again represents the observed spectrum, while the three dashed lines from top to bottom represent, respectively, a calculation with no N I present, our new, formal upper limit to the N I abundance assuming a noise level of 2 %, and the previous N I result by Roby(1987).

The resulting N abundances are listed in Table 1 (the 1411.9Å N I abundances are not yet finished) and are on a logarithmic scale relative to the total abundance of all elements which is defined as zero. The log solar abundance of N/Total is -4.05. Thus we find that N is typically depleted by at least factors of 200-660 in the HgMn stars and by roughly 8 times in the standard stars, relative to the sun. The first result agrees with an earlier speculation by Roby that upward diffusion together with a modest stellar wind may totally deplete the surface N in HgMn stars. The second result is a surprise and and suggests the possibilities of non-LTE effects and/or diffusion processes in the standard stars, and we are still considering its implications. If non-LTE effects are present, the effect on both sets of stars should be similar and so we can still conclude that the N in the HgMn stars is at least depleted by factors of 25-85 relative to the standard stars.

Table 1: 1740 N I Abundances compared with other studies

	Current study		Roby, 1987		
	N I	N I	N I(IR)	N I(IR)	N I(IR)
Star	1742.7	1745.2	Roby[a]	Roby	Sadakane
Standard stars					
21 Aql	-4.60	-4.70	-3.94	-3.92	x
Theta Leo	-4.80	-5.20	-4.19	-4.04	-4.25
Pi Cet	-5.40	(-4.60)[b]	-4.40	-4.32	x
Nu Cap	-5.40	-5.05	X	X	x
o Peg	-4.55	-4.35	X	X	-3.65
HgMn Stars					
Kappa Cnc	<-6.50	<-6.20	<-5.19	<-5.02	x
I Crb	<-7.00	<-6.75	(-4.72)[c]	(-4.62)[c]	x

[a] Roby abundances adjusted to temperatures, gravitite, and microturbulence of Adelman models.

[b] Wavelength is shifted by unknown feature, abund. might not be right.

[c] The weak lines seen at 8680Å are most likely due to the secondary star in this binary system, as the UV lines do not show up at all.

Fig. 1

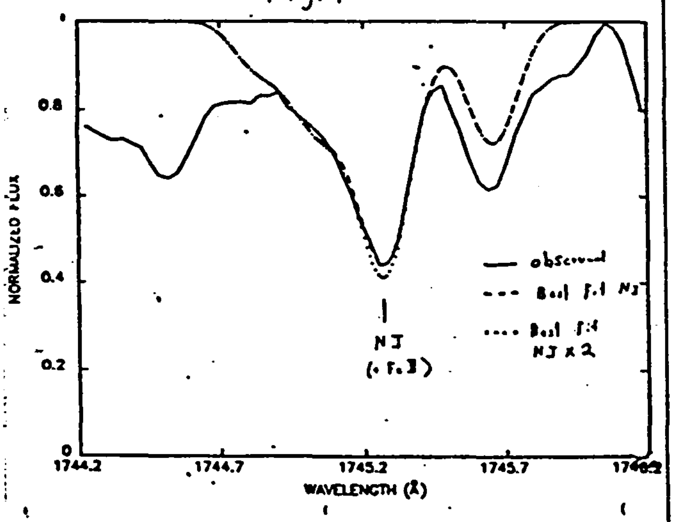
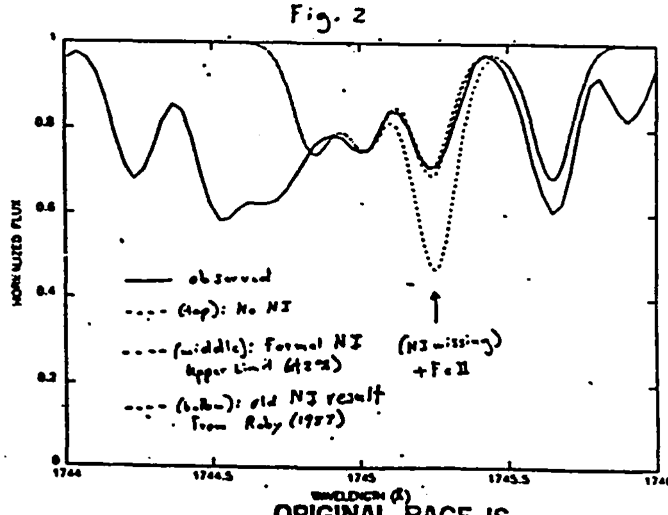


Fig. 2



N91
25925
UNCLAS

N91-25925

Work Summary of the 1989 Summer Faculty Fellowship Program
Performed at
NASA-Wallops Flight Facility

Spectral Calibration Analysis of the Airborne Oceanographic Lidar

Carlton E. Rousey, Ph.D.
Department of Physics
Murray State College
Tishomingo, Okla. 73460

NASA Colleague: Dr. Frank E. Hoge, Code 672

This second year work is based upon the continuation of the previous year's program, where most of the efforts were concentrated on the spectral resolution of the Airborne Oceanographic Lidar (AOL). This year's work was targeted towards the analysis of calibration techniques to enable the AOL to measure absolute radiances of both passive and active modes of operation.

Absolute spectral calibration of the AOL is necessary in order fo fully understand and monitor the sensitivity and stability of the total system. Calibration is also needed to obtain valid surface truth data, with which to improve the accuracy of satellite-borne oceanic color scanners. In particular, accurate measurements of oceanic chlorophyll concentrations rests upon reliable irradiance calibrations of both laser induced and solar induced chlorophyll fluoresence.

An analysis was performed on the spectral calibration methods used by the AOL. The optical path of the instrumentation was examined to study how the radiance from a calibration sphere was influenced. Ray-tracing analysis was performed, including the Cassegrain-telescope optics. It was determined that the calibration radiance was significantly effected by optical-defocusing, due to close positioning of the calibration sphere with respect to the telescope.

Since the multi-mode useages of the AOL require varing altitudes and trajectories, a computational algorithm was developed to compensate for image distortions of the telescoping optics. Secondary mirror blockage, secondary vignetting, and beam divergence was determined, in order to account for the actual amount of calibrated flux received at the spectral sensors.

N91

25926

UNCLAS

N91-25926

Work Summary of the 1989 Summer Faculty Fellowship Program Performed at Goddard Spaceflight Center

The Role of Polar Stratospheric Clouds on Total Ozone "Minihole" Events

Joseph L. Sabutis
School of Natural Sciences
Buena Vista College
Storm Lake, Iowa 50588

NASA Colleague: Dr. Mark R. Schoeberl, Code 616

Using seven years of data from the SAM II and TOMS instruments, along with 70 mbar temperatures extracted from an NMC analysis, the effect of the austral spring polar stratospheric clouds (PSC) on the formation of total ozone "miniholes" is investigated. A total ozone minihole event is designated as the rapid decrease of more than 20 DU of total ozone over a time period of a day and a spatial extent of approximately 1000 km by 1000 km. The severe decrease of total ozone during these minihole events could be explained in part by PSC being formed at altitudes of 10-24 km and preventing scattered UV radiation from ozone below the cloud from reaching the TOMS instrument. A result of the cloud's opaqueness is that the total ozone retrieval from TOMS data would underestimate the ozone column in the vicinity of the PSC.

The approach to investigate the effect of PSC on total ozone was to use SAM II aerosol extinction values in conjuction with NMC stratospheric temperatures to determine if PSC are present during total ozone minihole events occurring during August and September, 1979 to 1986. The minihole events during these seven years were divided into two types: type I, where the minihole occurred at the polar teminator, or the line separating the region of 24 hour darkness from regions exposed to sunlight, and type II, where the minihole occurred 5 to 10 degrees north of the terminator. The presence of PSC in a given region was ascertained by a maximum aerosol extinction greater than .006/km occurring with a temperature less than 189 K.

It is found that PSC are consistently present with type I miniholes events. This is contrasted with PSC rarely occurring in the same vicinity of type II miniholes. Also observed is that type I minihole events have minimum total ozone values which are on the average 3-10 DU smaller than type II miniholes. It can be concluded that care must be taken when trying to deduce a dynamical explanation of minihole events near the polar terminator and the role of PSC must be accounted for in type I minihole formation.

N91
25927
UNCLAS

N91-25927

Work Summary of the 1989 Summer Faculty Fellowship Program Performed at Goddard Space Flight Center

Choice of Gauge in 2-Photon 1s-2s Transition in Atomic Hydrogen and Pseudostate Expansions

Abdulalim A Shabazz
Department of Mathematical and Computer Sciences
Clark Atlanta University
Atlanta, Georgia 30314

NASA Colleague: Dr Richard J Drachman, Code 681

A number of writers have considered the problem of gauge choice in multiphoton transitions in conection with the proper choice of the unperturbed wave functions required to insure gauge invariance. In the paper, <u>Choice of Gauge in 2-Photon Transitions: 1s-2s Transition in Hydrogen</u>, Physical Review Letters, vol 39, #17, 24 October 1977, J Bassani, J J Forney and A Quattropani considered the case of 2-photon 1s-2s transition rate for hydrogen, using gauges $\vec{E}\cdot\vec{r}$ and $\vec{A}\cdot\vec{p}$. They obtained exactly the same results for the two gauges, but their findings indicate that the $\vec{E}\cdot\vec{r}$ interaction tends to the final result with a small number of intermediate states and is therefore the one to be used in any approximate calculation.

In our work this summer we sought to test whether the so-called pseudostate expansion method works equally well with either gauge. To accomplish this task, in addition to researching the problem, the present writer learned Fortran programming, and with the help of his NASA associates (Dr Anand Bhatia and Mrs Elva Glover) and NASA colleague (Dr Richard J Drachman) constructed a Fortran program for the calculation of the dimensionless 2-photon transition probability amplitude D(v) for 1s-2s transition in Hydrogen as a function of the incident photon frequency v in gauge $\vec{E}\cdot\vec{r}$ at certain values of v, using the pseudostate method. However, we have experienced some puzzling unresolved difficulties in our calculations. Thus, we shall continue the process upon the writer's return to his home University. Then should our pseudostate calculations prove successful for gauge $\vec{E}\cdot\vec{r}$, we shall apply the method to gauge $\vec{A}\cdot\vec{p}$. If successful, then the problem is complete.

N91-25928

Work Summary of the 1989 Summer Faculty Fellowship Program Performed at Goddard Spaceflight Center

Minimum Length Pb/Scin Detector for Efficient Cosmic Ray Identification

H. David Snyder
Physics Department
Gallaudet University
Washington, DC 20002

NASA Colleague: Dr Robert Streitmatter, Code 660

A study was made of the performance of a minimal length cosmic ray shower detector that would be light enough for space flight and would provide efficient identification of positrons and protons. Cosmic ray positrons are mainly produced in the decay chain of:

Pion -> Muon -> Positron

and they provide us with a measure of the matter density traversed by primary protons. Present positron flux measurements are consistent with the Leaky Box and Halo models for sources of cosmic rays. Abundant protons in the space environment are a significant source of background that would "wash out" the positron signal. Protons and positrons produce very distintive "showers" of particles when they enter matter; many studies have been published on their behavior in large "calorimeter" detectors. The challenge is to determine the minimal material necessary (minimal calorimeter depth) for positive particle identification.

The primary instrument for the investigation is the Monte Carlo code GEANT, a library of programs from CERN that can be used to model experimental geometry, detector responses and particle interaction processes. The use of the Monte Carlo approach is crucial since statistical fluctuations in shower shape are significant.

Studies conducted during the 1988 summer program showed that straightforward approaches to the problem achieved 85-90% correct identification, but left a residue of 10-15% misidentified particles. This percentage improved to a few percent when multiple "shower-cut" criteria were applied to the data.

This summer, the same study has been extended to employ several physical and statistical methods of identifying classes or catagories of shower behavior. In addition, the response of the calorimeter and the efficiency of the optimal shower cuts to off-normal incidence particle has been determined.

N91
25929
UNCLAS

N91-25929

Work Summary of the 1989 Summer Faculty Fellowship Program Performed at Goddard Space Flight Center

Low Frequency Electric and Magnetic Fields

Craig Spaniol
Department of Industrial Technology
West Virginia State College
Institute, West Virginia 25112

NASA Colleague: Dr. John F. Sutton, Code 728

Following preliminary investigations of the low frequency (3 - 30 Hz) electric and magnetic fields that may exist in the Earth-Ionospheric cavity, measurements were taken with state-of-the art spectrum analyzers. The results of these measurements were presented in a paper delivered at an international conference held during the Summer of 1988 at Colorado Springs. As a follow up to this activity, an investigation was initiated to determine sources and values for possible low frequency signals that would appear in the cavity. The lowest cavity resonance is estimated at about 8 Hz, but lower frequencies may be an important component of our electromagnetic environment.

The potential field frequencies produced by the electron were investigated by a classical model that included possible cross coupling of the electric and gravitation fields. During this work, an interesting relationship was found that related the high frequency charge field with the extremely low frequency of the gravitation field. The results of numerical calculations were surprisingly accurate and this area of investigation is continuing.

The work toward continued development of a standardized monitoring facility is continuing with the potential of installing the prototype at West Virginia State College early in 1990. This installation would be capable of real time monitoring of ELF signals in the Earth-Ionosphere cavity and would provide some directional information. A high gain, low noise, 1/f frequency corrected preamplifier has been designed and tested for the ferrite core magnetic sensor. The potential application of a super conducting sensor for the ELF magnetic field detection is under investigation.

It is hoped that a fully operational monitoring network could pinpoint the location of ELF signal sources and provide new information on where these signals originate and what causes them, assuming that they are natural in origin.

N91
25930
UNCLAS

N91-25930

Work Summary of the 1989 Summer Faculty Fellowship Program Performed at Goddard Spaceflight Center

Digital Redesign of the Control System for the Robotics Research Corporation Model K-1607 Robot

Robert L. Carroll

Department of Electrical Engineering & Computer Science
The George Washington University
Washington, DC 20052

NASA Colleague: Mr. Richard Schnurr, Code 712

The analog control system for positioning each link of the Robotics Research Corporation Model K-1607 robot manipulator was redesigned for computer control. In order to accomplish the redesign, a linearized model of the dynamic behavior of the robot was developed. The parameters of the model were determined by examination of the input-output data collected in closed-loop operation of the analog control system.

The robot manipulator possesses seven degrees of freedom in its motion. The analog control system installed by the manufacturer of the robot attempts to control the positioning of each link without feedback from other links. Constraints on the design of a digital control system include: (1) the robot cannot be disassembled for measurement of parameters; (2) the digital control system must not include filtering operations if possible, because of lack of computer capability; and (3) criteria of "goodness" of control system performance is lacking.

The resulting design employs sampled-data position and velocity feedback. The criteria of the design permits the control system gain margin and phase margin, measured at the same frequencies, to be the same as that provided by the analog control system.

N91

25931

UNCLAS

N91-25931

Work Summary of the 1989 Summer Faculty
Fellowship Program Performed at Goddard Space Flight Center

Atmospheric Occultation of a Solar Flare in Hard X-Rays

Kwan-Yu Chen
Department of Astronomy
University of Florida
Gainesville, Florida 32611

NASA Colleague: Dr. Brian Dennis, Code 682

The objective of this study is two-fold: (1) to investigate the absorption of hard x-rays along a tangential path through the terrestrial atmosphere, and (2) to locate, other than the use of imaging devices, the flare source of x-ray emission on the sun. Observational data were taken with the Hard X-Ray Burst Spectrometer (HXRBS) on board the Solar Maximum Mission satellite (SMM).

The occultation event chosen for investigation is the flare on 1981 October 14. "Night" fell on SMM during the decaying phase of the flare. In about fifteen seconds, the x-ray flux decreased to zero.

The model for computing synthetic light curve, which is directly comparable to the observed curve, consists of two computing programs. One is a modified version of an existing code, which compute the coordinates of the tangent points of the SMM-sun lines. The other program computes the atmospheric densities along the SMM-sun lines. The parameters in the model are the two directional angles (N-S and E-W) measured from the center of the sun. The model also depends on the densities of the terrestrial atmosphere at various heights. Information gathered for the model includes: (1) the geocentric positions of SMM and the sun, (2) the mean atmospheric densities at different heights and latitudes, and (3) the x-ray absorption cross sections of nitrogen, oxygen, and argon.

The optical length, at a given time and for a x-ray energy, is computed with the two angular parameters. The fit of a particular synthetic light curve, i.e. the exponentials of the optical lengths, to the observed eclipse curve, yeilds the desired angular parameters.

N91
25932
UNCLAS

N91-25932

Work Summary of the 1989 Summer Faculty Fellowship Program Performed at Goddard Spaceflight Center

The Transient Performance of a Two-Phase Fluid Reservoir

Joseph Chi
Professor and Chairman
Department of Mechanical Engineering
University of the District of Columbia
Washington, DC 20008

NASA Colleagues: Roy McIntosh and Ted Swanson, Code 732.2

Thermal control of future large, high power spacecraft (e.g., Space Station) will require a two-phase fluid central bus. The two-phase fluid reservoir is a critical component in the two-phase fluid bus. It both controls the saturation temperature and provides a space for volumetric changes. A dynamic reservoir simulation model does not currently exist, but it is needed to expediate design efforts and reduce risk. During his 1989 summer fellowship, this author and his NASA/GSFC colleagues have made an effort to develop a simulation model of the transient performance of a two-phase fluid reservoir.

As a beginning, a preliminary model has been developed. It is based upon component mathematical models in lumped parametric form and builds upon five component mathematical models for calculating dynamic responses of two-phase fluid reservoirs, primary feedback elements, controller commands, heater actuators, and reservoir heaters. As much as possible, the model took advantage of the available SINDA'85/FLUINT thermal/fluid integrator. Additional calculation logic and computer subroutines were developed to complete implementation of the model. The model is capable of simulating dynamic response of an equilibrium two-phase fluid reservoir.

Modification of the model to include the liquid/vapor nonequilibrium is required for applications of the model to simulate performance of reservoirs in which the liquid and vapor phases of the reservoir fluid are not in equilibrium. In addition, the model in its present form, needs to be refined in several respects. More empirical data are needed to quide the model development. The model may then be used to conduct a full parametric study of two-phase fluid reservoirs. More complexities in two-phase flow regions in laboratory and flight conditions may have to be considered eventually if empirical data cannot be simulated satisfactorily. System wih other components arrangement also need to be simulated if optimization is ever to be attained. The present model does, however, preliminarily demonstrates that such analyses are quite possible and offers a far less expensive method to understand the transient of a two-phase fluid reservoir system than a totally headware approach.

N91
25933
UNCLAS

N91-25933

Work Summary of the 1989 Summer Faculty Fellowship Program
Performed at Goddard Spaceflight Center

Gallium Arsenide Processing for Gate Array Logic

Eric D. Cole
Department of Electrical and Computer Engineering
George Mason University
Fairfax, Virginia 22030

NASA Colleague: Dr. Murzy Jhabvala, Code 724

The development of a reliable and reproducible GaAs process was initiated for applications in gate array logic. Gallium Arsenide is an extremely important material for high speed electronic applications in both digital and analog circuits since its electron mobility is 3-5 times that of silicon, this allows for faster switching times for devices fabricated with it. Unfortunately GaAs is an extremely difficult material to process with respect to silicon and since it includes the arsenic component GaAs can be quite dangerous (toxic) especially during some heating steps. The summer research was divided into three stages of which only stage one could be attacked in the fellowship time frame.

The first stage of the research was directed at developing a simple process to produce GaAs MESFETs. The MESFET (MEtal Semiconductor Field Effect Transistor) is the most useful, practical and simple active device which can be fabricated in GaAs. It utilizes an ohmic source and drain contact separated by a Schottky gate. The gate width is typically a few microns. Several process steps were required to produce a good working device including ion implantation, photolithography, thermal annealing, and metal deposition. A process was designed to reduce the total number of steps to a minimum so as to reduce possible errors. The first run produced no good devices. The problem occurred during an aluminum etch step while defining the gate contacts. It was found that the chemical etchant attacked the GaAs causing trenching and subsequent severing of the active gate region from the rest of the device. Thus all devices appeared as open circuits. This problem is being corrected and since it was the last step in the process correction should be successful.

The second planned stage involves the circuit assembly of the discrete MESFETs into logic gates for test and analysis. Finally the third stage is to incorporate the designed process with the tested circuit in a layout that would produce the gate array as a GaAs integrated circuit.

N91

25934

UNCLAS

N91-25934

Work Summary of the 1989 Summer Faculty
Fellowship Program Performed at Goddard Space Flight Center

Computer Network Environment Planning and Analysis

John F. Dalphin
Department of Computer and Information Sciences
Towson State University
Baltimore, Maryland 21204

NASA Colleague: Dr. David R. Howell, Code 521

The GSFC "Computer Network Environment" provides a broadband RF cable between campus buildings and ethernet "spines" in buildings for the interlinking of Local Area Networks (LANs). This system provides terminal and computer linkage among host and user systems thereby providing E-mail services, file exchange capability, and certain distributed computing opportunities. The Environment is designed to be transparent and supports multiple protocols (e.g. TCP/IP, DECNET, AppleTalk, etc.). Networking at Goddard has a short history and has been under coordinated control of a Network Steering Committee for slightly more than two years; network growth has been rapid with more than 1500 nodes currently addressed and greater expansion expected. A new RF cable system with a different topology is being installed during summer 1989; consideration of a fiber optics system for the future will begin soon.

Summer study has been directed toward Network Steering Committee operation and planning plus consideration of Center Network Environment analysis and modeling. Biweekly Steering Committees have been attended to learn the background of the network and the concerns of those managing it. Suggestions for historical data gathering have been made to support future planning and modeling.

"Data Systems Dynamic Simulator," a simulation package developed at NASA and maintained at GSFC has been studied as a possible modeling tool for the network environment. A three-day workshop on the language and its characteristics (as applied to Space Station Information System - SSIS - modeling) was attended August 1-3. A modeling concept based on a hierarchical model has been hypothesized for further development. Such a model would allow input of newly updated parameters and would provide an estimation of the behavior of the network. This may be the basis for future research efforts through grant proposals or a second summer program under ASEE/NASA auspices.

N91

25935

UNCLAS

N91-25935

Work Summary of the 1989 Summer Faculty Fellowship Program Performed at the Goddard Space Flight Center

The Use of Aircraft and Satellite Remote Sensing of Phytoplankton Chlorophyll Concentrations in Case 2 Estuarine Waters of the Chesapeake Bay

Lawrence W. Harding, Jr.
Chesapeake Bay Institute
The Johns Hopkins University
Shady Side, Maryland 20764

NASA Colleagues: Drs. Jane A. Elrod & Wayne E. Esaias

Two projects using remote sensing of phytoplankton chlorophyll concentrations in the Chesapeake Bay estuary were proposed. The first project has been in conjunction with Wayne Esaias and used aircraft remote sensing with a compact radiometer system developed at NASA's Goddard Space Flight Center (GSFC), the Ocean Data Acquisition System (ODAS). ODAS includes three radiometers at 460, 490, and 520 nm, an infrared temperature sensor (PRT-5), Loran-C for navigation, and a data acquisition system using a PC and mass storage device. This instrument package can be flown in light aircraft at relatively low expense, permitting regular and frequent flights. I have completed 16 flights with ODAS using the Virginia Institute of Marine Science's De Havilland "Beaver". The goal has been to increase spatial and temporal resolution in assaying phytoplankton pigment concentrations in the Chesapeake. This estuary is very dynamic and spatially heterogeneous; traditional sampling platforms have proven inadequate to the task of measuring the distribution of biomass. At present, analysis is underway of flight data collected between March and July 1989. This has required software development that I am undertaking in collaboration with Esaias and a colleague at Johns Hopkins.

The second project has been conducted with Jane Elrod and focuses on satellite data gathered with the Nimbus-7 Coastal Zone Color Scanner (CZCS) between late-1978 and mid-1986. The problem in using CZCS data for Chesapeake Bay is that the optical characteristics of this (and many) coastal and estuarine waters are distinct from those of the open ocean for which algorithms for computing pigment concentrations were developed. The successful use of CZCS data for the estuary requires development of site-specific algorithms and analytical approaches. Of principal importance in developing site-specific procedures is the availability of *in situ* data on pigment concentrations. We have acquired a significant data set from EPA's Chesapeake Bay Program in Annapolis, Maryland, and are presently analysing clear satellite scenes for which we have same-day sea truth measurements of pigment. Both the University of Miami and GSFC Seapak systems are being used in this effort. Our main finding to date is an expected one, *i.e.*, the algorithms developed for oceanic waters are inadequate to compute pigment concentrations for the Case 2 waters of the Chesapeake Bay. One reason is the overestimation of aerosol radiances by assuming that water-leaving radiance in Band 4 of CZCS (670 nm) is zero, an assumption that is invalid for the Bay. This prompted us to attempt iterative procedures for estimating the proportion of the Band 4 radiance that is actually attributable to aerosol by estimating the water-leaving component using optical data. We will conduct a cruise on the Chesapeake the week of 7 August 1989 to collect additional optical data necessary to this task. Both projects will continue beyond the duration of the 1989 Fellowship Program and I have made plans with both Esaias and Elrod to this effect.

N91

25936

UNCLAS

N91-25936

Work Summary of the 1989 NASA/ASEE Summer Faculty Fellowship Program
Performed at the Goddard Space Flight Center

Development of a Funding, Cost and Spending Model for Satellite Projects

Jesse P. Johnson
Department of Industrial Engineering
Morgan State University
Baltimore, MD. 21239

NASA Colleague: Mr. Bernard Dixon, Code 152, 286-7739

The need for a predictive budget/funding model is obvious. The current models used by the Resource Analysis Office (RAO) are used to predict the total costs of satellite projects. The research conducted this summer was an effort to extend the modeling capabilities from total budget analysis to total budget and budget outlays over time analysis.

A statistical based and data driven methodology was used to derive and develop the model. The budget data for the last 18 GSFC-sponsored satellite projects were analyzed and used to build a funding model which would describe the historical spending patterns. This raw data consisted of dollars spent in that specific year and their 1989 dollar equivalent. This data was converted to the standard format used by the RAO group and placed in a database.

A simple statistical analysis was performed to calculate the gross statistics associated with project length and project cost and the conditional statistics on project length and project cost.

The modeling approach used is derived from the theory of embedded statistics which states that properly analyzed data will produce the underlying generating function. The process of funding large scale projects over extended periods of time is described by Life Cycle Cost Models(LCCM). The data was analyzed to find a model in the generic form of a LCCM.

The model developed is based on a Weibull function whose parameters are found by both nonlinear optimization and nonlinear regression. In order to use this model it is necessary to transform the problem from a dollar/time space to a percentage of total budget/time space. This transformation is equivalent to moving to a probability space. By using the basic rules of probability, the validity of both the optimization (a form of steepest descent) and the regression (Gauss-Newton method for mimimizing nonlinear residual errors) steps are insured. This statistically significant model is then integrated and inverted. The resulting output represents a project schedule which relates the amount of money spent to the percentage of project completion.

The implications of these results are obvious. A priori, both a total budget and a time series of budget outlays can be produced for any future satellite project. Furthermore there exists a real time tool which can be used to calculate both cost overrun/underrun amounts and overrun/underrun completion times.

The theory of embedded statistics also can be used for further analyses. There seems to be a complete set of contract and pricing data and strategies which need to be looked at. A similar analysis can be done to quantify information on which contractors, management styles, scale of projects and funding styles lead to cost overruns or underruns.

N91
25937
UNCLAS

DETECTION AND AVOIDANCE OF ERRORS
IN COMPUTER SOFTWARE

N91-25937

Les Kinsler
Department of Computer Science
Kansas College of Technology
Salina, Kansas 67401
NASA/ASEE Summer Faculty,1989

NASA Colleague: Mr. Jon Valett, Code 552.2
Goddard Space Flight Center

The research examined the acceptance test errors of a computer software project to determine if the errors could have been detected or avoided in earlier phases of development. GROAGSS (Gamma Ray Observatory Attitude Ground Support System) was selected as the software project to be examined. The development of the software followed the standard Flight Dynamics Software Development methods. GROAGSS was developed between August 1985 and April 1989. The project is approximately 250,000 lines of code of which approximately 43,000 lines are reused from previous projects.

GROAGSS had a total of 1715 Change Report Forms (CRFs) submitted during the entire development and testing. These changes contained 936 errors. Of these 936 errors, 374 were found during the acceptance testing. These acceptance test errors were first categorized into methods of avoidance including: 1)more clearly written requirements; 2)detail design review; 3)code reading; 4)structural unit testing; and 5)functional system integration testing. The errors were later broken down in terms of effort to detect and correct, class of error, and probability that the prescribed detection method would be successful. These determinations were based on Software Engineering Laboratory (SEL) documents and interviews with the project programmers. A summary of the results of the categorizations:

PROBABILITY OF SUCCESS IN ERROR AVOIDANCE AND DETECTION.

METHOD	TOTAL	%	YES	NO	MAYBE
BETTER SPECIFICATIONS	9	2.4	5	1	3
DESIGN READING	16	4.5	5	5	6
CODE READING	157	41.7	87	23	47
STRUCTURAL TESTING	58	15.5	23	14	21
FUNCTIONAL TESTING	134	35.8	64	33	37
TOTAL	374		184 (49.2%)	76 (20.3%)	114 (30.5%)

Based on the results of this study, the number of programming errors at the beginning of acceptance testing can be significantly reduced. This study subjectively examined the results of the existing development methodology for ways of improvements. This study provides a basis for the definition of a new development/testing paradigm. Monitoring of the new scheme will objectively determine its effectiveness in avoiding and detecting errors.

N91
25938
UNCLAS

N91-25938

SPECIFICATION OF PARAMETERS FOR DEVELOPMENT OF A SPATIAL DATABASE FOR DROUGHT MONITORING AND FAMINE EARLY WARNING IN THE AFRICAN SAHEL

GILBERT L. ROCHON
NASA/ASEE FACULTY RESEARCH FELLOW, GODDARD SPACE FLIGHT CENTER
DIRECTOR, URBAN STUDIES & PUBLIC POLICY INSTITUTE
REMOTE SENSING & GIS LABORATORY
DILLARD UNIVERSITY
NEW ORLEANS, LA 70122

NASA COLLEAGUE:
DR. JIM SMITH, CHIEF, BIOSPHERIC SCIENCES BRANCH (623)
LABORATORY FOR TERRESTRIAL PHYSICS

ABSTRACT: Parameters were described for a spatial database to facilitate drought monitoring and famine early warning in the African Sahel. The proposed system, referred to as the African Drought and Famine Information System (ADFIS) is ultimately recommended for implementation with the NASA/FEMA Spatial Analysis and Modeling System (SAMS), a GIS/Dynamic Modeling software package, currently under development by Dr. Fran L. Stetina et al. in NASA Goddard's Ocean Data Lab. SAMS is derived from FEMA's Integrated Emergency Management Information System (IEMIS) and the Pacific Northwest Laboratory's/Engineering Topographic Laboratory's Airland Battlefield Environment (ALBE) GIS. SAMS is primarily intended for disaster planning and resource management applications within the developing countries.

Sources of data for the system would include the Developing Economies Branch of the U.S. Dept. of Agriculture, the World Bank, Tulane University School of Public Health and Tropical Medicine's Famine Early Warning Systems (FEWS) Project, the USAID's Foreign Disaster Assistance Section, the World Resources Institute, the World Meteorological Institute, the USGS, the UN FAO, UNICEF, and the United Nations Disaster Relief Organization (UNDRO). Satellite imagery would include decadal AVHRR imagery and Normalized Difference Vegetation Index (NDVI) values from 1981 to the present for the African continent and selected Landsat scenes for the Sudan pilot study.

The system is initially conceived for the MicroVAX II/GPX, running VMS. To facilitate comparative analysis, a global time-series database (1950-1987) is included for a basic set of 125 socio-economic variables per country per year. A more detailed database for the Sahelian countries includes soil type, water resources, agricultural production (i.e. wheat, corn, rice, millet, sorghum, and barley for 1966-1988), agricultural import and export, food aid, and consumption. A pilot dataset for the Sudan with over 2,500 variables from the World Bank's ANDREX system, also includes epidemiological data on incidence of kwashiorkor, marasmus, other nutritional deficiencies, and synergistically-related infectious diseases.

N91
25939
UNCLAS

N91-25939

INTEGRATING NASA'S LAND ANALYSIS SYSTEM (LAS) IMAGE PROCESSING SOFTWARE WITH AN APPROPRIATE GEOGRAPHIC INFORMATION SYSTEM (GIS): A REVIEW OF CANDIDATES IN THE PUBLIC DOMAIN

GILBERT L. ROCHON, M.P.H.
NASA/ASEE FACULTY RESEARCH FELLOW
GODDARD SPACE FLIGHT CENTER
DIRECTOR, URBAN STUDIES & PUBLIC POLICY INSTITUTE
REMOTE SENSING & GIS LABORATORY
DILLARD UNIVERSITY
NEW ORLEANS, LA 70122

NASA COLLEAGUE:
DR. YUN CHI LU, ACTING BRANCH CHIEF (636)
INFORMATION SYSTEMS DEVELOPMENT FACILITY
SPACE DATA AND COMPUTING DIVISION (630)
DR. MILTON HALEM, DIRECTOR

IN CONSULTATION WITH;
DRS. KRISHNAN NARAYANAN, FRED IRANI, DEAN GESCH (636)
AND DR. FRAN L. STETINA, OCEAN DATA SYSTEMS OFFICE (670.1)

ABSTRACT:A user requirements analysis (URA) was undertaken to determine an appropriate public domain Geographic Information System (GIS) software package for potential integration with NASA's LAS (Land Analysis System) 5.0 image processing system. The necessity for a public domain system was underscored due to the perceived need for source code access and flexibility in tailoring the GIS system to the needs of a heterogenous group of end-users, and to the specific constraints imposed by LAS and its user interface, Transportable Applications Executive (TAE).

Subsequently, a review was conducted of a variety of public domain GIS candidates, including GRASS 3.0, MOSS, IEMIS, and two university-based packages, IDRISI and KBGIS. The review method was a modified version of the GIS evaluation process, developed by the Federal Interagency Coordinating Committee on Digital Cartography. One IEMIS-derivative product, the ALBE (AirLand Battlefield Environment) GIS, emerged as the most promising candidate for integration with LAS. IEMIS (Integrated Emergency Management Information System) was developed by the Federal Emergency Management Agency (FEMA). ALBE GIS is currenty under development at the Pacific Northwest Laboratory under contract with the U.S. Army Corps of Engineers' Engineering Topographic Laboratory (ETL).

Accordingly, recommendations are offered with respect to a potential LAS/ALBE GIS linkage and with respect to further system enhancements, including coordination with the development of the Spatial Analysis & Modeling System (SAMS) GIS in Goddard's Ocean Data Systems Office and the KBGIS (Knowledge-Based GIS) and IDM (Intelligent Data Management) developments in Goddard's National Space Science Data Center.

N91
25940
UNCLAS

Summary of Work Performed Under the Summer Faculty Fellowship Program, Summer 1989 at Goddard Spaceflight Center

Solar Flare Hard and Soft X-ray Relationship Determined from SMM HXRBS and BCS Data

G. David Toot
Physics Department
Alfred University
Alfred, New York 14802

NASA Colleague: Dr. Brian Dennis, Code 602 and 680

The exact nature of the solar flare process is still somewhat a mystery. A key element to understanding flares is the relationship between the hard X-rays emitted by the most energetic portions of the flare and the soft X-rays from other areas and times. We studied this relationship by comparing hard X-ray light curves from the Hard X-ray Burst Spectrometer (HXRBS) with the soft X-ray light curve and its derivative from the Bent Crystal Spectrometer (BCS) which is part of the X-ray Polychrometer (XRP), these instruments being on the Solar Maximum Mission spacecraft (SMM).

Our data sample was taken from flares observed with the above instruments during 1980, the peak of the previous maximum of solar activity. Flares were chosen based on complete coverage of the event by several instruments. The HXRBS data covers the X-ray spectrum from about 25 keV to about 440keV in 15 spectral channels, while the BCS data we used covers a region of the spectrum around 3 angstroms including emission from the Ca XIX ion. Both sets of data were summed over their spectral ranges and plotted against time at a maximum time resolution of around 3 seconds.

The most popular theory of flares holds that a beam of electrons produces the hard X-rays by bremsstrahlung while the soft X-rays are the thermal response to this energy deposition. The question is whether the rate of change of soft X-ray emission might reflect the variability of the electron beam and hence the variability of the hard X-rays. To address this, we took the time derivative of the soft X-ray light curve and compared it to the hard X-ray light curve. The results were quite striking. Out of a sample of 17 flares, 12 of them showed very close agreement between the soft X-ray derivative and the hard X-ray light curve. The other five did not show this behavior but were similar to each other in general soft X-ray behavior. Efforts to determine basic differences between the two kinds of flares continue. A paper on these results is currently being written.

In addition to the above, I have also been looking at the behavior of soft X-ray temperature of flares, have investigated the possibility of doing support observations from my home institution's observatory, and have continued a little work with solar prominences.

N91

25941

UNCLAS

N91-25941

Work Summary of the 1989 Summer Faculty Fellowship Program Performed at NASA/Goddard Space Flight Center

Data System Interoperability

Dr. Nagi T. Wakim
Department of Computer Science
Bowie State University
Bowie, Maryland 20715

NASA Colleague: Dr. Milton Halem, Code 630

During the initial few weeks of the fellowship, I developed and tested software which allows an end-user to build a "book" data object in an interactive fashion. The electronic book model was developed for the Library front-end of the DAVID (Distributed Access View Integrated Database) system. It is a complex data object which is capable of holding data of different types and formats (e.g., databases and files). After this task, the plan was to assess the Book model and investigate the possibility of it serving as a knowledge base for an Expert System front-end to the DAVID system. However, the plan did not fall through and, therefore, I switched to another project/task in the Space Science Data Division.

For the rest of the fellowship period, I worked in the area of Data System Interoperability. Specifically, I prepared a plan titled "Implementations of the Land Analysis System (LAS) to Meet UNEP/GRID Requirements." This plan is part of studies funded and conducted by the United Nations, NASA, and other agencies aimed at reaching the goal of building one virtual global change information system which will link existing and future data systems allowing earth and space scientists to learn about, locate, access, and correlate data of interest regardless of its physical location.

The plan proposed the construction of a Master Directory (MD) for the European data systems that is equivalent in structure to NASA's MD. The MD is to contain brief, high-level information about existing earth and space science data sets sufficient for a user to know where data of interest reside and how to go about getting additional information. The plan also outlined the tasks that would be involved to electronically connect the MD system to the various discipline data systems (e.g. LAS) in order to achieve general interoperability, that is, the ability to perform cross-systems searches and exchange of and access to distributed information.

APPENDIX 1

Lists of Participants of the 1989

NASA-ASEE SFFP at GSFC

and Their Colleagues

1989 NASA-ASEE SUMMER FACULTY FELLOWSHIP PROGRAM

AT THE GODDARD SPACE FLIGHT CENTER

GREENBELT, MARYLAND 20771

Second-Year Faculty Fellows and Their GSFC Colleagues

Alley, Phillip W.	Professor Physics Department SUNY at Geneseo Geneseo, NY 14454 (716)245-5284	Mr. James Heaney Code 717.1 Building 5, Room C48 (301) 286-5285
Bayr, Klaus J.	Professor Geography Keene State College Keene, NH 03431 (603)352-1909 x480	Dr. Dorothy Hall Code 624.0 Building 16W, Room N45 (301)286-6892
Campbell, Roy K.	Assistant Professor Physics Department Southwest Adventist Col. Keene, TX 76059 (817)645-3921	Dr. Frank C. Jones Code 665.0 Building 2, Room S7 (301)286-5506
Collins, Aaron S.	Associate Professor Electrical & Computer Engineering Clemson University Clemson, SC 29631 (803)656-5905	Mr. James Chesney Code 521.1 Building 23, Room E411 (301)286-9029
Iverson, Richard L.	Professor Dept. of Oceanography Florida State University Tallahassee, FL 32306 (904)644-6700	Dr. Wayne Esaias Code 671.0 Building 22, Room 142 (301)286-5465
Kraus, George F.	Associate Professor Chemistry Charles Co.Commun. Col. LaPlata, MD 20646 (301)934-2251 x306	Dr. John Allen Code 691.0 Building 2, Room 171 (301)286-5896

Second-Year Faculty Fellows and Their GSFC Colleagues

Lawrence, William T.	Scientist, Center for Energy & Environ. Res. GPO Box 3682 University of Puerto Rico San Juan, PR 00936 (809)767-0371	Dr. James A. Smith Code 623.0 Building 16W, Room N22B (301)286-3532
Luft, Philip E.	Assistant Professor Dept. of Math Sciences Salisbury State College Salisbury, MD 21801 (301)543-6467	Mr. Chester L. Parsons Code 672.0 Building E106 Room 210 Wallops Flight Facility (301)824-1390
Myric, Carlos A.	Lecturer School of Engineering Morgan State University Baltimore, MD 21239 (301)444-3231/3912	Dr. James Tilton Code 636.0 Building 28, Room W153 (301)286-9510
Roby, Scott W.	Assistant Professor Dept. of Earth Sciences SUNY College of Oswego Oswego, NY 13126 (315)341-2790	Dr. David Lechrone Code 681.0 Building 21, Room G21 (301)286-8904
Rousey,Carlton E.	Instructor of Physics Department of Science Murray State College Tishomingo, OK 73460 (405)371-2371 x212	Dr. Frank E.Hoge Code 672.0 Building E106, Room 204 Wallops Flight Facility (301)824-1567
Sabutis,Joseph L.	Assistant Professor Physics Department Buena Vista College Storm Lake, IA 50588 (712)749-2019/2010	Dr. Mark Schoeberl Code 616.0 Building 21, Room 250 (301)286-5819

Second-Year Faculty Fellows and Their GSFC Colleagues

Shabazz, Abdulalim A.	Professor Dept. of Mathematics & Computer Science Atlanta University Box 303 Atlanta, GA 30314 (404)653-8540	Dr. Richard J. Drachman Code 681.0 Building 21, Room 126 (301)286-4426
Snyder, Henry D.	Professor Physics Department Gallaudet University Washington, DC 20002 (202)651-5385	Dr. Robert Streitmatter Code 661.0 Building 2, Room 27 (301)286-5481
Spaniol, G. Craig	Associate Professor Dept. of Industrial Tech. West Virginia State Col. Institute, WV 25112 (304)766-3191	Dr. John F. Sutton Code 728.1 Building 20, Room 39 (301)286-5454

1989 NASA-ASEE SUMMER FACULTY FELLOWSHIP PROGRAM

AT THE GODDARD SPACE FLIGHT CENTER

GREENBELT, MARYLAND 20771

First-Year Faculty Fellows and Their GSFC Colleagues

Carroll, Robert L. Dr.	Professor Electrical Engineering & Computer Science George Washington Univ. Washington,DC 20052 (202) 994-5514	Mr. Richard Schnurr Code 712.1 Building 11, Room S125 (301) 286-3194
Chen, Kwan-Yu Dr.	Professor Astronomy Dept. University of Florida Gainesville, FL (904) 392-2055	Dr. Bryan Dennis Code 682.0 Building 7, Room 292 (301) 286-7983
Chi, Joseph Dr.	Professor & Chairman Mechanical Engineering Univ. District Columbia Washington, DC (202) 282-3500	Mr. Roy McIntosh Code 732.2 Building 4, Room 181A (301) 286-3478
Cole, Eric D. Dr.	Assistant Professor Electrical Engineering 440 University Drive George Mason University Fairfax, VA 22030 (703) 764-6111	Dr. Murzy Jhabvala Code 724.1 Building 11, Room E5 (301) 286-5232
Dalphin, John F. Dr.	Professor & Chair Computer Sciences Towson State University Baltimore, MD 21204 (301) 321-3701	Dr. David Howell Code 521.0 Building 23, Room E449A (301) 286-6663
Harding, Lawrence W.Dr.	Research Scientist Johns Hopkins University Shady Side Campus (CBI) 4800 Atwell Road Shady Side, MD 20764-0037 (301) 867-7550	Dr. Wayne Esaias Code 671.0 Building 22, Room 142 (301) 286-5465

First-Year Faculty fellows and Their GSFC Colleagues

Johnson, Jesse P. Mr.	Act. Assistant Professor Industrial Engineering Morgan State University Cold Spring Lane & Hillen Roads Baltimore, MD 21239 (301) 444-3231	Mr. Bernard Dixon Code 152 Building 8, Room 415 (301) 286-7739
Kinsler, Leslie A. Mr.	Department Head Computer Science Kansas College of Techn. 4241 E. Cloud Salinas, KS 67401 (913) 825-0275	Mr. Jon Valette Code 552.2 Building 23, Room E231 (301) 286-5316
Rochon, Gilbert Mr.	Assistant Professor of Urban-Affairs Remote Sensing & GIS Lab Dillard University 2601 Gentilly Boulevard New Orleans, LA 70122 (504) 286-4706	Dr. James A. Smith Code 623.0 Building 16W, Room N22B (301) 286-3532
Toot, George D. Dr.	Assistant Professor Physics Department Alfred University Alfred, NY 14802 (607) 871-2208	Dr. Bryan Dennis Code 682.0 Building 7, Room 292 (301) 286- 7983
Wakim, Nagi T. Dr.	Associate Professor Computer Science Bowie State University Bowie, MD 20715 (301) 464-6647/7241	Dr. Milton Halem Code 630 Building 28A Room W205 (301) 286-8834

APPENDIX 2

STATISTICS

OF

APPLICANTS AND FELLOWS

APPLICANTS - TOTAL 69

W	Female	4	Male	53	Total	57
B		1		4		5
H		-		1		1
O		-		6		6
		5		64		69

FIRST YEAR FELLOWS SELECTED - Total 11

W	Female	-	Male	7	Total	7
B		-		2		2
H		-		-		-
O		-		2		2
		0		11		11

SECOND YEAR FELLOWS SELECTED - Total 15

W	Female	-	Male	13	Total	13
B		-		2		2
H		-		-		-
O		-		-		-
		0		15		15

TOTAL FELLOWS SELECTED - TOTAL 26

W	Female	-	Male	20	Total	20
B		-		4		4
H		-		-		-
O		-		2		2
		0		26		26

DISCIPLINES

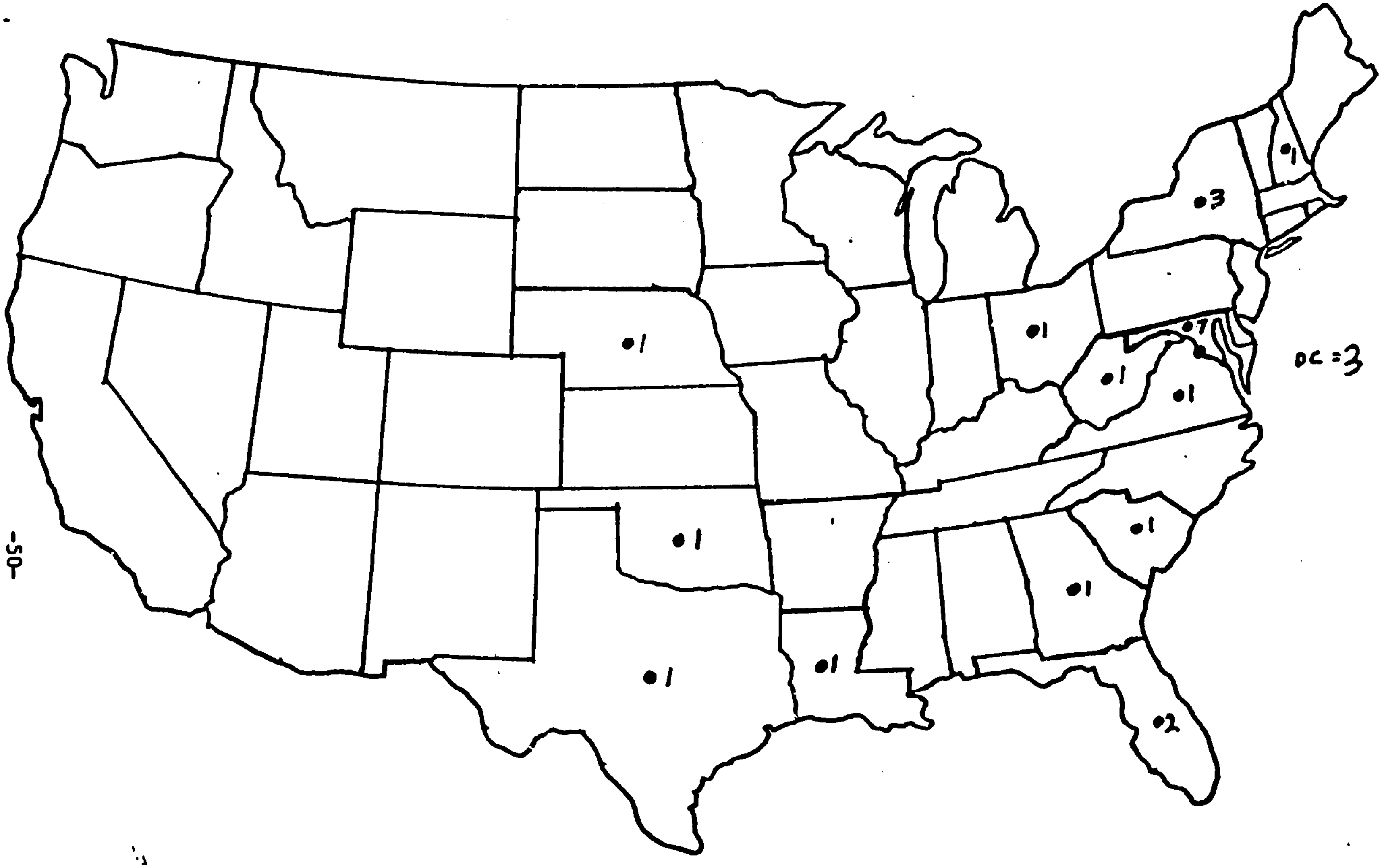
FELLOWS

	First Year	Second Year
Astronomer	1	1
Astro-physics	1	1
Biology	1	-
Ecology	-	1
Elec. Eng. & C.S.	5	2
Eng.- Economic Syst.	1	-
Engineering Science	-	1
Geo-Chemistry	-	1
Geography	-	1
Health Service Admin.	1	-
Mathematics	-	2
Mechanical Eng.	1	-
Oceanography	-	1
Physics	-	4
	11	15

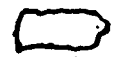
DISCIPLINES

APPLICANTS

Aero-Engineering	1
Astronomy	1
Astro-physics	1
Applied Mathematics	1
Biology	2
Civil Engineering	1
Computer Science	2
Control Theory	1
Ecology	1
Electrical Engineering	15
Engineering Economy	1
Engineering Science	2
Geography	1
Health Administration	1
Heat Transfer	1
Industrial Engineering	1
Inorganic Chemistry	2
Linguistics	1
Marine Studies	1
Mathematics	3
Mechanical Engineering	2
Nuclear Theory	1
Physical Chemistry	2
Physics	22
Science Education	1
Solid Mechanics	1
	69



Geographical Locations
of
1987 Fellows



Geographical Locations
of
New 1989 Applicants

APPENDIX 3

EVALUATION FORM

to be filled out

by

1989 Facult· Fellows

THE NASA-ASEE SUMMER FACULTY FELLOWSHIP PROGRAMS AT GSFC-1983

EVALUATION QUESTIONNAIRE
(to be filled out by Faculty Fellows)

1. Name ______________________________

2. Home Institution ______________________________

3. Research Colleague ______________________________

4. Brief description of research topic ______________________________

____

____

5. Did you have contact with your research colleague prior to your arrival? If yes, briefly indicate nature and extent of contact.

____

____

6. The objectives of the Summer Faculty Fellowship Program (SFFP) in Research are: (1) to further the professional knowledge of qualified engineering and science faculty members, (2) to stimulate and exchange of ideas between participants and NASA, and (3) to enrich and refresh the research and teaching activities of the participants' institutions.

Comment below to what degree the above objectives were or are being fulfilled. When responding to (2) please indicate the average number of hours per week you interact technically with your colleague/GSFC personnels.

____

____

____

____

____

7. Principal benefits of Fellowship to NASA.

____

____

____

8. Principal benefits of Fellowship to yourself.

9a. What arrangements, if any, have been/are expected to be made for continuation of project(s) through grants or contracts to fellow and his institution.

b. List articles/reports, if any which have been published/are planned as a result of your research in SFFP at GSFC.

10. Please give summary evaluation of seminar lectures.

11. How did you learn about the program?

12. (For Second-Year Fellows) What new activities, if any, have you instituted in your school as a result of your participation in last summer's program?

____

____

____

____

____

13. Have your office/working conditions been satisfactory? If not please describe the nature of the problems and estimate the number of manhours lost as a result.

____

____

____

14. How could the summer programs be improved? (Please make as specific recommendations as you can on housing assistance, social activities, seminars, luncheons, research presentations, program evaluations, and others.)

____

____

____

____

____

15. Add any other pertinent descriptive comments not covered by your other answers which will help assess the program. Comment on weaknesses as well as strong points. Your frank judgments will be greatly appreciated.

____

____

____

____

APPENDIX 4

EVALUATION FORM

to be filled out

by

GSFC and Wallops Island

Research Colleagues

NASA/ASEE SUMMER FACULTY RESEARCH PROGRAM

.SEARCH FELLOWSHIPS

EVALUATION OF FELLOW BY RESEARCH COLLEAGUE

______________________________ ______________________________

ıme of GSFC Colleague Name of Fellow

____

SFC Telephone Number

. Period of Tenure: ______________________________

. Give a brief statement of the fellow's research program, and comment on the progress and principal accomplishments, during tenure of the fellowship.

____

____

____

____

____

____

____

3. The objectives of the Summer Faculty Fellowship Program in Research are (1) to further the professional knowledge of qualified engineering and science faculty members, (2) to stimulate an exchange of ideas between participants and NASA, and (3) to enrich and refresh the research and teaching activities of the participants' institutions.
Comment below to what degree the above objectives were or are being fulfilled.

____

____

____

____

____

____

____

4. (a) To what degree is the Fellow a critical thinker?

(b) To what degree is the Fellow an original thinker?

Note to Colleague: In the rating scale below, describe the Fellow by checking, after each trait to be evaluated, the box that most nearly represents your opinion. Compare the Fellow with a representative group of postdoctoral scientists and engineers you have known during your professional career who have had approximately the same amount of experience and training as the Fellow.

5.	BELOW AVERAGE	AVERAGE	SOMEWHAT ABOVE AVERAGE	GOOD	UNUSUAL	OUT-STANDING	TRULY EXCEPTIONAL
A typical group of 100 scientists at this level might be expected to divide about like this →	Lowest 40	Middle 20	Next 15	Next Highest 15	Highest 10		
(a) Degree of mastery of fundamental knowledge in the general field:							
(b) Knowledge of and ability to use basic research techniques in this field:							
(c) Self-reliance and independence in scientific work:							
(d) Motivation toward a successful, productive scientific career:							

6. Principal benefits of fellowship to NASA.

7. Principal benefits of Fellowship to yourself.

8.. Add any other pertinent descriptive comments not covered by your other answers which will help assess the fellow's ability. Comment on weaknesses as well as strong points.

____

____

____

____

____

____

____

____

____

____

____

9. How does the fellow compare with other professional research scientists or engineers in your laboratory?

Equal to the best ☐ Very Good ☐ Above Average ☐ Average ☐ Below Average ☐

10. Would you wish to have the fellow return for a second summer with you.

Yes ☐ No ☐ No Comment ☐

11. **Summary Evaluation: Over-all Scientific Ability**

Comparing the Fellow with a representative group of postdoctorals who have had approximately the same amount of experience and training, how do you rate the Fellow?

BELOW AVERAGE	AVERAGE	SOMEWHAT ABOVE AVERAGE	GOOD	UNUSUAL	OUT-STANDING	TRULY EXCEP-TIONAL
Lowest 40	Middle 20	Next 15	Next Highest 15	Highest 10		

______________________________ ____________________
Signature of Colleague Date

APPENDIX 5

1989 SFFP SEMINAR/TOUR SCHEDULE

Seminar and Tour Schedule

1989 NASA-ASEE SUMMER FACULTY FELLOWSHIP PROGRAM AT GFSC/WFF

SEMINAR / TOUR SCHEDULE

June 5 10:45 a.m.	Introductory Meeting
June 9 9:00 a.m.	GSFC/WFF, An Overview, Building 3 Aud. Mr. William O'Leary NASA Public Affairs/Protocol Off.-Ret.
June 14	Picnic
June 16 9:00 a.m.	TOUR of GSFC, Building 8 Main Lobby Mr. William O'Leary NASA Public Affairs/Protocol Off.-Ret.

SEMINARS BUILDING 26

June 23 1:00 p.m. Room 212	Dr. Phillip W. Alley Dr. Aaron S. Collins Dr. Richard L. Iverson Dr. Joseph L. Sabutis
June 30	NO SEMINARS SCHEDULED
July 7 1:00 p.m. Room 212	Dr. George F. Kraus Dr. Roy K. Campbell Dr. Klaus J. Bayr
July 14 1:00 p.m. Room 205	Dr. Darryl Williams Earth Obs.Syste Mr. Carlos A. Myrie Dr. Henry D. Snyder Dr. G. Craig Spaniol

July 21 1:00 p.m. Room 212	Dr. James Tilton Ms. Jennie Wiseman Dr. G. David Toot Dr. Scott W. Roby Dr. Joseph Chi	Guest Speaker Grant Proposals
JULY 28 1:00 p.m. Room 212	Dr. William T. Lawrence Mr. Leslie A. Kinsler Dr. Philip E. Luft Dr. Carlton E. Rousey	
August 4 1:00 p.m. Room 212	Dr. Abdulalim A. Shabazz Dr. Lawrence W. Harding Dr. John F. Dalphin Dr. Eric D. Cole Dr. Nagi T. Wakim	
August 11 1:00 p.m. Room 205	Formal Conclusion of 1989 SFFP Dr. Robert L. Carroll Dr. Kwan-Yu Chen Mr. Jesse P. Johnson Mr. Gilbert L. Rochon	

Additional Seminars by Invited Speakers - To Be Announced

Interested Family Members are Invited

Weekly Seminars to be Preceded by a Brown Bag Lunch at 12:30 p.m. for Interested Fellows.

APPENDIX 6

LETTER

to

Research Colleagues

THE UNIVERSITY OF MARYLAND
COLLEGE PARK CAMPUS
Department of Electrical Engineering

June 5, 1989

To: Colleagues of the 1989 NASA-ASEE Summer Faculty Fellowship Program at GSFC/WFF

Dear Colleague:

I am asking your Summer Faculty Fellow to deliver this letter to you. First, we want you to know our appreciation of your participation in the 1987 NASA-ASEE SFFP at GSFC/WFF. Without the kind of active involvement like yours, this program at GSFC/WFF would be impossible.

The 1989 NASA-ASEE SFFP at GSFC/WFF formally starts today for a period of ten (10) weeks. The University of Maryland is providing administrative support for this summer's program. To accommodate the wide variation of academic calendars these days, you may already have your Faculty Fellow on site for sometime or you may be expecting him/her in the next couple of weeks.

The SFFP is a NASA wide program. Its objectives, common features, and program descriptions are contained in a concise brochure distributed by the American Society of Engineering Education. A copy of the ASEE brochure is attached with this letter for your reference. Around the middle of July a questionnaire wil be sent to you requesting your evaluation, comments, and suggestions on the 1989 SFFP at GSFC/WFF.

Your Faculty Fellow will be spending approximately 90% of his/her time at GSFC/WFF conducting research. The remaining 10% is set aside for educational activities such as attending seminars, tours, and other special events. These activities are normally held each Friday afternoon from 1:00 p.m. to 3:00 p.m. All Fellows are encouraged to join these activities as soon as possible. We plan to invite some Colleagues like yourself as our seminar speakers. If you are interested in giving a seminar on your research/program to the Faculty Fellows, please contact Hal Boroson, at the University of Maryland, 454-6845 or at GSFC x65064 as soon as possible.

Your Faculty Fellow has also been asked to extend an invitation to you to the Annual Picnic of the NASA-ASEE SFFP at GSFC/WFF to be held on June 14, 1989

College Park, Maryland 20742 (301) 454-2442

at the Goddard Rec Center. (An invitation is attached). This is one of the social activities planned for the program at this time. The picnic is free for all NASA colleagues. The cost for you to bring a guest to this year's picnic may be $8.50. In the past we were able to waive the guest charge at the time of the picnic. Depending on attendance, we probably will be able to repeat the waiver in this year's event.

We are looking forward to seeing you at the picnic.

Sincerely yours,

Hal Boroson

Hal Boroson
Co-Director at the Unviersity
of Maryland

Attachment: Brochure, ASEE
Invitation to Picnic

End Date Aug 7, 1991

End of Document