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Materials Presented at the MU-SPIN Tenth Annual Users' Conference

Sponsored by NASA's Office of Equal Opportunity Programs
Minority University Research and Education Division

James Harrington, Jr., Goddard Space Flight Center, Greenbelt, Maryland
Pooja Shukla, ADNET Systems, Inc., Potomac, Maryland

Proceedings of a Conference held at
Morris Brown College and The Renaissance Atlanta Hotel
Atlanta, Georgia
September 11–16, 2000

"Celebrating Our Tenth Year With Our Eyes on the Prize"

December 2000

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The Minority University-Space Interdisiplinary Network (MU-SPIN) Program and NASA's Minority University Research and Education Division (MURED) both reached their 10th anniversaries. In honor of this occasion, the 2000 Annual Users' Conference held at Morris Brown College in Atlanta, Georgia, September 11-15, 2000, was the first to be jointly hosted by MU-SPIN and MURED. With the theme *"Celebrating Our Tenth Year With Our Eyes on the Prize,"* the conference provided a national forum for showcasing successful MU-SPIN and MURED Program (MUREP) experiences to enhance faculty/student development in areas of scientific and technical research and education.

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Mr. James L. Harrington, Jr.
Project Manager

Conference Summary

By James L. Harrington, Jr., MU-SPIN Project Manager

Celebrations and special events were in order this year as the Minority University-Space Interdisciplinary Network (MU-SPIN) Program and NASA's Minority University Research and Education Division (MURED) both reached their 10^{th} anniversaries. In honor of this occasion, the 2000 Annual Users' Conference held at Morris Brown College (MBC) in Atlanta, Georgia, September 11–15, 2000, was the first to be jointly hosted by MU-SPIN and MURED. It was particularly fitting that this anniversary should fall in the year 2000. The start of the new millennium propelled us to push bold new ideas and renew our commitment to minority university participation in all areas of NASA.

With the theme "Celebrating Our Tenth Year With Our Eyes on the Prize," the conference provided a national forum for showcasing successful MU-SPIN and MURED Program (MUREP) experiences to enhance faculty/student development in areas of scientific and technical research and education.

Our NASA-relevant conference agenda resulted in a record-breaking 220 registered attendees. Using feedback from past participants, we designed a track of student activities closely tailored to their interests. The resulting showcase of technical assistance and best practices set a new standard for our conferences in the years to come.

This year's poster session was our largest ever, with over 50 presentations from students, faculty, and teachers. Posters covered a broad range of NASA activities from "A Study of the Spiral Galaxy M101" to "Network Cabling Characteristics."

On Tuesday, September 12, the main sessions began with opening remarks by John Malone, MURED University Programs Specialist. We then received a prideful welcome from Dr. Delores Cross, President of MBC. Dr. Cross summarized the history of MBC as well as the importance of hosting this conference there. Next, we received our Keynote Address from Mr. George Reese, Associate Administrator for Equal Opportunity Programs at NASA Headquarters (HQ). Mr. Reese delivered a powerful, insightful address entitled "NASA Equal Opportunities and Diversity for the New Millennium." Mr. Reese communicated the importance of technology skills in the new millennium and provided examples of NASA missions requiring those skills. He projected a vision of diversity activities with real-life applications, such as the construction and inhabitance of the International Space Station. Next, Ms. Bettie White, Director of MURED at NASA HQ summarized MURED's achievements over the past decade and provided a vision of opportunities for the next 5 years that place minority institutions directly on the critical path of NASA's mission success. I followed Ms. White with a MU-SPIN update, and announced MU-SPIN's new tenth anniversary brochure that highlights a decade of achievement. I then proceeded to provide a vision for how we are structuring our outreach and technical assistance to achieve local, regional, and national goals for science and mathematics education while positioning our institutions, faculty, and teachers to participate in NASA missions at the highest levels.

Just before lunch, we recognized key individuals who would not be attending the evening awards ceremony. Mr. Joseph Bredekamp, NASA

Office of Space Science, Senior Science Program Executive/Information Systems and Ms. White were recognized for their significant contributions to the MU-SPIN program through the decade. Also recognized were Mr. Ghassem Asrar, NASA Office of Earth Science, Associate Administrator; Mr. Edward Weiler, NASA Office of Space Science, Associate Administrator; and Mr. Al Diaz, NASA Goddard Space Flight Center (GSFC) Director, for support and contributions to the MU-SPIN program.

After lunch, we looked back at a few examples of how MURED and MU-SPIN contributed to major advancements in science research and education for minority institutions and people with disabilities. Dr. Willie Brown, Jackson State University, related how they leveraged a $50,000 MU-SPIN award into over $10,000,000 in technology investments for the campus. Next, Ms. Joan Gil, a high school teacher from the Canutillo Independent School District in El Paso, Texas, shared how she advanced from having no understanding of technology to being awarded "Technology Teacher of the Year for the State of Texas." She explained that her leap in understanding technology was the result of attending workshops provided by MU-SPIN and the University of Texas at El Paso Network Resources and Training Site (NRTS). Dr. Nagi Wakim next shared how the valuable experience he gained as the first MU-SPIN project coordinator led to being awarded a NASA/National Science Foundation (NSF) "Model Institution for Excellence." Dr. Fred Okoh, Computer Science Department of MBC, communicated the importance of receiving their first Internet connectivity from MU-SPIN. Mr. Marcus Britt, a graduate of South Carolina State University and former student staff of the Center for Network Resources and Training related how he could compete with students from major universities for high technology jobs because of his experiences with MU-SPIN. We closed the MU-SPIN tribute with a new 10th anniversary video showcasing MU-SPIN triumphs over the past decade.

We then heard MURED program achievements. We first heard from Mr. Bill Staderman, a participant of Project Access, which facilitates the participation of individuals with disabilities in NASA science research and education. Dr. Horton Newsom of the University of New Mexico and Dr. Tom Chyba of Hampton University shared two excellent examples of what can be achieved through the MURED Precollege Awards for Excellence in Mathematics, Science, Engineering, and Technology (PACE/MSET).

In the evening, we held our Annual Awards Dinner where we recognized over fifty people for their contributions to MU-SPIN and MURED over the past 10 years. In particular, we recognized Mr. George Reese and Dr. Milton Halem, Assistant Director for Information Technology at NASA/GSFC, for their leadership in NASA management in diversity and support of MU-SPIN. I also received an award from MURED for my accomplishments with the MU-SPIN program.

Dr. Halem opened Day 2 with an impressive NASA Earth science update with information science technology talk. He showcased the major Earth Science platforms that anchor data analysis efforts for everything from global warming to ozone depletion. Dr. Halem challenged the MU-SPIN project to keep its technology prowess high and to create a new vision of "e-MU-SPIN". We then heard three best practices of implementing Earth Science relevancy at universities by Elizabeth City State University, City College of New York, and Wheeling Jesuit University.

Next, we presented Space Science activities with talks by Jim Barrowman, Deputy Director for the Space Science Directorate at NASA/

GSFC, and Dr. Phillip Sakimoto, NASA Space Science Outreach Specialist at NASA/HQ. Mr. Barrowman and Dr. Sakimoto both communicated NASA's major Space Science quests, the current and proposed platforms to accomplish those quests, and how our institutions could contribute. We then presented three best practices for developing competitive space science programs at minority institutions. Presenting were Astrophysics at South Carolina State University, Solar Research at Prairie View A&M University, and Collaborative Research at the University of Texas at Brownsville.

The day ended with Earth and Space Science Breakout Sessions where speakers and attendees could ask questions, request further information, and exchange experiences.

Day 3 began with Calls for Participation. This session was moderated by Mr. Dillard Menchan, Chief of the Office of Equal Opportunity Programs at NASA/GSFC. Mr. Menchan opened the session by providing advice to all attendees to get to know local NASA bureaucrats, because they can provide support for unsolicited ideas. We then received a presentation from Mr. Roger Hathaway of the Education Office of NASA Langley Research Center on NASA's Aero-Space Technology Programs. Mr. Hathaway communicated new opportunities for universities to play a role in research and development of the next generation of commercial flight research as well as the next generation of space transport.

We then held concurrent sessions that highlighted MU-SPIN partnerships and programs for NASA Science Education goals and NASA Flight Programs quests for diversity. Key contributions included information from Dr. Leo Edwards of Fayetteville State University who communicated that the MU-SPIN efforts have contributed to the tripling of minority institution participation in the NASA Opportunities for Visionary Academics program. Ms. Diane Robinson of Hampton University communicated her MU-SPIN support for participation in the Earth Systems Science Education Alliance program which provides asynchronous online training for teaching Earth Science in grades K-12. New partnerships with Mr. Joseph Watson of the American Association for the Advancement of Science and Dr. George Tuthill and Montana State University's Space Science Courses. Ms. Virginia Butcher announced her award from Earth Science Education to produce Remote Sensing Education curriculum based on the Urbanization of New York City in partnership with Tennessee State University, City College of New York and Morgan State University.

The Flight Programs Plenary Session was designed to facilitate dialogue between major flight programs, private industry, minority institutions and NASA to improve the representation of minority institutions and principal investigators on flight missions. A panel was convened and presentations were given by:

- Jet Propulsion Laboratory
- Johns Hopkins Applied Physics Laboratory
- Naval Research Laboratory
- International Technology Management Inc.
- SGT Inc.

- NASA/GSFC

The results from the presentations and the discussions were:

- Minority institution capabilities need more exposure
- Minority institutions need to become more involved in flight program conferences
- Major flight programs need to open the doors for meaningful partnerships
- MU-SPIN needs to play a significant role in brokering relationships

On the final day, we held a half-day conference wrap-up. We opened the floor for questions and answers, comments, and suggestions for next year. Our annual users' conferences play a major role for inspiring new activities for the upcoming fiscal year. This was surely the best ever!

MU-SPIN Tenth Anniversary Users' Conference
MURED Second Annual Education Conference

September 11-16, 2000
Morris Brown College & Renaissance Atlanta Hotel
Atlanta, GA

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MURED Second Annual Education Conference

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Main Agenda

Monday, September 11

6:30–9:30 p.m. Registration and Welcome Reception
Renaissance Atlanta Hotel, 25th Floor

6:30–9:30 p.m. Poster Session
Renaissance Atlanta Hotel, 25th Floor

Summer Engineering Bridge Program at University of Maryland Eastern Shore: Objectives and Enrichment Activities - Mr. Olatunde Alade, University of Maryland Eastern Shore

A Graphical Interface to Multi-Tasking Programming Problems - Dr. David S. Alijani, Southern University of New Orleans

A Comparison of Aeolian Processes and Landforms on Earth and Mars - Ms. Deithra L. Archie, New Mexico State University

Environmental Factor-Induced Dopaminergic Degeneration: Relevance to Parkinson's Disorder - Ms. Sarai Arnold

City College of New York NRTS - Dr. Shermane Austin, City College of New York

University of Texas at El Paso Engineering - Mr. Leo Arroyo, Mr. Alberto Campuzano and Mr. Miguel Campuzano, University of Texas at El Paso

Center for Network Resources and Training Space Science and Technology Academy One - Ms. Alice Baker, South Carolina State University

Comparative Analysis of New York City's Multi-Filtered Rotating Shadow-band Radiometers Network Data and its Use in Validation of the Student Polarimeter Aerosols and Cloud Experiment - Mr. Colley Baldwin, Mr. Kevin Brathwaite, Mr. Dereck Skeete, and Dr. Wilbert W. Hope, Medgar Evers College

A Study of the Spiral Galaxy M101 - Ms. Katrina Banks and Mr. Isaac Lister, Elizabeth City State University

The Ionization Structure of the Irregular Galaxy NGC 4449 - Ms. Tamara L. Battle, Medgar Evers College

Agents Profiles Learning Styles and Tutors - Dr. Constance Bland and Dr. Pamela Lawhead, Mississippi Valley State University

Investigations of a Toy Model of Dark Matter Clustering - Ms. Shayla Brooks and Mr. Vincent Davis, Elizabeth City State University; Ms. Tecora Hicks, Dr. Daniel M. Smith, Jr., South Carolina State University; and Mr. Nelvin Thomas, University of Virgin Islands

6:30–9:30 p.m. Poster Session - continued
Renaissance Atlanta Hotel, 25th Floor

Studies of Volatile Organic Compounds in Ambient Air Using Tetraglyme Scrubber - Mr. Delroy Burnett and Ms. Yvette Samuels, Medgar Evers College

The Hampton University Center for Lidar and Atmospheric Sciences Students (CLASS) - Dr. Tom Chyba, Hampton University

Portsmouth Atmospheric Science School (PASS) Project - Dr. Clarence D. Coleman, Norfolk State University

Model-Building for Active Constructive Problem Solving - Dr. Jose D'Arruda, University of North Carolina - Pembroke

Tuskegee University Gateway Achievement Program (TUGAP) - Ms. Cheryl Davis, Tuskegee University

The Use of the UNIX Operating System in Scientific Research - Mr. Melton Davis, Medgar Evers College

Mathematical Treatment of Buffered PH - Mr. Witzar Destin, Medgar Evers College

University of Texas at El Paso Engineering - Mr. Miguel Escobedo and Ms. Aracely Sandoval, University of Texas at El Paso

Collaborative Electrical Engineering Program at University of Maryland Eastern Shore - Dr. Ali Eydgahi, University of Maryland Eastern Shore

A Comparison of Aerosol Hand-held Polarimeter and GISS Sunphotometer Results - Mr. Nasraddine Fouad, LaGuardia Community College

Standards-Based Classroom Activities in Meteorology - Mr. Barry Fried and Mr. Ian Harding, Canarsie High School

Teacher Training Integrating SMET - Dr. Sangeeta Gad, University of Houston - Downtown

Dissociative Recombination of He2+ - Dr. Ken Hardy, Florida International University

Medgar Evers College Aeronautics and Earth Science Academy - Dr. William C. Harris, Medgar Evers College

Elizabeth City State University NRTS - Dr. Linda Hayden, Elizabeth City State University

Use of Mapping Skills Remote Sensing and GIS to Study the Impact of Land-Use/Land-Cover Change on the Environment - Ms. Roberta L. Hoffer, University of Texas at El Paso

Network Cabling Characteristics - Dr. James Holloway and Mr. Charlie Wrenn, Tennessee State University

6:30–9:30 p.m.

Poster Session - continued
Renaissance Atlanta Hotel, 25th Floor

NASA Student Polarimeter Aerosol and Cloud Experiment (SPACE) and Data Archiving - Ms. Torren L. Hope, Medgar Evers College, and Mr. Nigel Phillip, City College of New York

Spatial Distribution of Mercury Vapor in Homes in Brooklyn New York - Mr. Ryan Hutchinson, Medgar Evers College

Fifth Graders EarthKAM Explorations - Ms. Evon Jackson, Sinclair Elementary School

Creation of a Space Science Major in the Existing CUNY Baccalaureate Degree Program - Dr. Leon Johnson, Medgar Evers College

Measuring the Age of the Universe Using the Old Galactic Globular Clusters - Mr. Charles Jordan II, California State University at Los Angeles

Morgan State University NRTS - Dr. William Lupton, Morgan State University

Inspiring Careers in Engineering Mathematics and Science (ICEMS): Program Overview Achievements, Challenges, and Expectations - Dr. Edward McDonald, Clark Atlanta University and Mr. Richard Makerson, Morehouse College

Digital Technology and Libraries: Collaborating with the Scientific Community - Ms. Elaina Norlin and Ms. Patricia Morris, University of Arizona

Applied Computer Science Program Improvements at University of Maryland Eastern Shore - Dr. Daniel Okunbor, University of Maryland Eastern Shore

UMES-AIR: A NASA-UMES Collaborative Experiential Learning and Exploratory Research Project - Ms. ToWanda Samples, University of Maryland Eastern Shore

University of Texas at El Paso NRTS - Mr. Harry L. Schulte, University of Texas at El Paso

In Search of a Geophysical Model for Light Winds and Calms - Ms. Veronica Seals, Medgar Evers College

Satellite Imaging GOES to School - Ms. Aileen M. Seshun and Dr. Linda Hayden, Elizabeth City State University

Tennessee State University NRTS - Dr. Willard Smith, Tennessee State University

The Design and Construction of an Inexpensive CCD Camera for Astronomical Imaging - Mr. Ben Teasdel III, South Carolina State University

A Comparison of CCD Images of M57 Taken with Different Cameras - Mr. Taran Tulsee, Queens College/ Queensborough Community College

University of Texas at El Paso Science - Mr. Lenny Martin Vielma and Ms. Iliana Zuniga, University of Texas at El Paso

Monday, September 11 - continued

6:30–9:30 p.m.	Poster Session - continued *Renaissance Atlanta Hotel, 25th Floor*
	Climate Impacts on New York City's Water Resources - Ms. Edie Vinson, City College of New York
	An Analysis of the GISS GCM's Simulative Properties - Mr. Sonjae Wallace, York College
	South Carolina State University NRTS - Dr. Donald Walter, South Carolina State University
	Curriculum Enhancement through Space Science Research - Dr. Donald Walter, South Carolina State University
	Producing Certification Teachers in Mathematics and Science: An Innovative Approach - Ms. Stacy J. White and Dr. Tyrone Powell, Mississippi Valley State University
	Infusing Earth System Science Across Disciplines Through Interdisciplinary Experiential Education - Dr. Claudette Williams, Clark Atlanta University
	Prairie View A&M University NRTS - Dr. John Williams, Prairie View A&M University
	Total Optical Depth/Extinction Analysis of Aerosols in Correlation with Weather Variables Using a Multi-Filter Rotating Shadowband Radiometer - Mr. Lorenzo Williamson, Medgar Evers College
7:30–9:00 p.m.	NRTS Principal Investigator's Meeting – By invitation only *Renaissance Atlanta Hotel, 25th Floor, Boardroom*

Tuesday, September 12

7:00–8:00 a.m.	Breakfast

	Renaissance Atlanta Hotel, 25th Floor
8:00 a.m.	Buses leave for Morris Brown College
9:00–9:45 a.m.	Welcome and Announcements Hickman Student Bldg., Cunningham Auditorium Ms. Bettie White, Director, MURED; Mr. James Harrington, Project Manager, MU-SPIN; Dr. Dolores E. Cross, President, Morris Brown College; Mr. John Malone, University Programs Specialist, MURED; and Mr. George Reese, Associate Administrator, Equal Opportunity Programs, NASA Headquarters
9:45–10:30 a.m.	Keynote NASA *Equal Opportunities and Diversity for the New Millennium* - Mr. George Reese, Associate Administrator, Equal Opportunity Programs, NASA Headquarters
10:30–10:45 a.m.	Break
10:45–11:15 a.m.	MURED Project Update Ms. Bettie White, Director, MURED

Tuesday, September 12 - continued

11:15–11:45 a.m.	MU-SPIN Project Update Mr. James Harrington, Project Manager, MU-SPIN
11:45 a.m.–12:00 p.m.	Leadership Awards Presentation
12:00–1:30 p.m.	Lunch and Tour of Morris Brown College Hickman Student Bldg., Cunningham Auditorium
1:30–2:30 p.m.	MU-SPIN Showcase/MU-SPIN Tenth Anniversary Video; Dr. Willie Brown, Jackson State University; Ms. Joan Gil, Canutillo ISD; Dr. Nagi Wakim, Bowie State University; Dr. Fred Okoh, Morris Brown College; and MU-SPIN students
2:30–3:30 p.m.	MURED Showcase/NASA: Milleniun Mission Video; Mr. Bill Staderman, Virginia Tech University; Dr. Horton Newsom, University of New Mexico; and Dr. Tom Chyba, Hampton University

3:30–3:45 p.m.	Wrap-up and Announcements
4:00 p.m.	Buses leave for hotel
6:00–7:00 p.m.	Reception *Renaissance Atlanta Hotel, Georgia Ballroom Pre-Function Area*
7:00–9:30 p.m.	Awards Dinner *Renaissance Atlanta Hotel, Georgia Ballroom*

Wednesday, September 13

7:30–8:30 a.m.	Breakfast *Renaissance Atlanta Hotel, 25th Floor*
9:00–9:15 a.m.	Announcements Mr. Reginald Eason, Deputy Program Manager, MU-SPIN *Renaissance Atlanta Hotel, Georgia Ballroom*
9:15–9:45 a.m.	Earth Science Update *NASA Earth Science Update with Information Science Technology* - Dr. Milton Halem, NASA Goddard Space Flight Center
9:45–10:30 a.m.	Earth Science Programs *Earth System Science (ESS) Academy* - Dr. Linda Hayden, Elizabeth City State University *Weather Watcher Institute* - Dr. Shermane Austin, City College of New York *Earth System Science Education Alliance (ESSEA) Online Courses* - Dr. James A. Botti, Wheeling Jesuit University
10:30–10:45 a.m.	Break

Wednesday, September 13 - continued

10:45–12:00 p.m.	Space Science Update
	Mr. Jim Barrowman, NASA Goddard Space Flight Center
	Space Science/OEOP NRA Overview - Dr. Phil Sakimoto, NASA Headquarters
	Space Science/OEOP NRA Awardees Presentations - TBA
12:00–1:00 p.m.	Lunch *Renaissance Atlanta Hotel, 25th Floor*
1:00–2:30 p.m.	Space Science Programs
	Building a Program in Astrophysics - Dr. Don Walter, South Carolina State University
	Solar Research Program - Dr. Tian-Sen Huang, Prairie View A&M University
	A Successful Story of Collaborative Research - Mr. Mario C. Diaz, University of Texas at Brownsville
2:30–2:45 p.m.	Break
2:45–4:15 p.m.	Earth Science Break-out Session *Renaissance Atlanta Hotel, Atlanta Ballroom C*
2:45–4:15 p.m.	Space Science Break-out Session *Renaissance Atlanta Hotel, Atlanta Ballroom D*
4:15–4:30 p.m.	Wrap-up and Announcements
	Dinner on your own

Thursday, September 14

7:30–8:30 a.m.	Breakfast *Renaissance Atlanta Hotel, 25th Floor*
9:00–9:10 a.m.	Announcements Mr. James Harrington, MU-SPIN Project Manager *Renaissance Atlanta Hotel, Georgia Ballroom*

9:10–10:30 a.m. Calls for Participation

Introduction - Mr. Dillard Menchan, NASA Goddard Space Flight Center

Linkages 2001 - Dr. Mabel Phifer, International Telecommunications Services (ITS), and Ms. Kimberly Phifer-McGee, Florida A&M University

Assessing Agricultural Land Conversion Impacts to Tribal Fisheries Using Satellite Multispectral Imagery - Mr. Michael Cochrane, Northwest Indian College

Thursday, September 14 - continued

9:10–10:30 a.m.	Calls for Participation - continued *Consortium for Undergraduate Research Experience* - Mr. Dean Arvidson, Los Angeles City College *Integration of Multidisciplinary Engineering Analysis Software for Teaching and Research* - Dr. Chivey C. Wu, California State University at Los Angeles
9:10–10:30 a.m.	PAIR Meeting – By invitation only Dr. Mabel Mattews, NASA Headquarters and Mr. James Jackson, NASA Goddard Space Flight Center *Renaissance Atlanta Hotel, Buckhead*
10:30–10:45 a.m.	Break
10:45–11:00 a.m.	Aero-Space Technology Update Mr. Roger Hathaway, NASA Langley Research Center
11:00–11:15 a.m.	Aero-Space Technology Programs *Detection of Objects Hidden in Highly Scattering Media Using Time-Gated Imaging Methods* - Mr. Pierre A. Galland, City College of New York, Institute for Ultrafast and Spectroscopy and Lasers
11:15 a.m.–12:15 p.m.	Flight Programs Panel Break-out Session *Renaissance Atlanta Hotel, Atlanta C & D* Moderator - Mr. Jerome Bennett, NASA Goddard Space Flight Center; Ms. Shari Asplund, Jet Propulsion Laboratory; Dr. George Carruthers, Naval Research Laboratory; Dr. Nicola J. Fox, Johns Hopkins University, Applied Physics Laboratory; Mr. Darrell Kelly, International Technology Management Inc. (ITMI); Mr. David G. Naves, SGT Inc.; Ms. Stephanie Stockman, NASA Goddard Space Flight Center; and Dr. Gilbert Yanow, Jet Propulsion Laboratory
11:15 a.m.–12:15 p.m.	Education Programs Moderator - Ms. Mary Anne Stoutsenberger, NASA Headquarters *Science, Engineering, Mathematics Aerospace Academy (SEMAA)* - TBA *Windows of the Universe* - Dr. Jeff Goldstein, Challenger Center for Space Science Education

Multidisciplinary, Multicultural, Urban Watershed Protection and Environmental Education Project - Dr. David Padgett, Tennessee State University

12:15–1:15 p.m.	Lunch *Renaissance Atlanta Hotel, 25th Floor*
1:15–2:35 p.m.	Flight Programs Panel Break-out Session - continued *Renaissance Atlanta Hotel, Atlanta C & D*

Thursday, September 14 - continued

1:15–2:35 p.m.	Education Programs - continued
	NOVA *Update* - Dr. Leo Edwards, Fayetteville State University; Dr. Matthew Edwards, Spelman College; and Dr. Victor O. Aimiuwu, Central State University
	Space Science Courses - Dr. George Tuthhill, Montana State University
	ESSEA Program at Hampton University - Dr. Diane Robinson, Hampton University
	Project VISION: A Collaborative Effort on Curriculum Development/Collaborative Research - Dr. Gustavo Roig, Florida International University
2:35–2:50 p.m.	Break
2:50–4:50 p.m.	Flight Programs Panel Break Out Session - continued *Renaissance Atlanta Hotel, Atlanta C & D*
2:50–4:50 p.m.	Education Programs - continued
	The Pigeon Adventure and ECHO Books - Ms. Ginger Butcher, NASA Goddard Space Flight Center
	American Association for the Advancement of Science (AAAS) - Mr. Joseph Watson, American Association for the Advancement of Science
	Negotiating the Learning Process Electronically - Dr. Marino C. Alvarez, Dr. Michael Busby, Dr. Geoffrey Burks, Ms. Goli Sotoohi, Ms. Montanez Wade, Ms. Keinan Brooks, Tennessee State University
	An Illustration of the Hybrid Model of Instruction: Energy and its Transformation - Dr. Subhash C. Bhatia, Morehouse College
	Sun Earth Connection Education Forum - Ms. Carolyn Ng, NASA Goddard Space Flight Center
4:50–5:00 p.m.	Wrap-up and Announcements
5:30 p.m.	Buses leave for group dinner
6:00 p.m.	Group Dinner - TBA

Friday, September 15

8:30–9:30 a.m. Breakfast
Renaissance Atlanta Hotel, 25th Floor

10:00–11:00 a.m. Student Track Report
Renaissance Atlanta Hotel, Georgia Ballroom

11:00 a.m.–12:00 p.m. Conference Wrap-up and Giveaways

2:00–6:00 p.m. Group Activity
Speed Zone

Saturday, September 16

10:00 a.m.–4:00 p.m. Group Activity #1
Stone Mountain

10:15 a.m.–1:00 p.m. Group Activity #2
Walking Tour of the MLK District

MU-SPIN Tenth Annual Users' Conference
MURED Second Annual Education Conference
Morris Brown College
Atlanta, GA
September 11-16, 2000

Attendee List

Mr. Samuel Adams
Prairie View A&M University
1A109A Hobart Taylor Sr. Hall
PO Box 2576
Prairie View, TX 77446
936-857-2595
936-857-4150
sam_adams@pvamu.edu

Dr. Victor O. Aimiuwu
Central State Unversity
Natural Sciences Mathematics and Computer Science Dept.
1400 Brushrow Road
Wilberforce, OH 45384
937-376-6306
937-376-6585
vaimiuwu@csu.ces.edu

Mr. Olatunde Alade
University of Maryland at Eastern Shore
Electrical Engineering Dept.
30806 University Blvd. South
Princess Anne, MD 21853-1299
410-548-9138
410-651-6486
blackmamba81@hotmail.com

Dr. David S. Alijani
Southern University of New Orleans
Graduate Studies Programs in CIS
6400 Press Drive
New Orleans, LA 70126
504-284-5423
dalijani@ix.netcom.com

Dr. Richard A. Alo
University of Houston - Downtown
Center for Computational Sciences
One Main Street
Suite 722-South
Houston, TX 77002
713-221-8207
713-226-5290

Dr. Marino C. Alvarez
Tennessee State University
Teaching and Learning Dept.
John Merritt Blvd.
Nashville, TN 37203
615-963-7328
615-963-7927
malvarez@coe.tsuniv.edu

Mr. Aaron Andrews
UNCFSPC
IDAP
8620 Willow Oaks Corporate Drive
Code 1008
Fairfax, VA 22031-8044
703-205-7642
703-205-7645
aandrews@uncf.org

Mr. Lewis Andrews
Sojourner Douglas College
Sponsored Programs
500 N. Caroline Street
Baltimore, MD 21117
410-276-0306 x236
410-675-1810
leandrews_99@yahoo.com

Ms. Deithra L. Archie
New Mexico State University
Geology Dept.
Las Cruces, NM 88003
505-522-1660
deithra@yahoo.com

Mr. Tim Armstrong
Jarvis Christian College
Hwy 80 east
Hawkins, TX 75765
903-769-5717
903-769-4842
tim_armstrong@jarvis.edu

Ms. Sarai Arnold
Baton Rouge Magnet High School
PO Box 128
White Castle, LA 70788
225-545-8014
saraiarnold@hotmail.com

Mr. Leo Arroyo
University of Texas at El Paso
NASA NRTS
500 West University Avenue
UGLC 308
El Paso, TX 79968
915-747-5058
915-747-5350
larroyo@utep.edu

Mr. Dean Arvidson
Los Angeles City College
Dept. of Physics
855 North Vermont Avenue
Los Angeles, CA 90029
323-953-4318
deanarvidson@earthlink.net

Ms Shari Asplund
Jet Propulsion Laboratory
Discovery Program
4800 Oak Grove Drive
Pasadena, CA 91109-8099
818-354-7280
818-393-3778
shari.e.asplund@jpl.nasa.gov

Dr. Magdy Attia
Johnson C. Smith University
Computer Science and
Engineering Dept.
100-300 Beatties Ford Road
Charlotte, NC 28216
704-378-1140
704-330-1395
mattia@jcsu.edu

Dr. Shermane Austin
City College of New York
Dept. of Computer Science and
Information Systems
138th Street and Convent
Avenue
New York, NY 10031
212-650-6164
212-650-6155

Mr. Alberto Avalos
University of Texas at El Paso
Mathematical Sciences Dept.
500 West University
El Paso, TX 79968-0514
915-747-5761
915-747-6502
big_avalos@mail.com

Mr. Jose Ruben Avalos
University of Texas at El Paso
Mathematical Sciences Dept.
500 West University
El Paso, TX 79968-0514
915-747-5761
915-747-6502
new_buster@yahoo.com

Ms. Alice Baker
South Carolina State University
Center for Network Resources
and Training
300 College Street
Orangeburg, SC 29117
803-533-8797
803-536-8569
alice@eejust.scsu.edu

Mr. Colley Baldwin
Medgar Evers College
Dept. of Physical Environment
and Computer Science
1150 Carroll Street
Brooklyn, NY 11225
718-270-6453
718-270-6197

Ms. Katrina Banks
Elizabeth City State University
Computer Science &
Mathematics
Elizabeth City, NC 27909
katrina@umfort.cs.ecsu.edu

Ms. Delores Banks
The National Academics
Fellowship Office
OSEP/TJ2036
2101 Constitution Avenue NW
Washington, DC 20418
202-334-2909
202-334-3419
dbanks@nas.edu

Dr. Prentice Baptiste
New Mexico State University
Educational Research Center
P.O. Box 30001
Las Cruces, NM 88003-8001
505-646-2616
505-646-7710
baptiste@nmsu.edu

Dr. James Barrowman
NASA Goddard Sapce Flight
Center
Code 600
Greenbelt, MD 20771
301-286-8824
301-286-1772
jim.barrowman@gsfc.nasa.gov

Ms. Tamara L. Battle
Medgar Evers College
Physical Environmental &
Computer Sciences
1150 Carroll Street
Room #417

Brooklyn, NY 11225
718-778-4428

Mr. David Baxter
F. M. Black Middle School
1575 Chantilly Lane
Houston, TX 77018
713-613-2508
713-613-2533

Dr. Subhash C. Bhatia
Morehouse College
Chemistry Dept.
830 Westview Drive
Atlanta, GA 30314
404-681-2800 x2286
404-614-3782
sbhatia@morehouse.edu

Dr. Constance Bland
Mississippi Valley State University
Mathematics Computer &
Information Sciences
4000 Hwy 82 West
Itta Bena, MS 38941
662-254-3421
662-254-3408
cgbland@mvsu.edu

Ms. Susan Boggess
Prairie View A&M University
PO Box 667
Prairie View, TX 77446
936-857-2246
936-857-4942
susan_boggess@pvamu.edu

Mr. Jim Botti
Wheeling Jesuit University
NASA Classroom of the Future
316 Washington Avenue
CET Bldg
Wheeling, WV 26003
304-243-4324
304-243-2497
jbotti@cet.edu

Mr. Kevin Brathwaite
Medgar Evers College
Dept. of Physical Environment
and Computer Science
1150 Carroll Street
Brooklyn, NY 11225
718-270-6453
718-270-6197

Mr. Joseph H. Bredekamp
NASA Headquarters
Office of Space Science
Code SA
Washington, DC 20546
202-358-2348
joe.bredekamp@hq.nasa.gov

Mr. Marcus K. Britt
285 Sandhill Road
Dorchester, SC 29437
803-563-6085
marcus_britt@hotmail.com

Ms. Shayla Brooks
Elizabeth City State University
Computer Science and
Mathematics
Elizabeth City, NC
shayla@umfort.ecsu.edu

Ms. Keinan Brooks
Tenneessee State University
Center of Excellence in
Information Systems
330 Tenth Avenue North
Box 139
Nashville, TN 37203-3401

Ms. Robin Brown
ADNET Systems Inc.
MU-SPIN Project
NASA Goddard Space Flight
Center
Code 933
Greenbelt, MD 20771
301-286-3409
301-286-1775

Dr. Willie Brown
Jackson State University
Computer Science Dept.
1400 J. R. Lynch St.
Jackson, MS 39217
601-968-2105
601-968-2478
wbrown@ccaix.jsums.edu

Dr. Geoffrey Burks
Tenneessee State University
Center of Excellence in
Information Systems
330 Tenth Avenue North
Box 139
Nashville, TN 37203-3401

Mr. Delroy Burnett
Medgar Evers College
Dept. of Physical Environment
and Computer Science
1150 Carroll Street
Brooklyn, NY 11225
718-9496-8224
708-270-6197
bursha@aol.com

Dr. Michael R. Busby
Tennessee State University
Center of Excellence in
Information Systems
330 Tenth Avenue North
Box 139
Nashville, TN 37203-3401

Ms. Ginger Butcher
SSAI
NASA Goddard Space Flight
Center
Greenbelt, MD 20771
301-614-6540
301-614-6015
ginger@ltpmail.gsfc.nasa.gov

Ms. Shirl R. Byron
Morgan State University
Computer Science Dept.
Baltimore, MD 21239
443-885-3745
sbyron@morgan.edu

Ms. Lisa Campbell
Jet Propulsion Laboratory
Educational Affairs
Office/Minority Initiatives
4800 Oak Grove Drive
Mail Stop 180
Room 109
Pasadena, CA 91109-8099
818-354-1444

Mr. Alberto Campuzano
University of Texas at El Paso
NASA NRTS
500 West University Avenue
UGLC 308
El Paso, TX 79968
915-747-5058
915-747-5350
acampu@utep.edu

Mr. Malcolm Cannon
ADNET Systems Inc.
MU-SPIN Project
NASA Goddard Space Flight
Center
Code 933
Greenbelt, MD 20771
301-286-0549
301-286-1775

Dr. George Carruthers
Naval Research Laboratory
Washington, DC 20375-5320
202-767-2764
george.carruthers@nrl.navy.mil

Ms. Beatrice Cartoleno

Dr. Tom Chyba
Hampton University
Dept. of Physics
1 Emancipation Drive
Olin Engineering Bldg.
Room 102H
Hampton, VA 23668
757-727-5824
757-728-6910

Ms. Mildred Coats
CTSPS Clark Atlanta University
Brawley Drive
Atlanta, GA 30314
404-792-0497
404-792-0497
mcoats@mindspring.com

Mr. Michael Cochrane
Northwest Indian College
2522 Kwina Road
Bellingham, WA 98226
360-373-2772 x299
360-738-0136
mcochrane@nwic.edu

Dr. Bobbie Coleman
The College of Santa Fe
Education Dept.
1600 St. Michael's Drive
Santa Fe, NM 87505
505-466-6838
505-466-0385
nasamobile@aol.com

Dr. Clarence D. Coleman
Norfolk State University
University Advancement
700 Park Avenue
Suite 410
Norfolk, VA 23504-8003
757-823-8323
757-823-2405
cdcoleman@nsu.edu

Ms. Tisha Coleman
Prairie View A&M University
1A109A Hobart Taylor Sr. Hall
PO Box 2576
Prairie View, TX 77446
936-857-2595
936-857-4150
tishia_coleman@pvamu.edu

Ms. Brenda Collins
NASA Ames Research Center
Minority University Programs
Code 223-3
Room 111
Moffett Field, CA 94035
650-604-3540
650-604-3869
bcollins@mail.arc.nasa.gov

Dr. Dolores Cross
Morris Brown College
Office of the President
643 Martin Luther King Jr. Drive
NW
Atlanta, GA 30314-4140
404-220-0100
dcross@morrisbrown.edu

Ms. Cheryl Davis
Tuskegee University
Allied Heath Sciences
Nurses Road
Room 200
Tuskegee, AL 36088
334-727-8335
334-727-8259
davis@tusk.edu

Mr. Vincent Davis
Elizabeth City State University
Physical Sciences
Elizabeth City, NC 27909

Mr. Melton Davis
Medgar Evers College
Dept. of Physical Environment
and Computer Science
1150 Carroll Street
Brooklyn, NY 11225
718-297-6355
718-270-6197

Ms. Witzar Destin
Medgar Evers College
Dept. of Physical Environment
and Computer Science
1150 Carroll Street
Brooklyn, NY 11225
718-270-6197
live4rapture@usa.net

Mr. Mario C. Diaz
University of Texas at Brownsville
Physical Sciences Dept.
80 Fort Brown
Brownsville, TX 78520
956-574-6641
956-574-6642
mdiaz@utb1.utb.edu

Mr. Vincent Didwall
Morgan State University
Computer Science Dept.
1700 E. Coldspring Lane
Calloway Hall
Room 205
Baltimore, MD 21251
443-885-3962
410-319-3628

Ms. Cynthia Dinkins
Satellite Broadcasting and
Communications Association
The T. Howard Foundation
225 Reinekers Lane
Suite 600
Alexandria, VA 22314
703-739-8346
703-549-7640

Ms. Charlene Dorn
UNCFSPC
IDAP
8260 Willow Oaks Corporate Drive
Code 1008
Fairfax, VA 22031-8044
703-205-7641
703-205-7645
cdorn@uncf.org

Ms. Maylene Duenas
NASA/Ames Research Center
MS 19-6
Moffett Field, CA 94035
650-604-6370
mdüenas@mail.arc.nasa.gov

Ms. Jasmyn Dyer
McKinley High School
12479 Pride Port Hudson Road
Zachary, LA 70791
225-658-7778
jasmyndyer@hotmail.com

Mr. Reginald Eason
MU-SPIN
NASA Goddard Space Flight
Center
Greenbelt, MD 20771
301-286-4633
301-286-1775
reggie@muspin.gsfc.nasa.gov

Dr. Leo Edwards
Fayetteville State University
Mathematics & Science
Education Center
1200 Murchinson Road
SBE 328
Fayetteville, NC 28301
910-486-1669
910-486-1862

Dr. Matthew Edwards
Spelman College
350 Spelman Lane
Atlanta, GA 30314
404-215-7806
404-215-2784
medwards@spelman.edu

Dr. Efremfon Ekpo
Bethune-Cookman College
Physics Dept.
640 Dr. M. M. Bethune Blvd.
Daytona Beach, FL 32114
904-255-1401 x532
904-239-8316
ekpoe@cookman.edu

Mr. Miguel Escobedo
University of Texas at El Paso
NASA NRTS
500 West University Avenue
UGLC 308
El Paso, TX 79968
915-747-5058
915-747-5350
escobedo@utep.edu

Ms. Billie Evans
Prairie View A&M University
PO Box 667
Prairie View, TX 77446
936-857-2246
936-857-4942
billie_evans@pvamu.edu

Dr. Ali Eydgahi
University of Maryland Eastern
Shore
Dept. of Engineering and
Aviation Sciences
30806 University Blvd.
Princess Anne, MD 21853
410-651-7559
410-651-6486

Dr. James Falco
Heritage College
Arts and Sciences Division
3240 Fort Road
Toppenish, WA 98948
509-865-8580
509-865-4469
falco_j@heritage.edu

Mr. Tom Fitzgerald
ADNET Systems Inc.
MU-SPIN Project
NASA Goddard Space Flight Center
Code 933
Greenbelt, MD 20771
301-286-9514
301-286-1775

Mr. Nasraddine Fouad
LaGuardia Community College
fnasraddin@yahoo.com

Dr. Nicola J. Fox
Johns Hopkins University
Applied Physics Laboratory
1100 Johns Hopkins Road
Room 7-302
Laurel, MD 20723-6099
240-228-3529
240-228-6670
nicola.fox@jhuapl.edu

Mr. Maurice Foxworth
Foxworth & Dinkins Inc.
6852 Julian Avenue
St. Louis, MO 63130
888-857-0462
mofox@foxdin

Ms. Betsy Frederick
New Mexico Technet
New Mexico HS Supercomputing Challenge
5921 Jefferson NE
Albuquerque, NM 87109
505-220-5050
505-281-9496
betsy@nm.net

Mr. Barry Fried
Canarsie High School
Science Dept.
1600 Rockaway Parkway
Brooklyn, NY 11236
718-487-0660
718-487-0681
bfriedfab4@aol.com

Dr. Sangetta Gad
University of Houston - Downtown
Center for Computational Sciences and Advanced Distributed Simulation
One Main Street
Suite 722-South
Houston, TX 77002
713-221-8432 OR 86

Mr. Pierre A. Galland
City College of New York
Institute for Ultrafast and Spectroscopy and Lasers
Dept. of Physics and Electrical Engineering
Room J-419
New York, NY 10031
212-650-5531

Ms. Amy Garcia
New Mexico State University/MASEF
Education Research Center
PO Box 30001
MSC 3R
Las Cruces, NM 88003-8001
505-646-2616
505-646-7710

Ms. Joan Gil
Cantutillo ISD
Curriculum and Instruction
7273 Bosque Road
Attn: Bill Childress Elementary
Cantutillo, TX 79932
915-877-9440
giljoan@hotmail.com

Dr. Stephen D. Gillam
Jet Propulsion Laboratory
Table Mountain Observatory
Wrightwood, CA 92397
760-249-6610
760-249-5392
gillam@tmo48inch.jpl.nasa.gov

Dr. Jeff Goldstein
Challenger Center for Space Science Education
1250 North Pitt Street
Alexandria, VA 22314
703-683-9740
703-683-7546
jgoldstein@challenger.org

Dr. Henry Gore
Jackson State University
Mathematics Dept.
John R. Lynch Street
PO Box 17610
Jackson, MS 39217
601-979-2161
601-979-5852
hgore@ccaix.jsums.edu

Ms. Kristin Gorter
University of Texas at El Paso
Mathematical Sciences Dept.
500 West University
El Paso, TX 79968-0514
915-747-5761
915-747-6502
k23kg@aol.com

Ms. Cyn Hadnott
4423 Lehigh Road
Apt. #145
College Park, MD 20740
301-408-1548
301-408-1096
muspin@yahoo.com

Dr. William C. Harris
Medgar Evers College
Dept. of Physical Environment
and Computer Science
1150 Carroll Street
Brooklyn, NY 11225
718-270-6449
718-270-6197
wharris@acm.org

Ms. Tecora Hicks
South Carolina State University
School of Engineering
Technology & Sciences
Orangeburg, SC 29117
tecora97@hotmail.com

Mr. Ian Harding
Canarsie High School
Science Dept.
1600 Rockaway Parkway
Room 330
Brooklyn, NY 11236
718-487-0607
718-487-0681
bonedoc570@aol.com

Ms. Keisha Harrison

Mr. Anthony Hill
PO Box 1007
Hempstead, TX 77445
979-826-5503
979-826-5510
hilla@hempstead.isd.esc4.net

Ms. Wanda Harding
NASA Kennedy Space Center
Mail Code VB-C
KSC, FL 32822
321-431-9354
wanda.harding-1@ksc.nasa.gov

Mr. Roger Hathaway
NASA Langley Research Center
Office of Education
Hampton, VA 23681-2199
757-864-3312
757-864-6521
r.a.hathaway@larc.nasa.gov

Dr. Roberta L. Hoffer
University of Texas at El Paso
Dept. of Geological Sciences
500 West University Street
El Paso, TX 79968
915-747-5101
915-747-5073
rhoffer510@aol.com

Dr. Ken Hardy
Florida International University
Physics Dept.
University Park
Miami, FL 33199
305-348-2605
305-348-6700
hardyk@fiu.edu

Mr. Warren Hawkins
Wiley College
711 Wiley Avenue
Marshall, TX 75670
903-927-3236
903-938-8100
whawkins@wileyc.edu

Dr. James Holloway
Tennessee State University
computer Science Dept.
3500 John Merritt Blvd.
Nashville, TN 37209
615-963-5874
615-963-5847
jholloway@tnstate.edu

Mr. James Harrington Jr.
MU-SPIN
NASA Goddard Space Flight
Center
Greenbelt, MD 20771
301-286-4063
301-286-1775
james@muspin.gsfc.nasa.gov

Dr. Linda Hayden
Elizabeth City State University
Mathematics and Computer
Science
1704 Weeksville Road
Box 672
Elizabeth City, NC 27909
252-335-3696
252-335-3790

Dr. Wilbert W. Hope
Medgar Evers College
Dept. of Physical Environment
and Computer Science
1150 Carroll Street
Brooklyn, NY 11225
718-270-6451
718-270-6197
wilbert@mec.cuny.edu

Ms. Torren L. Hope
Medgar Evers College
Dept. of Physical Environment
and Computer Science
1150 Carroll Street
Brooklyn, NY 11225
718-270-6197
torren@netzero.net

Mr. Ryan Hutchinson
Medgar Evers College
Dept. of Physical Environment
and Computer Science
1150 Carroll Street
Brooklyn, NY 11225
718-270-6197
ryanoh1@yahoo.com

Mr. Ashok Jha
ADNET Systems Inc.
11260 Roger Bacon Drive
Suite 403
Reston, VA 20190
703-709-7218
703-709-7219
ajha@adnet-sys.com

Dr. Che-Taso Huang
York College of City University of
New York
Academic Computing
94-20 Guy R. Brewer Blvd.
Jamaica, NY 11451
718-262-2750
718-262-2114
huang@york.cuny.edu

Mr. James Jackson
NASA Goddard Space Flight
Center
Minority University Programs
Office
Greenbelt, MD 20771
301-286-4086
301-286-1610
James.A.Jackson.1@gsfc.nasa.go

Dr. Leon Johnson
Medgar Evers College
Dept. of Physical Environment
and Computer Science
1150 Carroll Street
Brooklyn, NY 11225
718-270-6440 OR 64
212-243-5496
lpjohnson99@cswebmail.com

Dr. Tian-Sen Huang
Prairie View A&M University
Solar Observatory
Prairie View, TX 77446
936-857-2859
936-857-4148
tshuang@cps.pvsci.pvamu.edu

Ms. Evon Jackson
Sinclair Elementary School
Baltimore, MD 410-885-3745
410-319-3963
sbyron@morgan.edu

Mr. Paul Johnson
Prairie View A&M University
PO Box 4079
Prairie View, TX 77446
936-857-2317
936-857-2325
paul_johnson@pvamu.edu

Dr. Tom Hughes
Kentucky State University
Computer Science Dept.
400 East Main Street
Frankfort, KY 40601
502-227-6385
hughestm@navair.navy.mil

Mr. Patrick Jackson
10721 Mesa Drive
Houston, TX 77078
713-633-4334
713-633-4377
pjackson@nfisdnrts.northforest.k12
.tx.us

Mr. Charles Jordan III
California State University at Los
Angeles
306 East 115 Street
Los Angeles, CA 90061
323-777-2256
bucc_i@yahoo.com

Mr. Norman J. Hunter
Prairie View A&M University
PO Box 2098
Prairie View, TX 77446
936-857-2595
norman_hunter@pvamu.edu

Ms Taunya Jenkins
The LaVal Corporation
5152 7th STreet NE
Washington, DC 20011
202-529-6678
202-635-0810
tj6678@aol.com

Ms. Alicia Joseph
Medgar Evers College
Physical Environmental &
Computer Science
1150 Carroll Street
Room 407
Brooklyn, NY 11225
718-270-6455
718-270-6197

Mr. Darrell Kelly
International Technology
Management Inc. (ITMI)
6301 Ivy Lane
Suite 620
Greenbelt, MD 20770
301-474-6060 x107
301-474-6064
dkelly@itmi1.com

Dr. Reza Khanbilvardi
City College of New York
C E Department
138th Street and Convent
Avenue
Room T-107
New York, NY 10956
212-650-8009
212-650-8097

Mr. Jerome Kohn
Queensborough Community
College
Administrative Affairs
222-05 56th Avenue
Administration Bldg.
Room A-508
New York, NY 11364
718-631-6221

Mr. Jean Laguerre
City College of New York
Computer Science Dept.
138th Street and Convent
Avenue
NAC Bldg.
Room 7/309
New York, NY 10031
212-650-6155

Mr. Thomas Lavence

Dr. Pamela Lawhead
University of Mississippi
Computer and Information
Science Dept.
302 Weir Hall
University, MS 38677
662-915-5356
662-915-5623
lawhead@cs.olemiss.edu

Ms. Lillybet Ledo
Florida International University
HCET
10555 W. Flagler Street
EAS2100
Miami, FL 33174
305-348-1406
305-348-1852
lilly@eng.fiu.edu

Mr. Isáac Lister
Elizabeth City State University
Computer Science &
Mathematics
Elizabeth City, NC 27909
252-335-4590
isaac_lister@hotmail.com

Ms. Lu Liu
University of Texas at El Paso
Chemistry Dept.
500 West University Avenue
El Paso, TX 79968
915-747-5849
915-747-5701
luliu@utep.edu

Dr. Jeannette Lorem
Lane College
Education Department
545 Lane Avenue
Jackson, TN 38301
901-426-7636
jlovern@lanecollege.edu

Mr. Willie Love
NASA Stennis Space Center
Stennis Space Center, MS 39529

Dr. Stephen Lucci
City College of New York
Computer Science Dept.
138th Street and Convent
Avenue
New York, NY 10031
212-650-6156
212-650-6184
lucci@cs-mail.engr.ccny.cuny.ed

Dr. William Lupton
Morgan State University
Computer Science Dept.
1700 E. Coldspring Lane
Calloway Hall
Room 205
Baltimore, MD 21251
443-885-3962
443-319-3963

Dr. Beverly Lynds
University Corporation for
Atmospheric Research
Unidata
3300 Mitchell Lane
Suite 170
Boulder, CO 80301
303-497-8654
303-497-8668

Mr. Richard Makerson
Morehouse College
830 Westview Drive SW
Atlanta, GA 30314

Mr. John Malone
NASA Headquarters
300 E Street SW
Washington, DC 20546
202-358-0948
202-358-3745
jmalone@mail.hq.nasa.gov

Dr. Shirley McBay
Quality Education for Minorities (QEM) Network
1818 N. Street NW
Suite 350
Washington, DC 20036
202-659-1818
202-659-5408
smmcbay@qem.org

Mr. Dillard Menchan
NASA Goddard Space Flight Center
Equal Opportunity Program Office
Greenbelt, MD 20771
301-286-7348
301-286-0298
dmenchan@pop100.gsfc.nasa.g

Ms. Jan Mangana
Hampton University
Dept. of Physics
Room 203
Hampton, VA 23668
757-728-6908
jan.mangana@hamptonu.edu

Ms. Debbie McCallum
NASA Goddard Space Flight Center
Code 293
Greenbelt, MD 20771
301-286-7141
301-286-0249
dmccallu@pop200.gsfc.nasa.gov

Dr. Noureddine Milikechi
Delaware State University
Physics Dept.
1200 N. Dupont Highway
Dover, DE 19901
302-857-6656
302-857-6807
melik@dsc.edu

Mr. Igor Maslov
City College of New York
Computer Science Dept.
137th Street and Convent Avenue
NAC 7/309
New York, NY 10031
212-650-6503
ivm3@columbia.edu

Dr. Edward McDonald
Clark Atlanta University
Mathematics Dept.
James P. Brawley Drive at Fair Street
Room 205
Atlanta, GA 30314
404-880-6000 x6028
404-880-8677

Dr. Ali Modarres
California State University - Los Angeles
Center for Spatial Analysis and Remote Sensing
5151 State University Drive
Los Angeles, CA 93021
323-343-3788
323-343-3774

Ms. Gillian Massey
California State University - Northridge
College of Engineering and Computer Science
18111 Nordhoff Street
Mail Stop 8295
Room 2101E
Northridge, CA 91330

Ms. Essie McFarland
ICEMS
2362 Deer Pass Way
Decatur, GA 30035
404-288-0221
404-755-7564

Ms. Patricia Morris
University of Arizona
Science-Engineering Library
SEL 206
Tucson, AZ 85721
520-621-6375
520-621-3655
pmorris@bird.library.arizona.edu

Dr. Mabel Matthews
NASA Headquarters
300 E Street SW
Code EU
Washington, DC 20546
202-358-0406
202-358-3745
mmatthew@hq.nasa.gov

Mr. Vidhya Mellakrod
University of Texas at El Paso
Undergraduate Learning Center
500 West University
Suite 304
El Paso, TX 79968
915-747-5058

Ms. Stepahnie Moultrie
Florida A&M University
School of Graduate Studies
Continuing Education & Research
GEC Unit C
Room 103
Tallahassee, FL 32307-5800
850-599-3766
850-599-3745

Dr. Alfred Msezane
Clark Atlanta University
Dept. of Physics/CTSPS
223 J. P. Brawley Drive S.W.
Box 92
Atlanta, GA 30314
404-880-8663
404-880-8360
amsezane@ctsps.cau.edu

Dr. G. Muchane
Lane College
Division of Natural & Physical
Sciences
545 Lane Avenue
Jackson, TN 38301
901-426-7608
901-426-7553
gmuchane@lanecollege.edu

Mr. David G. Naves
SGT Inc.
Technical Services
7701 Greenbelt Road
Suite 400
Greenbelt, MD 20770
301-614-8600 x316
301-614-8601
dnaves@sgt-inc.com

Mr. Golar Newby

Dr. Horton Newsom
University of New Mexico
Department of Earth and
Planetary Sciences
Institute of Meteoritics
Room 306D
Albuquerque, NM 87131
505-277-0375
505-277-3577

Ms. Carolyn Ng
NASA Goddard Space Flight
Center
Greenbelt, MD 20771
301 286-1359
301 286-0264
ng@nssdc.gsfc.nasa.gov

Ms. Elaina Norlin
University of Arizona
Main Library
A401C
Tucson, AZ 85721
520-621-8366
520-621-9733
enorlin@bird.library.arizona.edu

Mr. Dmitri Norwood
Alabama A&M University
Education and Information
Technology (EITS)
PO Box 1267
Normal, AL 35762
256-858-4125
256-851-5957
dnorwood@aamu.edu

Dr. Kafui Nyavor
Tuskegee University
Chemical Engineering Dept.
Tuskegee, AL 36088
334-727-8975
334-724-4398
nyavor@acd.tusk.edu

Dr. Sally O'Connor
Xavier University of Louisiana
Center for Environmental
Programs
1 Drexel Drive
New Orleans, LA 70125
504-483-7506
504-488-7977
soconnor@xula.edu

Dr. Cyril Okhio
Clark Atlanta University
Engineering Dept.
223 James P. Brawley Drive
Room 1026
Atlanta, GA 30314
404-880-6915
404-880-6882
cokhio@cau.edu

Mr. Fred Okoh
Morris Brown College
Chemistry Dept.
643 MLK Jr. Drive NW
Room 310
Atlanta, GA 30314
404-220-0178
404-220-3799
fiok@chem.morisbrown.edu

Dr. Oyelola Oladayd
Lane College
Chemistry Dept.
545 Lane Avenue
Jackson, TN 38305
901-426-7517
901-664-9473
oyelola@lanecollege.edu

Dr. Ali Omar
Hampton University
Center for Atmospheric Sciences
23 Tyler Street
Hampton, VA 23668
757-727-5127
ali.omar@hamptonu.edu

Dr. David Padgett
Tennessee State University
History Geography and Political
Science Dept.
3500 John A. Merritt Blvd.
Crouch Hall 216
Nashville, TN 37209
615-963-5508
615-963-5497

Ms. Lakesha Patterson
Prairie View A&M University
PO Box 2576
Prairie View, TX 77446
936-857-2595
936-857-4150
kisha_epat@hotmail.com

Dr. Mabel Phifer
International
Telecommunications Services (ITS)
1703 Mallard Court
Upper Marlboro, MD 20774
301-218-8749
301-218-8929
mabelp@bigplanet.com

Ms. Kimberly Phifer-McGee
Florida A&M University
Instructional Media Center &
Distance Learning Programs
104 Coleman Library
Tallahassee, FL 32307
850-599-8129
850-599-3385
kphifer@famu.edu

Mr. Nigel Phillip
Medgar Evers College
Dept. of Physical Environment
and Computer Science
1150 Carroll Street
Brooklyn, NY 11225
718-270-6197
nphillip@hotmail.com

Dr. William Porter
Elizabeth City State University
Geoscience Dept.
1704 Weeksville Road
Campus Box 975
Room 415 JSC
Elizabeth City, NC 27909
252-335-3378
252-335-3465

Dr. Tyrone Powell
Mississippi Valley State University
Natural Sciecnes and
Environmental Health Dept.
14000 Highway 82 West
Itta Bena, MS 38941-1400
662-254-3390
662-254-3668
tpowelldvm@hotmail.com

Mr. Terry Reed
Houston-Tillotson College
900 Chicon Street
Austin, TX 78702
512-505-3005
512-505-3195
treed@htc.edu

Ms. Janet Reed
Southern University at Baton
Rouge
Physics Dept. / PIPELINES
William James Hall
Room 241
Baton Rouge, LA 70813
225-771-2730
225-771-4341

Mr. George Reese
NASA Headquarters
Equal Opportunity Programs
300 E Street SW
Washington, DC 20546-0001
202-358-2167
202-358-3336
greese@mail.hq.nasa.gov

Dr. Terrence Reese
Southern University
Physics Dept.
Harding Street
Baton Rouge, LA 70813
225-771-4130
225-771-2310
treese2436@aol.com

Mr. Kurt Roberson
ADNET Systems Inc.
MU-SPIN Project
NASA Goddard Space Flight
Center
Code 933
Greenbelt, MD 20771
301-286-0876
301-286-1775

Dr. Diane Q. Robinson
Hampton University
Interdisciplinary Science Center
Hampton, VA 23668
757-727-5869
757-728-6369
dianne.robinson@hamptonu.edu

Dr. Gustavo Roig
Florida International University
College of Engineering
10555 West Flagler Street
EAS 2620
Miami, FL 33199
305-348-3700
305-348-6188
gus@eng.fiu.edu

Dr. Phil Sakimoto
NASA Headquarters
Office of Space Science
300 E Street SW
Washington, DC 20546-0001
202-358-0949
202-358-3095
psakimot@mail.hq.nasa.gov

Ms. ToWanda Samples
University of Maryland at Eastern
Shore
Engineering and Aviation
Sciences
Princess Anne, MD 21853-1299
410-651-6365
410-651-6486
towandasamples@mail.umes.edu

Ms. Yvette Samuels
Medgar Evers College
Dept. of Physical Environment
and Computer Science
1150 Carroll Street
Brooklyn, NY 11225
718-270-6197
oyjoseph@yahoo.com

Ms. Aracely Sandoval
University of Texas at El Paso
NASA NRTS
500 West University Avenue
UGLC 308
El Paso, TX 79968
915-747-5058
915-747-5350
arasando@utep.edu

Mr. Harry L. Schulte
University of Texas at El Paso
Multimedia Teaching and
Learning Center
500 West University Avenue
Room 310
El Paso, TX 79968
915-747-5401
915-747-5350

Ms. Veronica Seals
Medgar Evers College
Dept. of Physical Environment
and Computer Science
1150 Carroll Street
Brooklyn, NY 11225
718-270-6197
vsalicia@aol.com

Dr. Dipendra Sengupta
Elizabeth City State University
Math & Computer Science
Department
1706 Weeksville Road
Box 917
Room LH 203
Elizabeth City, NC 27909
252-335-3309

Ms. Aileen M. Seshun
Elizabeth City State University
1704 Weeksville Road
Elizabeth City, NC 27909
252-335-3696
252-335-3790
transes@interpath.com

Ms. Pooja Shukla
ADNET Systems Inc.
MU-SPIN Project
NASA Goddard Space Flight
Center
Code 933
Greenbelt, MD 20771
301-286-5083
301-286-1775

Mr. Dereck Skeete
Medgar Evers College
Dept. of Physical Environment
and Computer Science
1150 Carroll Street
Brooklyn, NY 11225
718-270-6453
718-270-6197
dskeete67@yahoo.com

Dr. Willard Smith
Tennessee State University
COE/ISEM
330 Tenth Avenue North
Suite 265
Nashville, TN 37203
615-963-7089
615-963-7027
smith@coe.tnstate.edu

Mr. John Smith
Langston University
Langston, OK 73050
405-466-3836
405-466-3271
jlsmith@lunet.edu

Dr. Daniel M. Smith Jr.
South Carolina State University
Physical Sciences Dept.
Orangeburg, SC 29117
803-536-7162
803-536-8436
dsmith@scsu.edu

Ms. Goli Sotoohi
Tenneessee State University
Center of Excellence in
Information Systems
330 Tenth Avenue North
Box 139
Nashville, TN 37203-3401

Mr. Bill Staderman
208 Turner Street
Suite 101
Blacksburg, VA 24060
540-552-9079
wstade@vt.edu

Mr. Jeffrey Steiner
City College of New York
Earth and Atmospheric Sciences
135th and Convent Avenue
Room J1106
New York, NY 10031
212-650-6398
212-650-6482
steiner@scisun.sci.ccny.cuny.edu

Dr. Harold S. Stinger

Ms. Stephanie Stockman
SSAI
NASA Goddard Space Flight Center
Greenbelt, MD 20771
301-614-6457
301-614-6522
stockman@core2.gsfc.nasa.gov

Mr. Enoch Temple
Alabama A&M University
Math Deptartment
Meridian Street
Chambers Hall
Room 242
Huntsville, AL 35810
256-858-4843
etemple@aamu.edu

Mr. Nelvin Thomas
University of the Virgin Islands
Science and Mathematics
PO Box 1921
St. Thomas, VI 00803
340-775-4819
thonel@bet.c

Mr. Eduardo Takamura
ADNET Systems Inc.
MU-SPIN Project
NASA Goddard Space Flight Center
Code 933
Greenbelt, MD 20771
301-286-7661
301-286-1775

Mr. Amos Terry
Prairie View A&M University
PO Box 2576
Prairie View, TX 77446
936-857-2595
936-857-4150
amos_terry@pvamu.edu

Mr. Chevell L. Thomas
The LaVal Corporation
9520 Lyonswood Drive
Owings Mills, MD 21117
410-654-1222
kapsi6@erols.com

Mr. Carl A. Taylor
Prairie View A&M University
1A109A Hobart Taylor Sr. Hall
PO Box 2576
Prairie View, TX 77446
936-857-2595
936-857-4150
carl_taylor@pvamu.edu

Ms. Melvina Terry

Mr. Larry Troesh
F. M. Black Middle School
1575 Chantilly Lane
Houston, TX 77018
713-613-2508
713-613-2533

Mr. Ben Teasdel III
South Carolina State University
Physical Science Dept.
803-533-3773
803-536-8569

Dr. James R. Thieman
NASA Goddard Space Flight Center
Greenbelt, MD 20771
301-286-9790
301-286-1771
thieman@nssdc.gsfc.nasa.gov

Mr. Taran Tulsee
Queens College /
Queensborough Community College
Physics Dept.
Richmond Hill, NY 11419
718-323-4634
blond2ice@aol.com

Mr. Aon Tejani
University of Houston - Downtown
Center for Computational Sciences
One Main Street
Suite 722-South
Houston, TX 77002
713-221-8207
713-226-5290

Dr. Valerie L. Thomas
The LaVal Corporation
2004 Clearwood Drive
Mitchellville, MD 20721
301-249-0580
301-249-0580
thomas@muspin.gsfc.nasa.gov

Ms. Evett Turner
NASA Marshall Space Flight Center
Education Programs Dept.
Rideout Road
Code CD60
Room 213A
Huntsville, AL 35812
256-544-5920

Dr. George Tuthhill
Montana State University
Dept. of Physics
EPS-264
Bozeman, MT 59717-3840
406-994-6177
tuthhill@physics.montana.edu

Dr. Nader Vadiee
University of New Mexico
ACE Center
EECE
Albuquerque, NM 87131
505-227-1200
505-277-4681
manimar@unm.edu

Dr. John Vickers Jr.
Alabama A&M University
EITS
Po Box 1265
Normal, AL 35749
256-851-5993
256-851-5957
jvickers@aamu.edu

Mr. Lenny Martin Vielma
University of Texas at El Paso
NASA NRTS
500 West University Avenue
UGLC 308
El Paso, TX 79968
915-747-8769
915-747-5350
lvielma@miners.utep.edu

Ms. Edie Vinson
City College of New York
Center of Water Resources
138th Street and Convent Avenue
New York, NY 10031
917-623-0890
ediefg@aol.com

Ms. Montanez Wade
Tennessee State University
Center of Excellence in Information Systems
330 Tenth Avenue North
Box 139
Nashville, TN 37203-3401

Dr. Nagi Wakim
Bowie State University
Model Institutions for Excellence/Computer Science Dept
14000 Jericho Park Road
Marshall Library Bldg
Suite 272
Bowie, MD 20715

Ms. Gloria Walker
NOAA/National Weather Service
Equal Employment Opportunity Program Office
1325 East West Highway
Room 11348
Silver Spring, MD 20910
301-713-0692
301-713-3374

Mr. Sonjae Wallace
York College
89-30 146th Street
Jamaica, NY 11435
sonjae_wallace@yahoo.com

Dr. Donald K. Walter
South Carolina State University
Physical Sciences Dept.
300 College St
Orangeburg, SC 29117
803-533-3773
803-536-8500
dkw@physics.scsu.edu

Ms. Pauline B. Washington
Atlanta Public School
Atlanta Systemic Iniative
3240 Linden Garden Road
College Park, GA 30349
404-624-2064
404-624-2111
paulabwashington@aol.com

Mr. Joseph S. Watson
American Association for the Advancement of Science
1333 H Street NW
Washington, DC 20005
202-326-6701
202-842-5196
jwatson@aaas.org

Mr. Chris Watson
Texas College
2404 N. Grand
Tyler, TX 75702
903-593-8311 x301
903-593-0588
chris_watson@hotmail.com

Mr. Joe Watts
Los Alamos National Laboratory/Supercomputing Challenge
Nuclear Materials Technology
NMT-11
TA-55 PF-66
Code E505
Room 227

Ms. Bettie White
NASA Headquarters
Minority University Research and Education Division
300 E Street SW
Wasington, DC 20546-0001
202-358-0970
202-358-3061
bwhite@mail.hq.nasa.gov

Ms. Stacy J. White
Mississippi Valley State University
Mathematics Computer and
Information Sciences
14000 Highway 82 West
Itta Bena, MS 38941-1400
662-254-3661
662-254-3662
swhite@cypress.mcsr.olemiss.edu

Mr. Darryl White
Southern University - New Orleans
6400 Press Drive
New Orleans, LA 70126
504-286-5000
504-286-5016
darryl@suno.edu

Dr. John Williams
Prairie View A&M University
Dept. of Chemistry
PO Box 2576
Prairie View, TX 77446
936-857-3910
936-857-2095
john_r_williams@pvamu.edu

Dr. Claudette Williams
Clark Atlanta University
Educational Leadership
223 James P. Brawley Drive
Atlanta, GA 30314
404-880-8495
404-880-8564
cwilliam@cau.edu

Mr. Lorenzo Williamson
Medgar Evers College
Dept. of Physical Environment
and Computer Science
1150 Carroll Street
Brooklyn, NY 11225
718-270-6197
lorenzowilliamson@hotmail.com

Mr. Charlie Wrenn
Tennessee State University
Center of Excellence - ISEM
330 Tenth Avenue North
Room 265
Nashville, TN 37203
615-963-7020
615-963-7027
wrenn@coe.tsuniv.edu

Dr. Chivey C. Wu
California State University at Los
Angeles
Mechanical Engineering Dept.
5151 State University Drive
Los Angeles, CA 90032
323-343-4489
323-343-5004
cwu@calstatela.edu

Dr. Gilbert Yanow
Jet Propulsion Laboratory
Educational Outreach
QuikSCAT/SeaWinds Mission
4800 Oak Grove Drive
Pasadena, CA 91109-8099
818-354-8060
818-354-1392
gilbert.yanow@jpl.nasa.gov

Ms. Efe Yousif
City College of New York
138th Street and Convent
Avenue
NAC8/206
New York, NY 10031
212-650-6154
212-650-6155
efe@cs-mail.engr.ccny.cuny.edu

Ms. Iliana Zuniga
University of Texas at El Paso
Undergraduate Learning Center
500 West University Drive
Suite 304
El Paso, TX 79968
915-747-8768
915-747-8610
ilianaz@utep.edu

Poster Session
Renaissance Atlanta Hotel
September 11-16, 2000

A Graphical Interface to Multi-Tasking Programming Problems - Dr. David S. Alijani, Southern University of New Orleans

A Comparison of Aeolian Processes and Landforms on Earth and Mars - Ms. Deithra L. Archie, New Mexico State University

City College of New York NRTS - Dr. Shermane Austin, City College of New York

University of Texas at El Paso Engineering - Mr. Leo Arroyo, Mr. Alberto Campuzano and Mr. Miguel Campuzano, University of Texas at El Paso

Center for Network Resources and Training Space Science and Technology Academy One - Ms. Alice Baker, South Carolina State University

Comparative Analysis of New York City's Multi-Filtered Rotating Shadow-band Radiometers Network Data and its Use in Validation of the Student Polarimeter Aerosols and Cloud Experiment - Mr. Colley Baldwin, Mr. Kevin Brathwaite, Mr. Dereck Skeete, and Dr. Wilbert W. Hope, Medgar Evers College

A Study of the Spiral Galaxy M101 - Ms. Katrina Banks and Mr. Isaac Lister, Elizabeth City State University

The Ionization Structure of the Irregular Galaxy NGC 4449 - Ms. Tamara L. Battle, Medgar Evers College

Agents Profiles Learning Styles and Tutors - Dr. Constance Bland and Dr. Pamela Lawhead, Mississippi Valley State University

Investigations of a Toy Model of Dark Matter Clustering - Ms. Shayla Brooks and Mr. Vincent Davis, Elizabeth City State University; Ms. Tecora Hicks, Mr. Daniel M. Smith, Jr., South Carolina State University; and Mr. Nelvin Thomas, University of Virgin Islands

Studies of Volatile Organic Compounds in Ambient Air Using Tetraglyme Scrubber - Mr. Delroy Burnett and Ms. Yvette Samuels, Medgar Evers College

The Hampton University Center for Lidar and Atmospheric Sciences Students (CLASS) - Dr. Tom Chyba, Hampton University

Portsmouth Atmospheric Science School (PASS) Project - Dr. Clarence D. Coleman, Norfolk State University

Model-Building for Active Constructive Problem Solving - Dr. Jose D'Arruda, University of North Carolina - Penbroke

Tuskegee University Gateway Achievement Program (TUGAP) - Ms. Cheryl Davis, Tuskegee University

The Use of the UNIX Operating System in Scientific Research - Mr. Melton Davis, Medgar Evers College

Mathematical Treatment of Buffered PH - Mr. Witzar Destin, Medgar Evers College

University of Texas at El Paso Engineering - Mr. Miguel Escobedo and Ms. Aracel Sandoval, University of Texas at El Paso

Collaborative Electrical Engineering Program at University of Maryland Eastern Shore - Dr. Ali Eydgahi, University of Maryland Eastern Shore

A Comparison of Aerosol Hand-held Polarimeter and GISS Sunphotometer Results - Ms. Nasraddine Fouad, LaGuardia Community College

Standards-Based Classroom Activities in Meteorology - Mr. Barry Fried and Mr. IanHarding, Canarsie High School

Teacher Training Integrating SMET - Dr. Sangeeta Gad, University of Houston - Downtown

Dissociative Recombination of He2+ - Dr. Ken Hardy, Florida International University

Medgar Evers College Aeronautics and Earth Science Academy - Dr. William C. Harris, Medgar Evers College

Elizabeth City State University NRTS - Dr. Linda Hayden, Elizabeth City State University

Use of Mapping Skills Remote Sensing and GIS to Study the Impact of Land-Use/Land-Cover Change on the Environment - Ms. Roberta L. Hoffer, University of Texas at El Paso

Network Cabling Characteristics - Dr. James Holloway and Mr. Charlie Wrenn, Tennessee State University

NASA Student Polarimeter Aerosol and Cloud Experiment (SPACE) and Data Archiving - Ms. Torren L. Hope, Medgar Evers College, and Mr. Nigel Phillip, City College of New York

Spatial Distribution of Mercury Vapor in Homes in Brooklyn New York - Mr. Ryan Hutchinson, Medgar Evers College

Fifth Graders EarthKAM Explorations - Ms. Evon Jackson, Sinclair Elementary School

Creation of a Space Science Major in the Existing CUNY Baccalaureate Degree Program - Dr. Leon Johnson, Medgar Evers College

Measuring the Age of the Universe Using the Old Galactic Globular Clusters - Mr. Charles Jordan III, California State University at Los Angeles and Dr. Stephen D. Gillam, Jet Propulsion Laboratory

Morgan State University NRTS - Dr. William Lupton, Morgan State University

Inspiring Careers in Engineering Mathematics and Science (ICEMS): Program Overview Achievements, Challenges, and Expectations - Dr. Edward McDonald, Clark Atlanta University and Mr. Richard Makerson, Morehouse College

Digital Technology and Libraries: Collaborating with the Scientific Community - Ms Elaina Norlin and Ms. Patricia Morris, University of Arizona

Applied Computer Science Program Improvements at University of Maryland Eastern Shore - Dr. Daniel Okunbor, University of Maryland Eastern Shore

Beowulf Class Supercomputers in Undergraduate Education - Dr. Dorothy Funches Russell, Morgan State University

UMES-AIR: A NASA-UMES Collaborative Experiential Learning and Exploratory Research Project - Ms. ToWanda Samples, University of Maryland Eastern Shore

University of Texas at El Paso NRTS - Mr. Harry L. Schulte, University of Texas at ElPaso

In Search of a Geophysical Model for Light Winds and Calms - Ms. Veronica Seals, Medgar Evers College

Satellite Imaging GOES to School - Ms. Aileen M. Seshun and Dr. Linda Hayden, Elizabeth City State University

Tennessee State University NRTS - Dr. Willard Smith, Tennessee State University

The Design and Construction of an Inexpensive CCD Camera for Astronomical Imaging - Mr. Ben Teasdel III, South Carolina State University

Summer Engineering Bridge Program at University of Maryland Eastern Shore: Objectives and Enrichment Activities - Mr. Jason Tilghman, University of Maryland Eastern Shore

A Comparison of CCD Images of M57 Taken with Different Cameras - Mr. Taran Tulsee, Queens College/Queensborough Community College

University of Texas at El Paso Science - Mr. Lenny Martin Vielma and Ms. Iliana Zuniga, University of Texas at El Paso

Climate Impacts on New York City's Water Resources - Ms. Edie Vinson, City College of New York

An Analysis of the GISS GCM's Simulative Properties - Mr. Sonjae Wallace, York College

South Carolina State University NRTS - Dr. Donald Walter, South Carolina State University

Curriculum Enhancement through Space Science Research - Dr. Donald Walter, South Carolina State University

Producing Certification Teachers in Mathematics and Science: An Innovative Approach - Ms. Stacy J. White and Dr. Tyrone Powell, Mississippi Valley State University

TBA - Dr. Claudette Williams, Clark Atlanta University

Prairie View A&M University NRTS - Dr. John Williams, Prairie View A&M University

Total Optical Depth/Extinction Analysis of Aerosols in Correlation with Weather Variables Using a Multi-Filter Rotating Shadowband Radiometer - Mr. Lorenzo Williamson, Medgar Evers College

MURED Update

Welcome and Announcements

Ms. Bettie White, Director, MURED

Mr. James Harrington, Jr., Project Manager, MUSPIN

Dr. Dolores E. Cross, President, Morris Brown College

Mr. John Malone, University Programs Specialist, MURED

Mr. George Reese, Associate Administrator,
Equal Opportunity Programs, NASA Headquarters

NASA Equal Opportunities and Diversity for the New Millenium

Mr. George Reese, Associate Administrator,
Equal Opportunity Programs, NASA Headquarters

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MU-SPIN Conference

September 12, 2000

Bettie L. White
Director, Minority University
Research and Education Division
Office of Equal Opportunity Programs
Washington, DC

Precollege Awards to Establish and Maintain a Science, Engineering, Mathematics, and Aerospace Academy (SEMAA)

- Solicits proposals in 2 categories: 1) from US colleges to establish an educational program to excite youth, particularly the underserved, to an interest and possible career in science, mathematics or technology; and 2) to continue current SEMAA sites.
- Must demonstrate meaningful collaborative efforts between many different partners in a community.
- SEMAA Program
  - Targets students in grades K-12
  - Participants usually meet on Saturdays or after school for up to 4 hours during which time participants are involved in "hands on/minds on activities."
  - Includes a parent component that includes opportunity to learn how to do science and math activities at home for the younger children and at the same time how to apply for financial aid for the parents of older students.
  - An integral part of the SEMAA program is the Aeronautics Education Laboratory (AEL). The AEL is a state-of-the-art classroom.

Graduate Student Researchers Program - GSRP

The NASA Graduate Student Researchers Program (GSRP) is designed to help meet the continuing needs of the aeronautics and space effort by increasing the number of highly trained scientists and engineers in aerospace, space science, space applications and space technology.

The NASA Graduate Student Researchers Program (GSRP) awards fellowships for graduate study leading to research-based masters or doctoral degrees in the fields of science, mathematics, and engineering.

NASA Earth System Science Fellowship Program

NASA announces graduate student training fellowships for persons pursuing Master of Science (M.Sc.) or Doctoral (Ph.D.) degree in Earth System Science. The purpose is to ensure continued training of interdisciplinary scientists to support the study of the Earth as a system.

Resident Research Associateship Program

This program is administered by the National Research Council and supports excellence in postdoctoral research. It is directed toward scientists whose research interests are compatible with NASA's programs in space science and aerospace technology.

OFFICE OF EQUAL OPPORTUNITY PROGRAMS
MINORITY UNIVERSITY RESEARCH AND EDUCATION PROGRAMS

ASEE Summer Faculty Fellowship Program

The NASA/American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program is a coordinated effort between Old Dominion University, Hampton University, and LaRC to host approximately 40 U.S. college or university faculty members who are appointed as Fellows.

These individuals will spend 10 weeks in cooperative research and study at LaRC. Through this educational research initiative, Fellows will be able to further their professional knowledge and contribute to the research being done at Langley Research Center.

The stipend for the 2001 Faculty Fellow is $1,000 per week for the 10 week summer program. In addition, for Fellows who must travel 50 miles or more and must relocate, there will be a $1,000 relocation allowance, plus travel expenses to cover round trip mileage up to the cost of a maximum coach airfare of $500.

ASEE fellows devote approximately 90% of their time to a research problem and the remaining time to a study program consisting of technical lectures and seminars given by distinguished scientists and engineers from NASA, academe, or industry on topics of general interest or of direct relevance to the research project.

OFFICE OF EQUAL OPPORTUNITY PROGRAMS
MINORITY UNIVERSITY RESEARCH AND EDUCATION PROGRAMS

Undergraduate Student Awards for Research (USAR)

The program targets socially and economically disadvantaged students and/or students with disabilities; hereafter referred to as disadvantaged students. The goals of this program are:

- to attract disadvantaged students at the beginning of their undergraduate studies to career paths in areas of science or engineering relevant to NASA's mission;
- to retain these students in their field of study through the completion of the undergraduate degree;
- to increase the number of these students who pursue graduate degrees and research-related and/or teaching careers, and;
- to support the development of minority-serving institutions.

Contact: Robert Lawrence, Glenn Research Center, robert.f.lawrence@grc.nasa.gov

Upcoming Opportunity for Networking

OCT 19, 2000 NASA/UNIVERSITY RESEARCH FALL CONFERENCE

- Cyber/Internet Conference to discuss NASA Plans for increasing university research efforts;
- Targeted to Deans and Vice Provosts for Sponsored Research
- Video feed, internet stream, and chat/email/800 number will allow dissemination to a wide audience.
- More details to follow on the NASA WEB Site.

NASA WEBSITES-www.nasa.gov

Navigating NASA's Strategic Enterprises

Aero-Space Technology

Human Exploration and Development of Space

Earth Science

Space Science

•NASA Centers

- •Ames Research Center, Moffett Field, CA.
- •Dryden Flight Research Center, Edwards, CA.
- •Glenn Research Center at Lewis Field, Cleveland, OH.
- •Goddard Institute for Space Studies, New York, NY.
- •Goddard Space Flight Center, Greenbelt, MD.
- •Independent Validation & Verification Facility, Fairmont, WV.
- •Jet Propulsion Laboratory, Pasadena CA.
- •Johnson Space Center, Houston, TX.
- •Kennedy Space Center, FL.
- •Langley Research Center, Hampton, VA.
- •Marshall Space Flight Center, Huntsville, AL.
- •Moffett Federal Airfield, Mountain View, CA.
- •Stennis Space Center, MS.
- •Wallops Flight Facility, Wallops Island, VA.
- •White Sands Test Facility, White Sands, NM.

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Doing Business with NASA

Equal Opportunity
Educational Resources

History
Freedom of Information Act
Jobs and Internships
NASA Technology Portal

News and Information

Organization and Subject Index

Project Home Pages

Research Opportunities

Scientific and Technical Information

See a Launch

Launch Schedule

Spinoffs and Commercial Technology

Visiting NASA

OFFICE OF EQUAL OPPORTUNITY PROGRAMS
MINORITY UNIVERSITY RESEARCH AND EDUCATION PROGRAMS

AMES RESEARCH CENTER Ms. Brenda Collins **Mail Stop 223-3** **Moffett Field, CA 94035** **Tel. (650) 604-3540** **Fax (650) 604-3869** bcollins@arc.nasa.gov	DRYDEN FLIGHT RESEARCH CENTER Ms. Jo Ann Larson **Mail Stop D-1517** **P.O.Box 273** **Edwards, CA 93523** **Tel. (661) 276-2472** **Fax (661) 276-2800** **joann.larson@dfrc.nasa.gov**	KENNEDY SPACE CENTER Ms. Rosalyn McKinney **Mail Code AJ** **Kennedy Space Center, FL 32899** **Tel. (407) 867-8025** **Fax. (407) 867-1066** rmckinney@ksc.nasa.gov
GLEN RESEARCH CENTER Mr. Robert Lawrence **Mail Stop 3-16** **21000 Brookpark Rd.** **Cleveland, OH 44135-3191** **Tel. (216) 433-2921** **Fax (216) 433-2348** **For USAR & GEM** **robert.f.lawrence@grc.nasa.gov**	GODDARD SPACE FLIGHT CENTER Mr. James Jackson **Mail Code 120** **Greenbelt, MD 20771** **Tel. (301) 286-4086** **Fax. (301) 286-0298** James.A.Jackson.1@gsfc.nasa.gov	JET PROPULSION LABORATORY Ms. Deborah Johnson (Acting) **Mail Stop 72-109** **4800 Oak Grove Drive** **Pasadena, CA 91109-8099** **Tel. (818) 354-2668** **Fax. (818) 393-4977** deborah.s.johnson@jpl.nasa.gov
JOHNSON SPACE CENTER Ms. Gladys Henderson (Acting) **Mail Code AJ** **Houston, TX 77058** **Tel. (281) 483-0604** **Fax. (281) 483-0609** gladys.m.henderson1@jsc.nasa.gov	LANGLEY RESEARCH CENTER Mr. Roger Hathaway **Mail Stop 400** **Hampton, VA 23681** **Tel. (757) 864-3312** **Fax. (757) 864-8835** r.a.hathaway@larc.nasa.gov	MARSHALL SPACE FLIGHT CENTER Mr. Willie Love **Mail Code CE01** **MSFC, AL 35812** **Tel. (256) 544-0088** **Fax (256) 544-2411** willie.l.love@msfc.nasa.gov
STENNIS SPACE CENTER Dr. Ramona Travis **Mail Code MAOO** **Stennis Space Center, MS 39529-6000** **Tel. (228) 688-3830** **Fax (228) 688-7499** **Ramona.e.travis@ssc.nasa.gov**		

NASA CENTER
MUREP MANAGERS

MU-SPIN Project Update

Mr. James Harrington, Jr.
Project Manager, MU-SPIN

MU-SPIN UPDATE

MU-SPIN/MURED 10th Annual Users' Conference

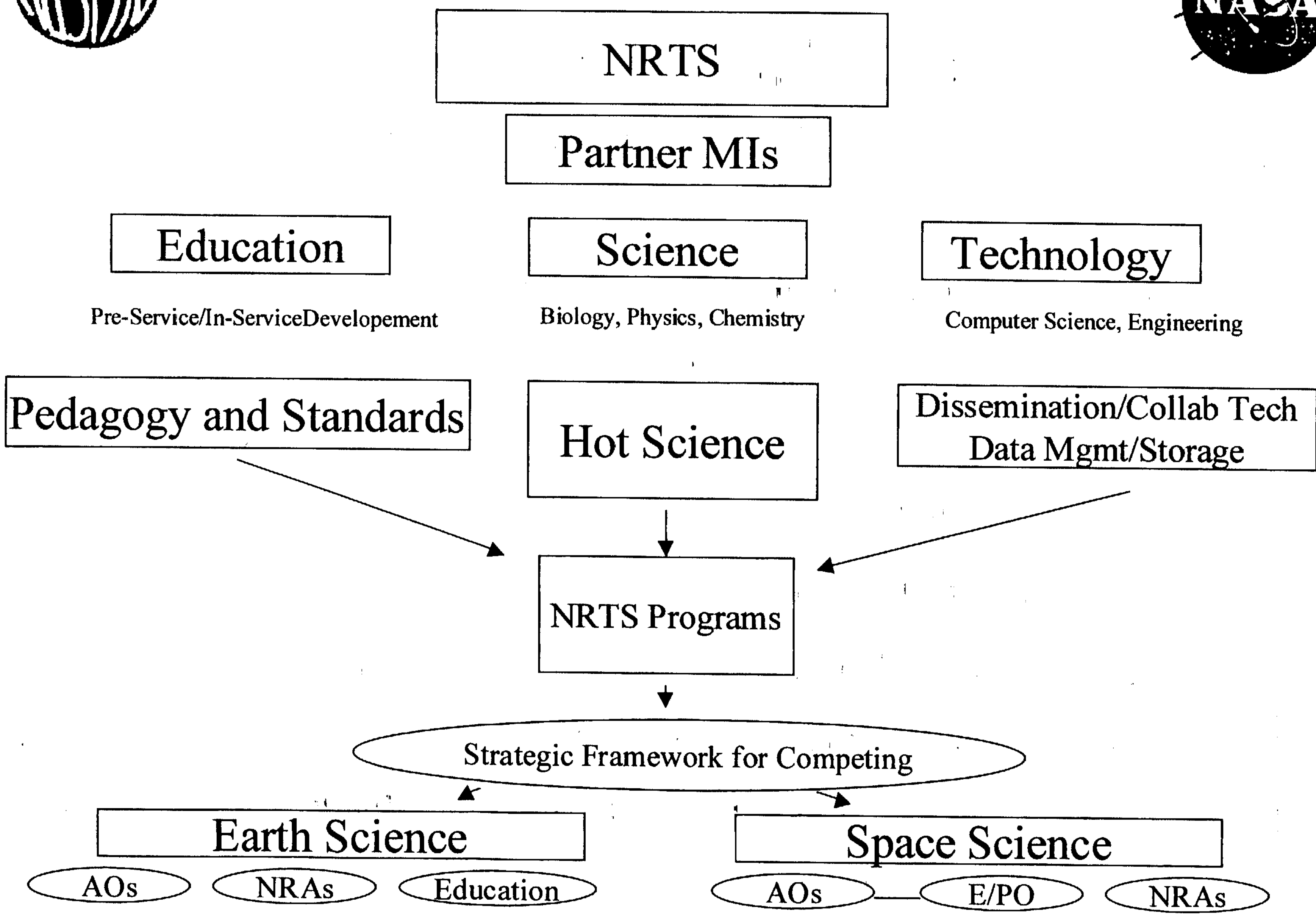
September 11-15, 2000

Morris Brown College

MU-SPIN DESCRIPTION

The Minority University Space Interdisciplinary (MU-SPIN) Network project is a comprehensive outreach and education initiative that focuses on the transfer of advanced computer networking technologies and relevant science to Historically Black Colleges and Universities (HBCU's) and Other Minority Universities (OMU's) for supporting multi-disciplinary education research.

Strategic Framework for 2000



Institutions Hosting Fall/Spring Workshops

- South Carolina State U.
- Prairie View A&M U.
- Elizabeth City State U.
- University of Texas at El Paso
- Tennessee State U.
- City College of NY
- Morgan State U.
- Morris Brown College
- Morris College
- Central State University
- New Mexico State University
- Texas A&M U. at CC
- UNC at Pembroke
- U. of Maryland at ES
- Benedict College
- Alabama A&M U.
- Southern U. at NO
- Cal State U. at LA
- Meharry Medical Coll
- Kentucky State U.
- Voorhees Coll.
- Florida International U.
- Southwestern Indian Poly Inst
- Dine College
- Virginia State U.
- Fisk U.
- Norfolk State U.
- Paul Quinn Coll.
- Bowie State U.
- Bennett Coll
- Kentucky State U.
- Jackson State U.

Institutional Research Awards (Minority Universities Information Network for Research and Education)

CONTINUATION PROPOSAL GUIDELINES

Limited to the Existing NASA Institutional Research Awards at:

The City College of New York
Elizabeth City State University
Morgan State University
Prairie View A&M University
South Carolina State University
Tennessee State University
The University of Texas at El Paso

Guidelines Issued: June 21, 2000
Letters of Intent Due: June 30, 2000
Proposals Due: July 21, 2000

Areas of Interest

Each proposing IRA (Minority Universities Information Network for Research and Education) is expected to continue research and/or education activities and student development based on the "Expert Institute" areas in which they are already working. There should be increased and/or sustained emphases on developing expertise capable of successfully leveraging support from sources outside of the NASA IRA (Minority Universities Information Network for Research and Education) program. Proposals requesting over $250,000 should define "Expert Institute" activities at partner institutions which require additional funds. Each partner "Expert Institute" concept needs to be described in an appendix with a budget description accompanied by a letter of commitment from the participating institution representative.

IRA (Minority Universities Information Network for Research and Education) Performance Metrics

Each IRA (Minority Universities Information Network for Research and Education) must propose additional measures against which it will evaluate the performance of its operation. Additionally, all grantees are required to submit, as part of their annual report, a complete and timely response to NASA MUREP's annual Uniform Outcomes Report. This report is used to satisfy congressional and White House requirements for reporting MUREP performance. The following are metrics for which each IRA (Minority Universities Information Network for Research and Education) should report as part of their annual cooperative agreement renewal report.

Research Activity Metrics

Outcome: To increase the number of MI faculty and students in NASA related research which will contribute substantially to the NASA mission and move the IRA recipeints increasingly toward gaining support form sources outside the IRA Program.

- Number and types of NRTS collaborating research activities relevant to the NASA Strategic Enterprises.
- Number and types of workshops held to support the NRTS collaboration research efforts.
- Number and types of attendees participating in the research oriented workshops.
- Number and types of institutions participating in research oriented workshops.
- Number and types of proposals submitted in response to a NASA research announcement.
- Number and types of institutions participating in NRTS research oriented collaborations.
- Amount of leveraged funding received from NRTS research related activities.
- Number and types of facilitated research publications.
- Number and types of funded awards from NRTS research activities.
- Number of students participating in NRTS research activities.

Education Activity Metrics

Outcome: To provide a quality learning and research envrionment to inspire an increase in the number and quality of students, including pre-service student teachers achieving degrees in NASA related SMET fields.

- Number and types of NRTS collaborating education activities relevant to the NASA Strategic Enterprises.
- Number and types of workshops held to support the NRTS collaboration education efforts.
- Number of pre-service teachers impacted by education activities.
- Number of in-service teachers impacted by education activities.
- Number and types of institutions participating in education oriented workshops.
- Number and types of proposals submitted in response to a NASA education announcement.
- Number and types of NASA Enterprise Education products systemically implemented by NRTS and partner institutions.
- Number and types of institutions participating in NRTS education oriented collaborations.
- Amount of leveraged funding received from NRTS education related activities.
- Number and types of NRTS facilitated education publications.
- Number and types of funded awards from NRTS education activities.
- Number of students participating in NRTS education activities.

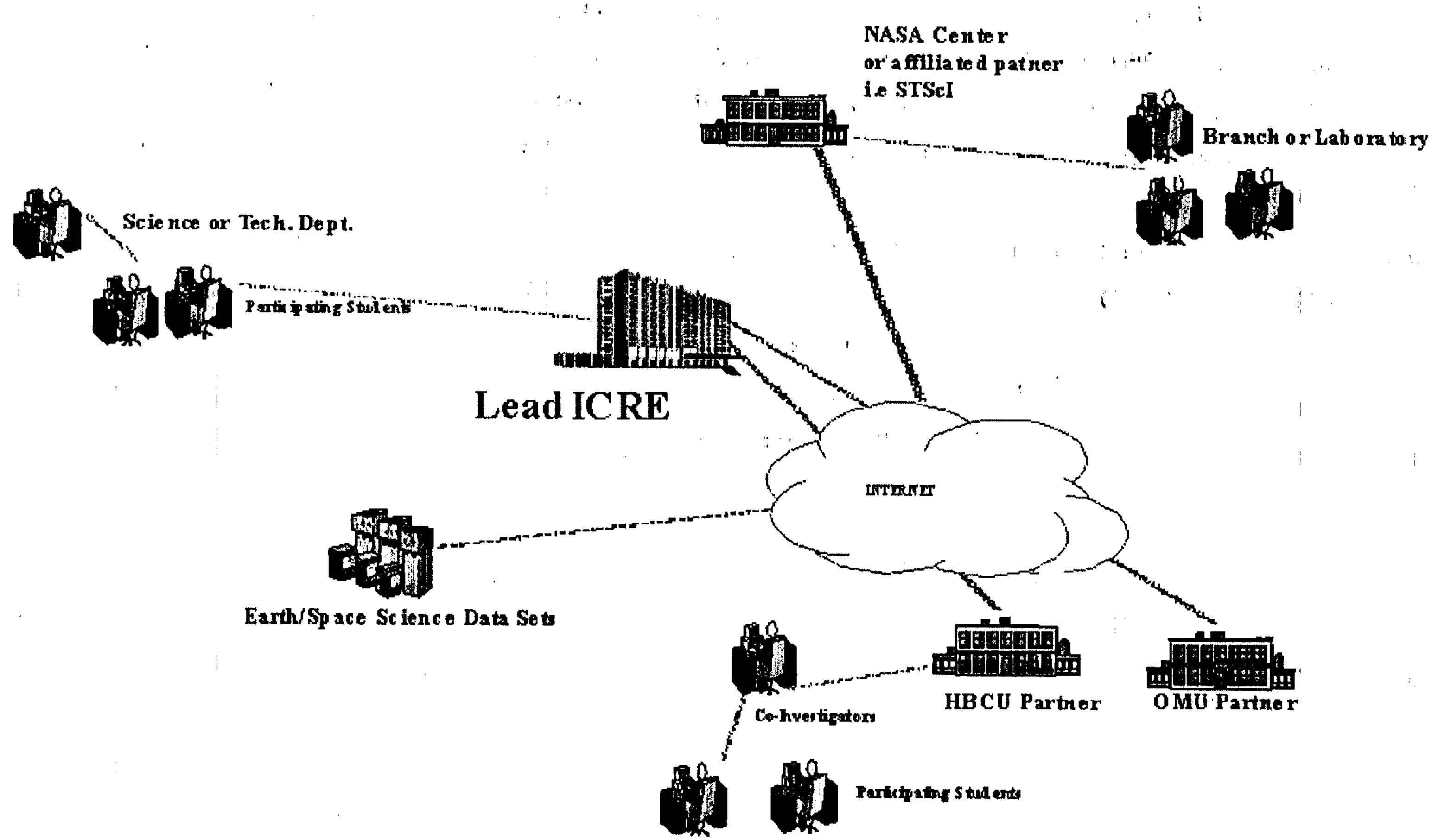
Technology Activity Metrics

Outcome: To improve the capacity of MIs to provide a technology rich environment which promotes increased usage of technology for research and education for increasing the number and quality of students graduating with SMET degrees.

- Number and types of institutions participating in technology oriented workshops.
- Number and types of electronic networks **funded** being being leveraged to support research and education related activities.
- Number and types of proposals submitted in response to a NASA research announcement.
- New technology deployed in region to support collaboration for research and education.
- New technology deployed in region to support research.
- New technology deployed in region to support education.
- Number and types of technology departments (i.e. Computer Science, Engineering, Information Systems, etc.) in the region participating in the support of NRTS regional research and/or education technology requirements.
- Number of students in technology departments participating in technology efforts.
- Amount of leveraged funding received for improving technology infrastructure from NRTS activities.

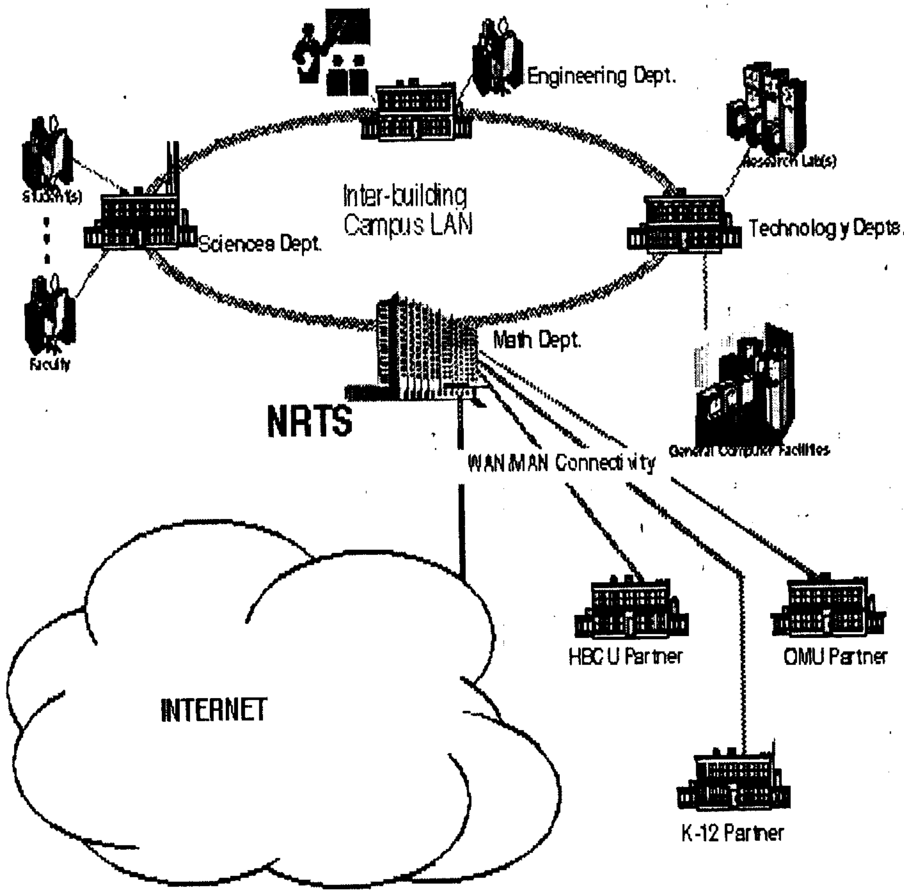
Institute for Collaborative Research and Education

- Perform collaborative research i
- Outreach to a mininum of two HB·
- Assist in coordination and provi
  academic year workshops on NASA



Network Resources and Training Site Concept

- o Connect all Math, Science, Engineering and Technology Departments to the Internet;
- o Outreach to a mininum of four HBCUs or OMUs and one K-12 for LAN and WAN requirements; and
- o Host a minimum of two academic year workshops on LAN/WAN technology and NASA related science.



Activity Platforms

- Collaborative Research and Education
  - SCSU Astronomy Institute
  - TSU Astronomy/Planetary Geography Education
  - PVAMU Solar Research
- Science Curriculum Reform
  - Code FE NOVA/MU-SPIN workshops
- Flight Research Support/Team Building
  - Understanding the OSS Strategic Plan and Themes
  - Mentoring flight alternatives and competitive science
  - Promoting diverse team building
- Collaborating E/PO for MESSENGER

Search for Origins	Structure & Evolution of the Universe	Exploration of the Solar System	The Sun-Earth Connection

What is Space Science?

NASA's Space Science Enterprise is responsible for all of NASA's programs relating to astronomy, the solar system, and the sun and its interaction with Earth. That includes all of NASA's telescopes and planetary probes. Our research covers everything from the middle levels of Earth's atmosphere (about 60 kilometers up) to the edge of the universe billions of light years away.

Multi-Mission Programs

The following programs include multiple missions, many of which are linked above. You can see brief descriptions of these programs, along with links to them, by clicking here.

- Discovery Program
- Explorer Program
- Mars Exploration program at JPL
- New Millennium Program
- International Solar-Terrestrial Physics
- Scientific Balloons and Ultra-Long Duration Balloons
- Solar-Terrestrial Probes
- Sounding Rockets
- Spartan

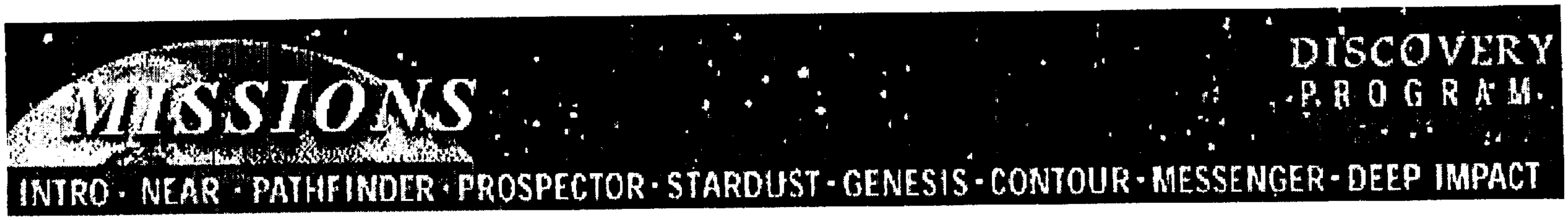
Ground-Based Astronomy

Most of our research activities are carried out using spacecraft or suborbital vehicles (sounding rockets, balloons, and high-altitude aircraft). The National Science Foundation is the government agency that is responsible for most U.S. ground-based astronomical research. However, we do support a few ground-based activities

In space exploration, the possibilities for discovery are without limits. Even with the vast amount of knowledge gained since exploration of our solar system began, there are still more questions than answers.

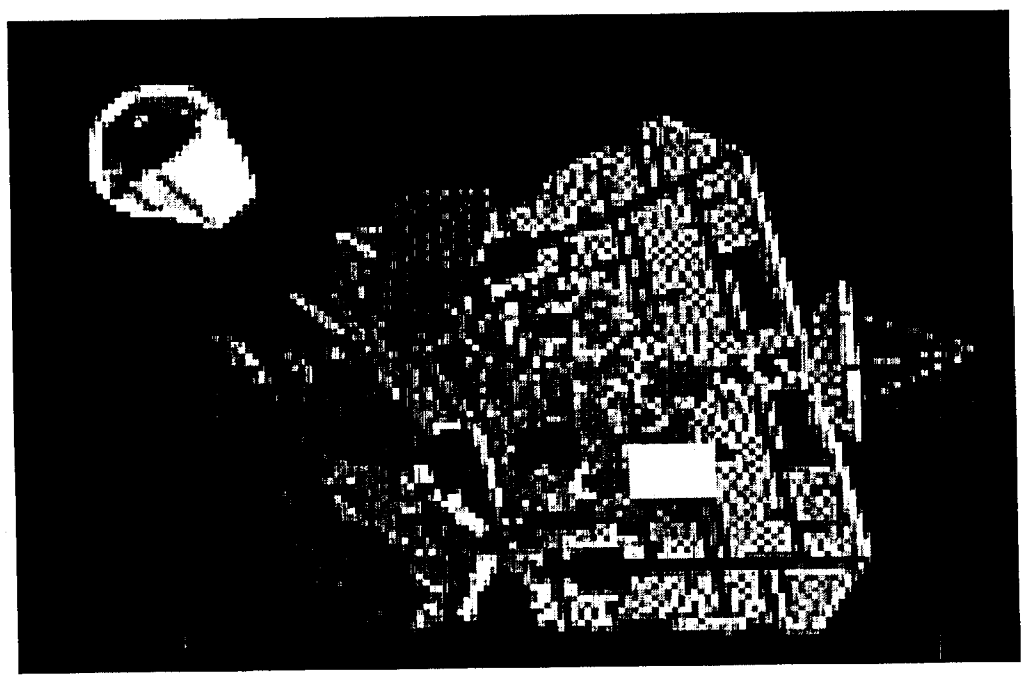
NASA's Discovery Program gives scientists the opportunity to dig deep into their imaginations and find innovative ways to unlock the mysteries of the universe. It represents the implementation of NASA Administrator Daniel Goldin's vision of "Faster, Better, Cheaper" planetary missions.

The program's prime objective is to enhance our understanding of the solar system, both historically and as it is today, by exploring the planets, their moons and other small bodies, either by traveling to them or remotely from the vicinity of Earth.



DISCOVERY MISSION: DEEP IMPACT

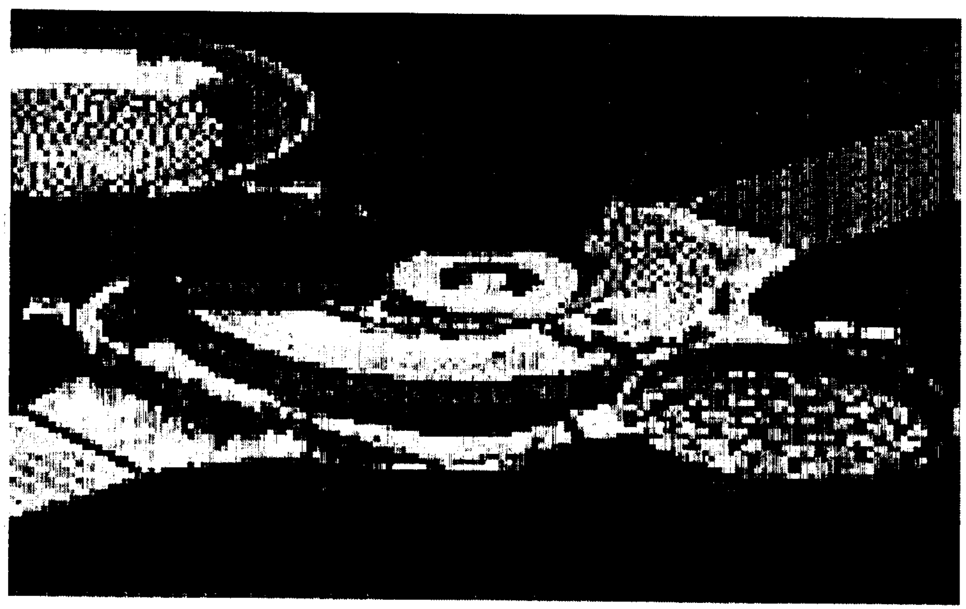
The First Look Inside a Comet!



GENESIS

SEARCH FOR ORIGINS

What is the sun made of? Are the Earth and planets made of the same stuff?



MISSIONS

DISCOVERY PROGRAM

INTRO · NEAR · PATHFINDER · PROSPECTOR · STARDUST · GENESIS · CONTOUR · MESSENGER · DEEP IMPACT

DISCOVERY MISSION: MESSENGER

The MESSENGER (MErcury: Surface, Space ENvironment, GEochemistry and Ranging) mission is a scientific investigation of the planet Mercury.

Understanding Mercury and the forces that have shaped it is fundamental to understanding the evolution of terrestrial planets.

MISSION OBJECTIVES

MESSENGER will be launched in March 2004 and will enter Mercury Orbit in September 2009, to peel back Mercury's veil of mystery.

MESSENGER

MErcury Surface, Space ENvironment, GEochemistry and Ranging

To implement and coordinate the ambitious MESSENGER E/PO program, the project engages diverse groups of skilled professionals from several organizations:

MST - Messenger Science Team members
AAAS - American Association for the Advancement of Science
CCSSE - Challenger Center for Space Science Education
SSAI - Science Systems and Applications, Inc
CASE - Carnegie Academy for Science Education
JHU/APL - The Johns Hopkins University Applied Physics Laboratory
GSFC - Goddard Space Flight Center
SEI - Space Explorers Inc.
CERES - Center for Educational Resources at Montana State University-Bozeman
NASM - National Air and Space Museum
AMNH - American Museum of Natural History in New York
MU-SPIN - Minority University-Space Interdisciplinary Network
PW - Parmee/Weinrich independent television production/direction team

MESSENGER
MErcury Surface, Space ENvironment, GEochemistry and Ranging

Science Team

William McClintock
University of Colorado
Ralph L. McNutt
JHU Applied Physics Laboratory
Scott L. Murchie
JHU Applied Physics Laboratory
Stanton J. Peale
University of California - Santa Barbara
Roger J. Phillips
Washington University

Mark S. Robinson
Northwestern University
James A. Slavin
NASA Goddard Space Flight Center
David E. Smith
NASA Goddard Space Flight Center
Robert G. Strom
University of Arizona
Jacob I. Trombka
NASA Goddard Space Flight Center
Maria T. Zuber
Massachusetts Institute of Technology

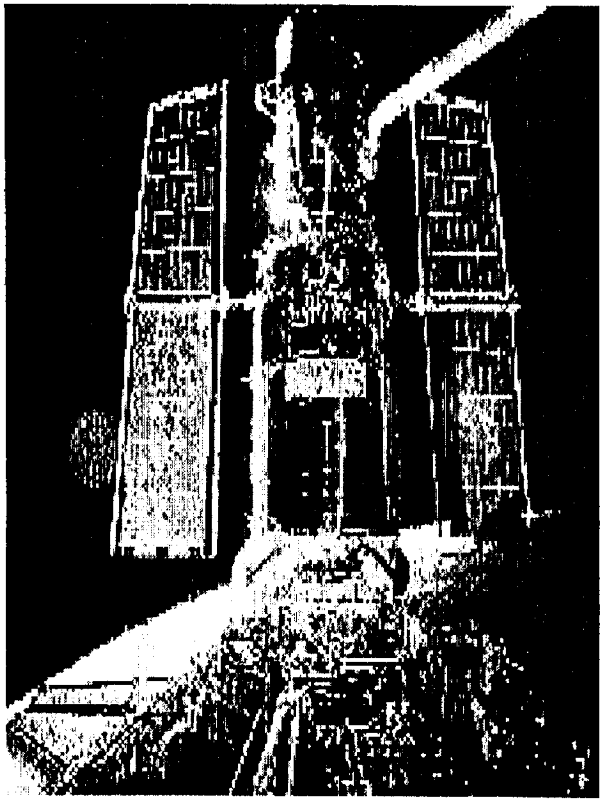
Mario H. Acuna
NASA Goddard Space Flight Center
Daniel N. Baker
University of Colorado
William V. Boynton
University of Arizona

Clark R. Chapman
Southwest Research Institute
Andrew F. Cheng
JHU Applied Physics Laboratory

George Gloeckler
University of Michigan / University of Maryland

Robert E. Gold,
JHU Applied Physics Laboratory

James W. Head III
Brown University
Stamatios M. Krimigis
JHU Applied Physics Laboratory



Description

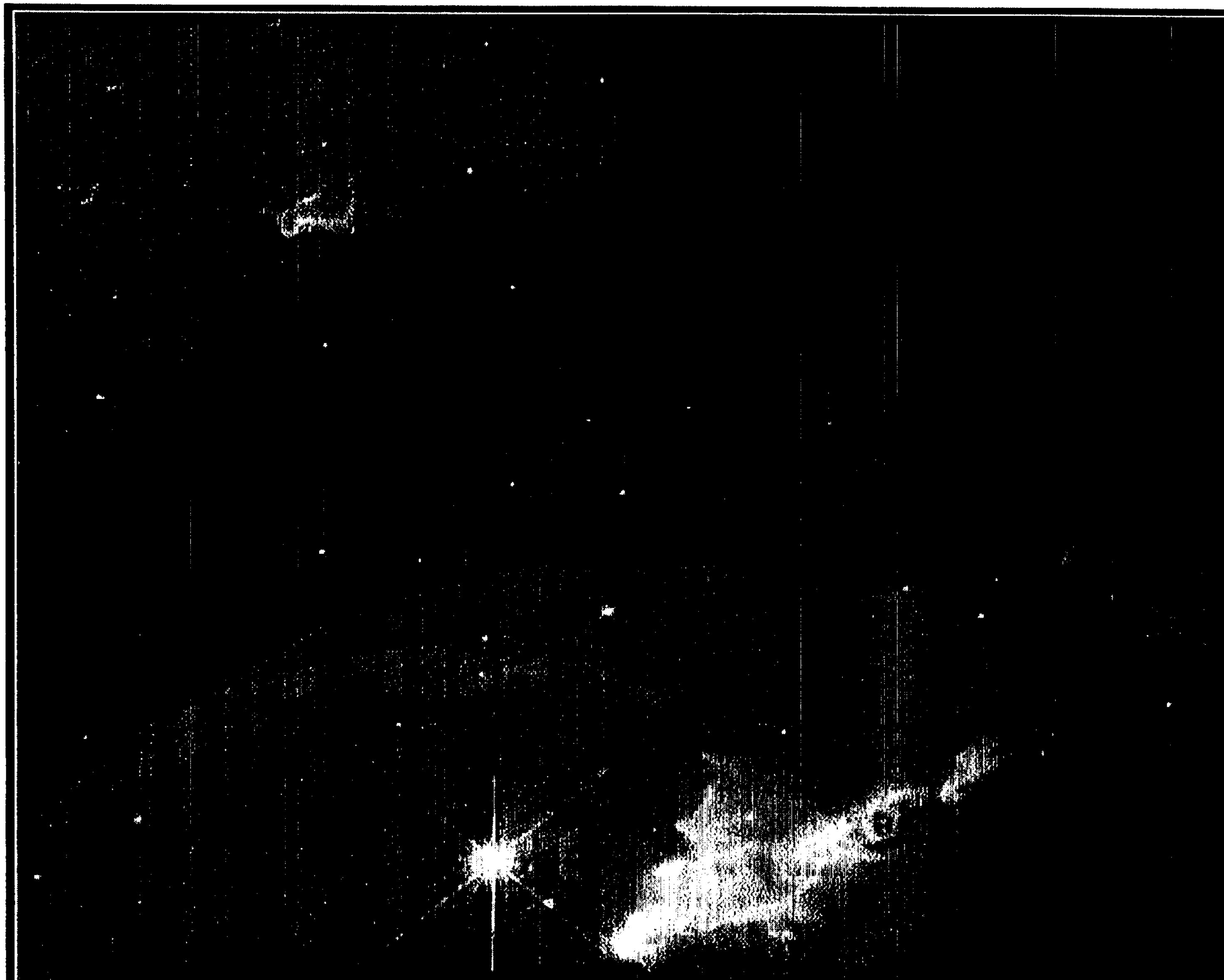
The Hubble Space Telescope (HST) was the first and flagship mission of NASA's Great Observatories program. Designed to complement the wavelength capabilities of the other spacecraft in the program (CGRO, AXAF, and SIRTF), HST was a 2.4 m, f/24 Ritchey-Chretien telescope capable of performing observations in the visible, near-ultraviolet, and near-infrared (1150 A to 1 mm).

Gaseous Pillars • M16

HST • WFPC2

PRC95-44a • ST ScI OPO • November 2, 1995

J. Hester and P. Scowen (AZ State Univ.), NASA



Bubble Nebula • NGC 7635 **HST • WFPC2**
NASA, D. Walter (South Carolina State University)
and P. Scowen (Arizona State University) • STScI-PRC00-04

Credits: NASA, **Donald Walter (South Carolina State University),** Paul Scowen and Brian Moore (Arizona State University)

Research Team: Donald Walter (South Carolina State University), Paul Scowen, Jeff Hester, Brian Moore (Arizona State University), Reggie Dufour, Patrick Hartigan and Brent Buckalew (Rice University).

Funding: Space Telescope Science Institute, **NASA MUSPIN** and NASA URC.

7.2 Proposal Preparation Checklist

Table 7.1: Proposal Preparation Checklist

Step	Procedure
1) Obtain Template	Send an e-mail message to newprop@stsci.edu containing the words `request templates' in the subject line.
2) Receive Template	You will receive via return e-mail: - the Phase I Observing (GO/SNAP) Proposal Template fileobstemplate.tex and the Archival Research (AR) Proposal Template fileartemplate.tex ; - the style file phase1.sty which includes the supertabular files; - an example of a completed observing template file inobsexample.tex .
3) Fill out the Template	Fill out the appropriate Proposal Template file using your favorite text editor. Detailed Instructions can be found in Section 8.1 . Summary instructions can be found in the templates themselves.
4) Prepare a Postscript or PDF version of your proposal.	For most proposers, the easiest way to produce a Postscript or PDF version of the proposal is to use the LaTeX software on the completed proposal template. If you are not familiar with LaTeX, please check with your system manager for how to run it on your system, and how to use PostScript encapsulation for any figures. The STScI Help Desk (see Section 1.5)
5) Send the completed proposal template to STScI: "LaTex Submission"	To complete the first part of your submission, send the completed Phase I proposal LaTeX template file to STScI by e-mail to newprop@stsci.edu . Set the formattedsubmission keyword in the LaTeX template to either `EMAIL' or `FTP' (see Section 8.1.5), depending on how you plan to perform your formatted submission (see step 6).

What is the Earth Science Enterprise?

We understand some facets of our environment fairly well: short-term weather forecasts, basic hurricane tracking, and detecting changes on the Earth's surface. However, much critical information is missing: we cannot predict how the climate will shift a year from now, and what the effects will be on people whose livelihoods depend on that climate, from farmers to urban planners.

NASA's Earth Science Enterprise captures our spirit of exploration and focuses it on the Earth. NASA and its inter-agency and international partners are striving to discover patterns in climate which will allow us to predict and respond to environmental events - such as floods and severe winters - well in advance of their occurrence. Nations, regions, and individuals can then use this knowledge to prepare for these events, likely saving countless lives and resources.

Key Understanding

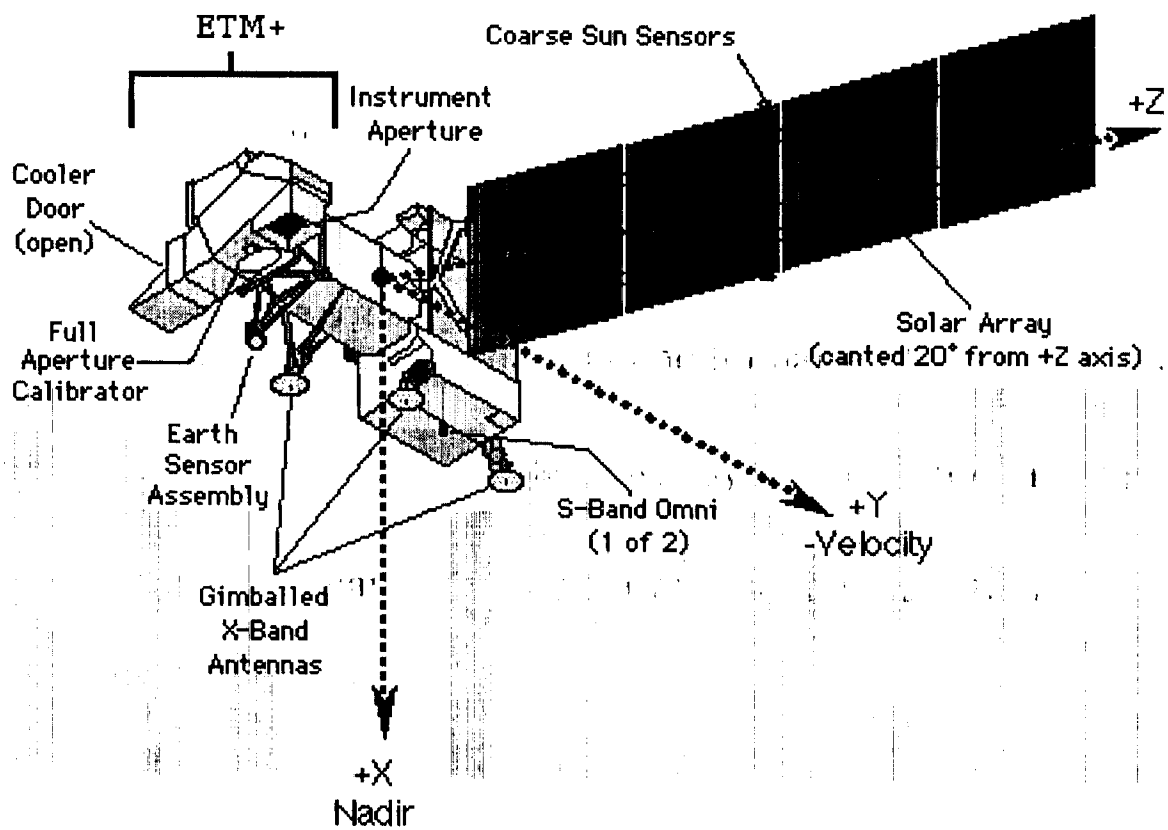
NASA uses the unique vantage point of space to provide the scientific basis for informed policymaking, and the research to support the operational missions of other US Governmental organizations. Results of ESE science research and applications provide an objective starting point for the development of sound global environmental policy.

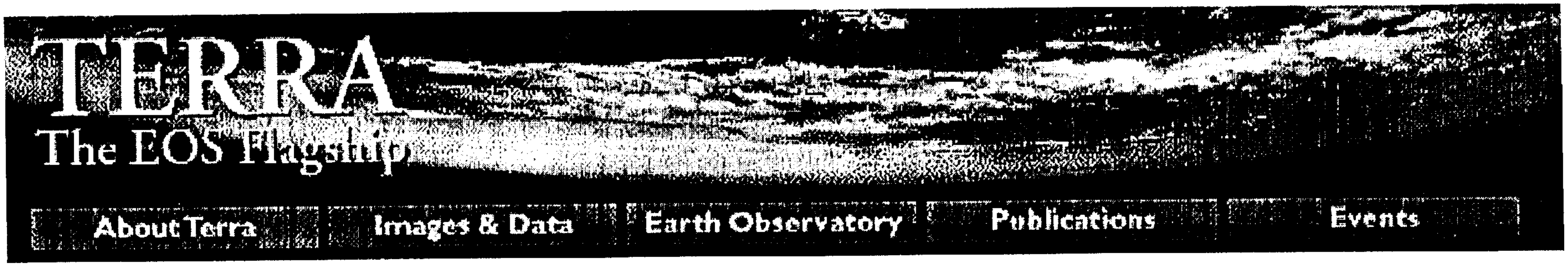
Earth Science Missions

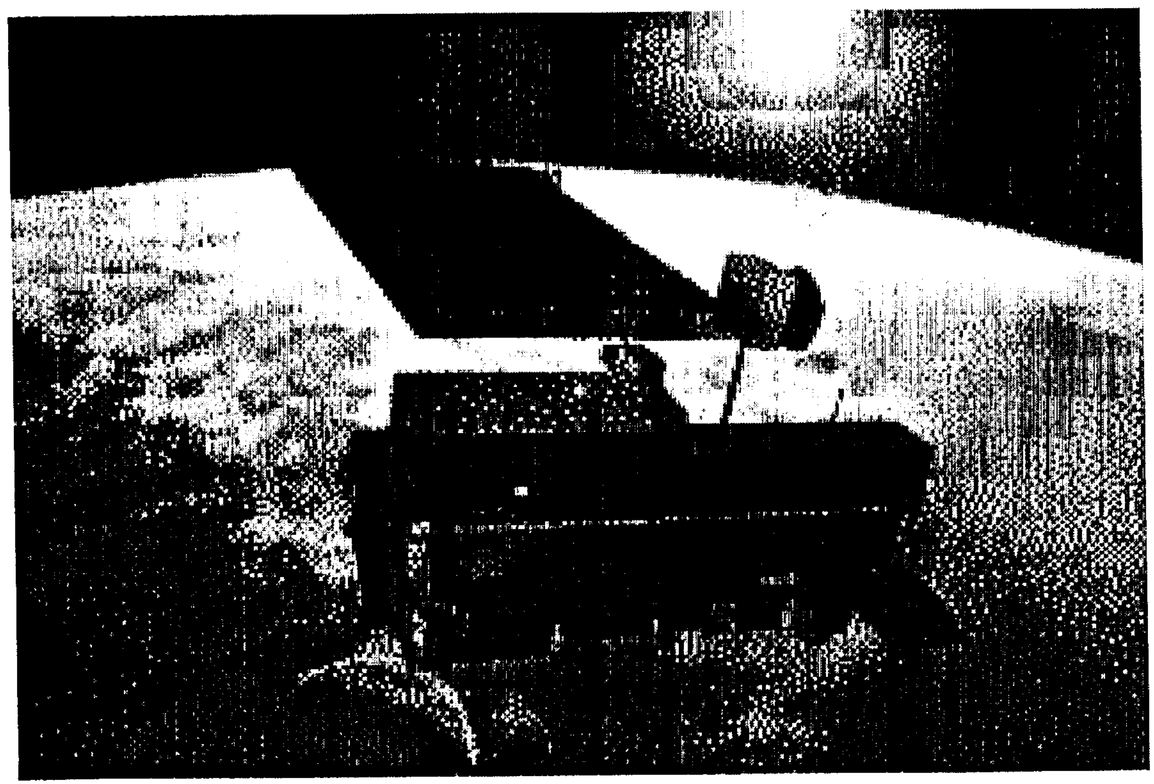
- Earth Observing System (EOS) @GSFC (Atmospheric Physics and Land Surface)
- Earth Observing System (EOS) @JPL (Oceanography)
- Earth Observing System (EOS) @LaRC (Atmospheric Chemistry)
- Earth Probes @JPL
- Earth Probes @GSFC
- Earth Science Technology Program (ESTP)
- Geostationary Operational Environmental Satellites (GOES)

- Commercial Remote Sensing
- EO-1/EO-2 New Millennium Missions
- New Millennium Program (NMP)
- Polar Operational Environmental Satellites (POES)


LANDSAT 7


ETM+
Instrument Aperture
Coarse Sun Sensors
Cooler Door (open)
Full Aperture Calibrator
Earth Sensor Assembly
Gimballed X-Band Antennas
S-Band Omni (1 of 2)
Solar Array (canted 20° from +Z axis)
+Z
+Y
-Velocity
+X
Nadir


TERRA
The EOS Flagship
About Terra
Images & Data
Earth Observatory
Publications
Events



The UARS Flight Observatory

The Problem: Changes in the Upper Atmosphere

For several decades, scientists have sought to understand the complex interplay between chemistry, physical dynamics, and radiative processes that govern the structure of Earth's atmosphere. Much attention has now been focused on the upper atmosphere, with particular concern about two areas:

- the possible effect of natural and man-made influences, and
- the potential effects of changes in the upper atmosphere on such areas as climate, weather, and protection provided by the ozone layer.

NASA Earth Science Enterprise Research Strategy for 2000-2010

1. Introduction

The mission of NASA's Earth Science Enterprise (ESE) is to develop a **scientific understanding** of the **Earth system and its response to natural or human-induced changes** and **improve prediction capabilities for climate, weather, global air quality and natural hazards**. The Earth science research program aims to acquire a deeper understanding of the components of the Earth system and their interactions. These **interactions occur on a continuum of spatial and temporal scales** ranging from **short-term weather to long-term climate scales**, and from **local and regional to global scales**. The Enterprise also seeks to provide accurate assessments of changes in the composition of the atmosphere, the extent and health of the world's forest, grassland, and agricultural resources, and geologic phenomena that lead to natural hazards.

The strategic objective of the Enterprise is to provide scientific answers to the overarching question:

How is the Earth changing and what are the consequences for life on Earth?

NASA Earth Science Enterprise Research Strategy for 2000-2010

2. Earth System Science Issues

The key research topics studied by NASA's Earth Science Enterprise fall largely into three categories: **forcings, responses, and the processes that link the two** and provide feedback mechanisms.

How is the global Earth system changing?

What are the primary forcings of the Earth system?

How does the Earth system respond to natural and human-induced changes?

What are the consequences of change in the Earth system for human civilization?

How well can we predict the changes to the Earth system that will take place in the future?

NASA Earth Science Enterprise
Research Strategy for 2000-2010

Basic Research and Data Analysis

The **intellectual capital** for both the **planning and exploitation** of Earth **system observations** is vested in an **robust research and analysis program**. Research and analysis is the conceptual source of Earth system science questions, and strategies to address them. The research program is at the **origin of new scientific ideas** and **emerging research approaches…..**

Institute on Climate and Planets (ICP)
CCNY Metropolitan Weather Network

A collaboration of universities, K-12 and NASA

In recent times, however, the most significant **anthropogenic forcing** of the planetary environment has been the modification of the **composition of the atmosphere**, leading to **rising** concentrations of a number of **reactive and radiation absorbing gases** that contribute to **depleting the stratospheric ozone layer** and to **increasing the atmospheric greenhouse effect**. The buildup of atmospheric CO2, driven by the **combustion of fossil fuels along with deforestation and other changes in land use**, is the largest contributor to the global increase in the greenhouse effect. Quantifying the fraction of CO2 from anthropogenic sources that accumulates and remains in the atmosphere (about half of total emission) is, in itself, a very complex problem, considering that CO2 fluxes from the combustion of fossil fuels and changes in land use are but a small fraction of the large natural fluxes between atmospheric, terrestrial ecosystem, and oceanic reservoirs

Destination: Earth

Office of Earth Science Program

University Earth System Science
(UnESS)
Project Announcement of Opportunity

This Announcement of Opportunity (AO) is intended to **foster** the development of the **next generation of Earth system scientists, engineers, managers, educators**, and entrepreneurs through significant and meaningful **hands-on student involvement** in Earth observation space missions at the **university level**. The **hands-on student involvement** should include **helping prepare the proposal** through **analysis and distribution of the data** to the scientific community.

David E. Steitz
Headquarters, Washington, DC
(Phone: 202/358-1730)

March 31, 2000

RELEASE: 00-51

NASA AWARDS UNIVERSITY CONCEPT STUDIES FOR EARTH SCIENCE PROJECTS

The four concepts chosen for further development are:

*** The "SPACE" mission, proposed by Columbia University, New York, NY, would examine, from aboard the International Space Station, the scattering properties of clouds and aerosols over a two-year period.**

* The THOR mission, proposed by the University of Alabama in Huntsville, hopes to examine in unprecedented detail the growth and decay of thunderstorms through continuous observations of lightning over the Americas and adjacent oceans. By placing a lightning-monitoring sensor on a weather satellite, the THOR team hopes to gain radical new insight into the formation and evolution of thunderstorms.

* The Coral Reef Ecosystem Spectro-Photometric Observatory, proposed by the University of Hawaii, Kaneohe, would look at the health of coral reefs around the world. By using spaceborne spectral observations of the reefs, scientists hope to determine how climate change may be affecting these vital contributors to Earth's health.

* CIRRUS, proposed by the University of Wisconsin, Madison, would be an instrument flying aboard the International Space Station to look at clouds and, in particular, cloud ice. Understanding cloud ice will greatly enhance our understanding of clouds and their role in the global climate system.

National Aeronautics and
Space Administration

June 29, 1999

NRA-99-OES-02

RESEARCH ANNOUNCEMENT

OPPORTUNITIES TO PARTICIPATE IN THE EARTH SCIENCE ENTERPRISE (ESE) EDUCATION PROGRAM

SELECTION RESULTS
FOR
NRA-99-OES-02

Opportunities to Participate in the Earth Science Enterprise Education Program

Teacher Enhancement

Aponte-Avellanet, Ibis L University of Puerto Rico**
Interactions and Diversity: Earth System Science and Beyond

Benson, Bernard W University of Tennessee Chattanooga
Pre-Service Teacher Enhancement Program

Hayden, Linda B Elizabeth City State University*
Mathematics of the Great Dismal Swamp

Kuglin, John R University of Montana
Earth Science Enterprise Research Program

Limaye, Sanjay S University of Wisconsin Madison
Earth Science Component for Academic Professional Enhancement (ESCAPE)

Locke, Sharon M University of Southern Maine
ACCESS Earth: Promoting Accessibility to the Earth System Sciences for Persons with Disabilities

Odell, Michael R L University of Idaho
NOVA Online ESS

Panah, Assad I University of Pittsburgh
An Interdisciplinary Teacher Training Program on Earth System Science Using Information Technology, 2000-2002

Strong, William R University of North Alabama
Earth System Science On-Line Course: On Opportunity in Geography Education

Student Enrichment

Chambers, Lin H Langley Research Center
Students' Cloud Observations On-Line (S'COOL): A Unique Project with Emphasis on Grades 4 and Under

Hayden, Linda B Elizabeth City State University*
You BE the Scientist with Satellite Imagery in EZ/EC Communities

Moon, Thomas Montana Technical University
STEP Careers in Research Exploration Program

Morris, Vernon R Howard University
Celebrating 20th Century Pioneers in Atmospheric Sciences

Olson, Tim Salish Kootenai College
Remote Sensing of Tribal Lands: Earth System Science Student Research Experiences at Salish Kootenai College

Yamaguchi, Janet Discovery Science Center
The Dynamic Earth

Curriculum Support

Blount, Grady Texas A&M University Corpus Christi
The Translingual Earth System Science Education Center

Butcher, Ginger Goddard Space Flight Center
The Pigeon Adventure: An Adventure through Remote Sensing History

Gobert, Judith M Salish Kootenai College**
NASA Native Earth Systems Science Curriculum Project (NESCP)

Kahn, Ralph A Jet Propulsion Laboratory
Practical Uses of Math And Science (PUMAS)

Pickle, John D AER, Inc.
Enhance of the Global Systems Science Student Guide Series for the Digital Earth Initiative

Vierling, Lee A South Dakota School of Mines & Technology
Earth Systems Connections: An Integrated K-4 Science, Mathematics, and Technology Curriculum

Digital Earth

Gordin, Douglas N Michigan State University
Pending Availability of Funds: (Transforming Learning and Traveling through the Digital Earth)

Rodriguez, Waldo J Norfolk State University*
Scenario Based Learning: Inquiry for a Digital Earth

Expected Outcomes

- MU-SPIN will increase the number of proposals MURED receives from traditionally underrepresented minority institutions.
- MU-SPIN will increase the number of minority institutions participating in and benefiting from NASA education programs.
- MU-SPIN will assist in identifying barriers for minority institutions to participate in NASA Enterprise programs.
- MU-SPIN will address and outreach technology issues for minority institutions to compete in the 21st century.
- MU-SPIN will improve the effectiveness of MURED's funded initiatives for education and research.
- MU-SPIN will assist in identifying qualified candidates from minority institutions to assist NASA with diversity goals for employment.

MU-SPIN Showcase

Dr. Willie Brown, Jackson State University

Ms. Joan Gil, Canutillo ISD

Dr. Nagi Wakim, Bowie State University

Dr. Fred Okoh, Morris Brown College

Dr. Willie Brown
Jackson State University

Information Technology at Jackson State University

Strategic Plan

- Access Services
- Shared Systems
- Support Services

Priorities

- CampusWide Network
- Computer Labs
- Electronic Classrooms
- Faculty/Staff Desktops
- Training

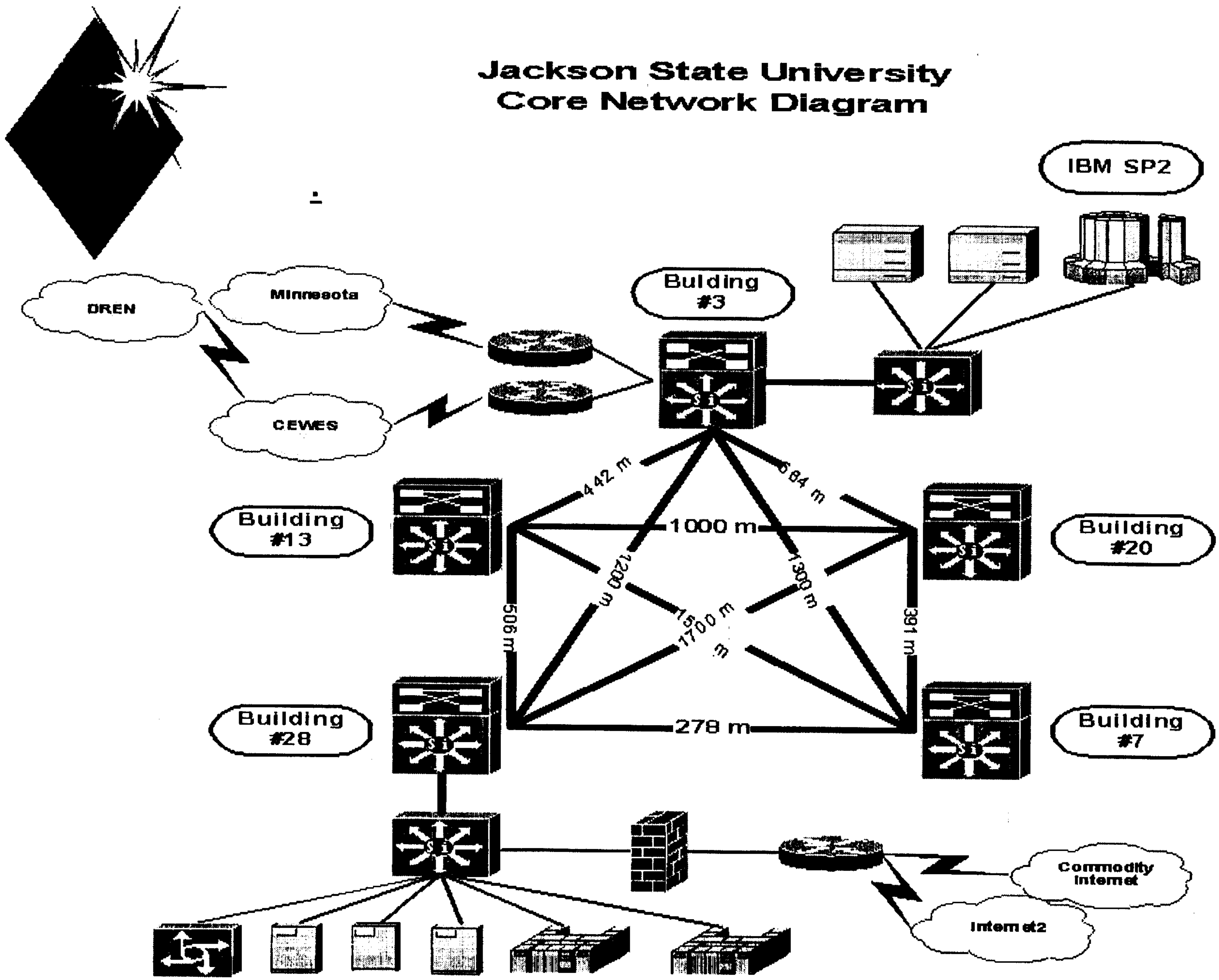
Funding

- NASA-NRTS ($50,000)
- Legislature ($4 million)
- Title III ($2 million)
- DoD ($10 million)
- Tech Fee($1 million)

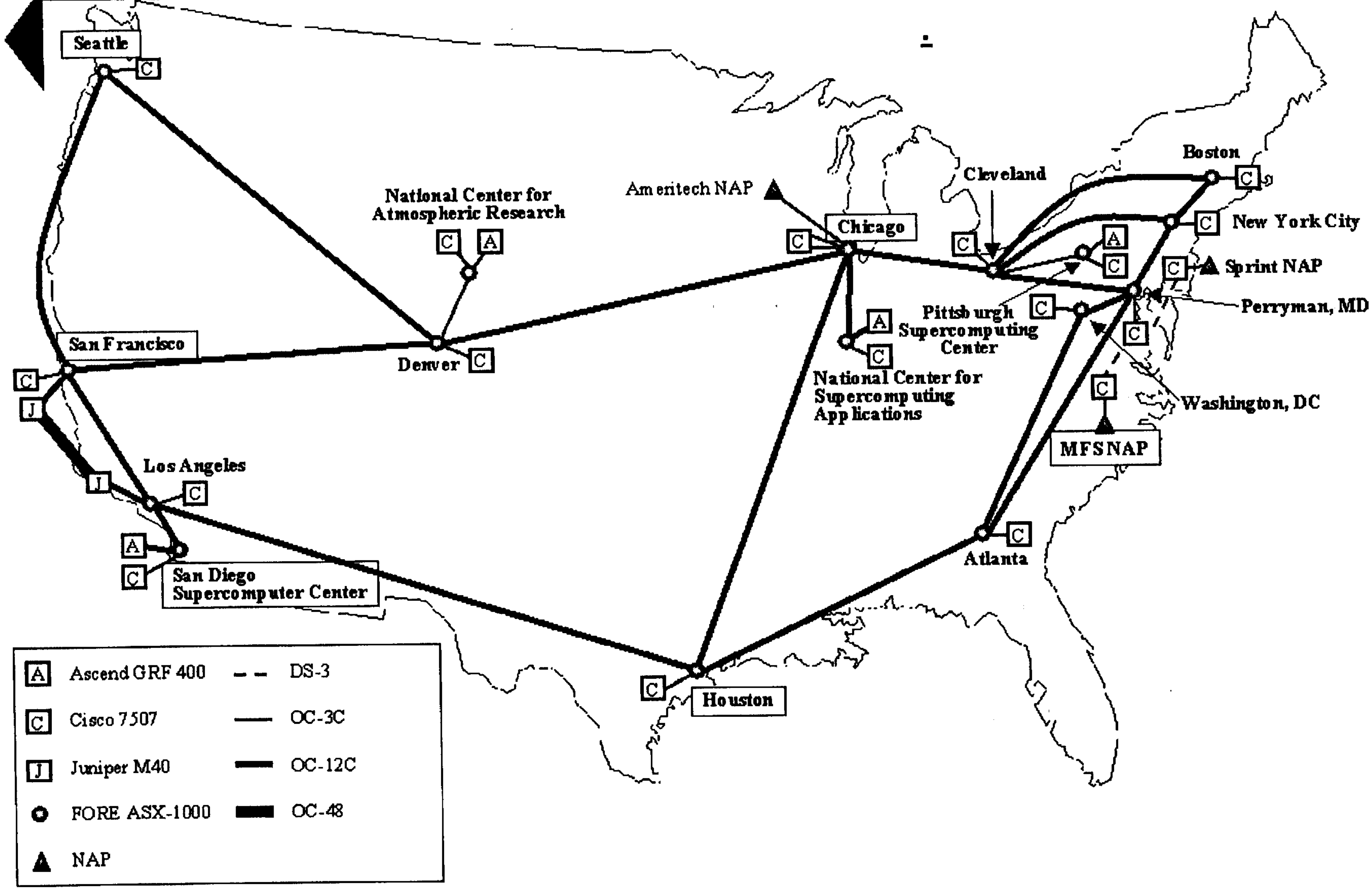
Access Services

- Connectivity at JSU
  - Fiber-Optic Network
    - Completed June 1999
- Connectivity to Outside World
  - Next Generation Internet (NSF)
    - vBNS
  - Internet2 (UCAID)
    - Abilene Network

Jackson State University
Core Network Diagram



vBNS Backbone Network Map

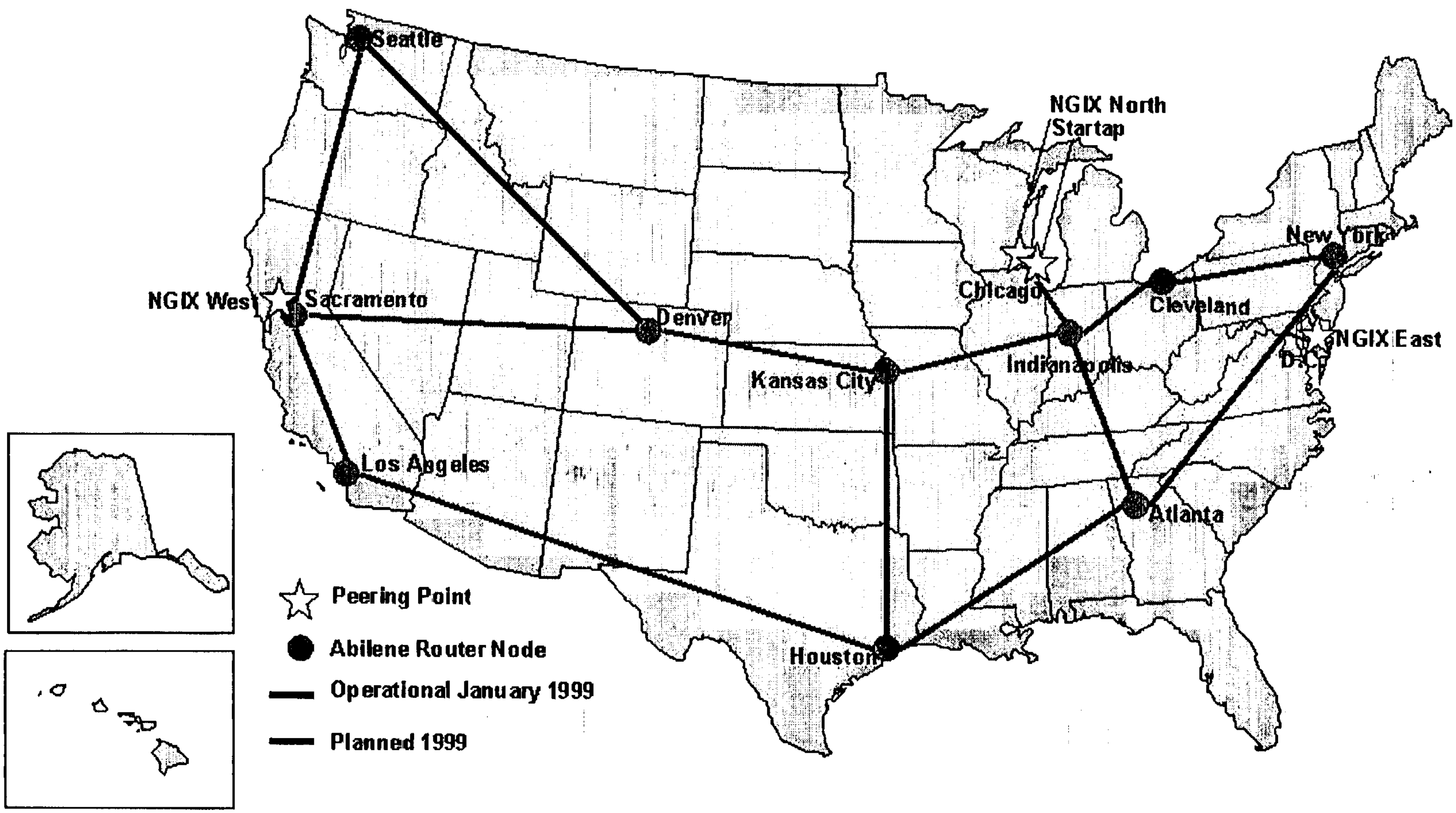


Abilene Network

February 1999

University Corporation for Advanced Internet Development

Abilene



Shared Systems

- SCT PLUS2000 (SIS, FRS, HRS, ADS)
  - Student Information System (SIS)
    - Web for Students (Payment Gateway)
    - Web for Faculty
    - Web for Executives
  - Touch-Screen Kiosks
    - SIS (Campus Union, H. T. Sampson Library, Universities Center, B. F. Roberts)
    - Treasury Department (Career Counseling)

Shared Systems

- Academic Computing
  - HP, IBM, Sun, SGI Servers
- High Performance Computing
  - IBM SP2 Supercomputer ($2 M)
- Administrative Computing
  - IBM ES9000 Mainframe System
- Network Management & Security

Support Services

- Personnel
  - Academic IT Coordinator
  - Network Manager
  - Computer Lab Coordinator
  - Computer Technician
- Hardware & Software
  - Over 1,000 Computers
  - Site Licenses for Software

Support Services

- Computer Labs
  - JAP
  - H. T. Sampson Library
  - All Dormitories
- Electronic Classrooms
  - JAP

Support Services Progress Report

- Teaching/Learning Lab
  - CFM
- Distance Learning Classrooms
  - SEB (T-1 Connection to MIVN)
  - JAP (ISDN)

Support Services

- ***Distance Learning Courses***
  - *Rehabilitative Services* (MIVN)
  - *Biology* (ISDN)
  - *Computer Science* (WEB)
- ***Training***
  - *JSU Faculty and Staff*

Support Services

- Research Activities
  - Mississippi Space Commerce Initiative -- NASA
  - High Performance Visualization Center Initiative – DoD (Navy)

Challenges
(Potential Barriers to Progress)

- OIT Organizational Issues
  - Staff Size
  - Salary Scale
- Equipment Upgrades and Maintenance

Staff Size

- Rennselear Polytechnic University
- Lehigh University
- 6,500 Students
- 1,000 - 2,000 Faculty/Staff
- RPU & LU ~ 150 IT personnel each
- JSU -- 35 IT personnel positions

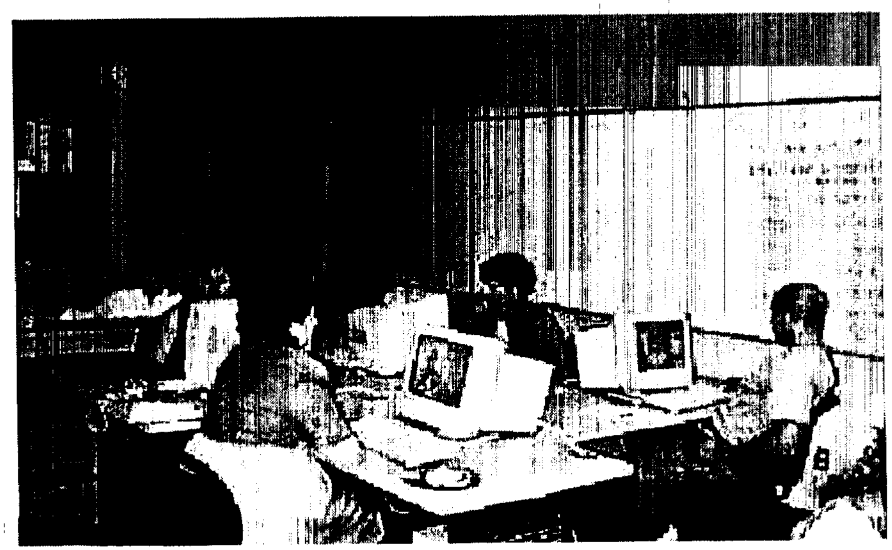
Salary Scale

- 1998 NACUBO Study
- IT Spending Per Capita
  - Average* -- $333
  - JSU -- $132

* All Universities Responding to Survey

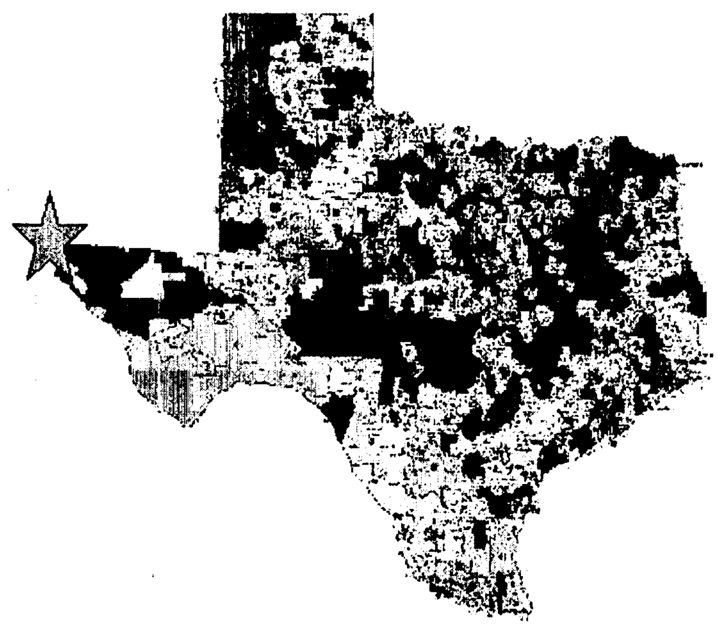
Ms. Joan Gill,
Canutillo, ISD

The NASA/MU-SPIN-Canutillo ISD Connection



Planting the Seeds for Growth

Where in the World Is Canutillo?



The Canutillo ISD is located the center of a low-income rural community that serves over 5,000 students and their families.

The Roots

"All students attending Canutillo Middle School will have the opportunity to uniformly access and use technology in its various forms in the pursuit of achieving their full potential."

1997-Present

Continuous and Timely Staff Development Opportunities

- E Rate, TIF Grants
- SEDL/TAP
  http://www.sedl.org/tap
- Service Learning
  http://www.nationalservice.org
- Challenge Grants

Growth

- ✓ 1997-Canutillo middle school intranet hooked up with the district's LAN
- ✓ 1998-website launched
- ✓ 1999-2000media distribution center, first rocket fair, globe implementation
- ✓ 2000-rockets to health community fair
- ✓ 2000-Journado experimental range
- ✓ 2000-EPA investigation

The Open Forums

Canutillo Independent School District

- Democracy in action
- Web Development
- Video Production
- Live on the Net

To go places and do things that have never been done before, that's what living is all about.

Michael Collins

"Permit me to congratulate you for the fine *Meet the Candidates Forum*.... You have helped put democracy into action. I know of no other social studies or government class which organizes and implements such a successful event in public affairs."

Kathleen Staudt

Director of Public Education, UTEP

NASA is a priceless asset to assist students in becoming change agents in the community. NASA/MU-SPIN is providing hands-on experience and technical know-how with some of the most advanced technology for our students at the high school. The technology is understandable and useful not only to the curriculum of the sciences, but education in general. Harry Schulte and his staff are assuring that students are learned citizens to enrich their community. NASA is a great partner in education.

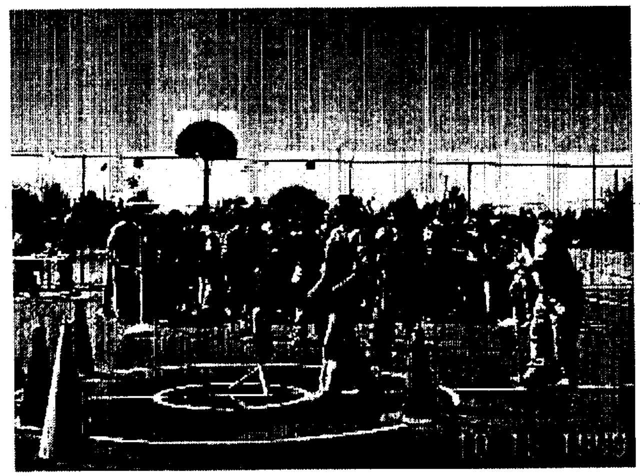
Canutillo Independent School District

Gary Berglund
Social Science teacher
Canutillo HS

Canutillo Technology Camp

"Thank you for allowing our students to experience university environment at NASA/MUSPIN and sharing your resources and knowledge. The skills learned will prepare our students for future academic and career choices."

Joe Bueno, teacher
Canutillo Elementary Technology Camp



Kudos to NASA/ MUSPIN for the assistance and support. We have soared with visits to the NRTS site Harry Schulte and his staff serve as role models. Teachers and students have learned HTML. Valuable funding has allowed the second annual Rocket Fair to become a community event. In the coming months, students and teachers will be visiting NASA/MU-SPIN lab to design rockets and create web pages that will be displayed on the NASA server.

Thank you for bringing hands-on and real life learning into our classrooms.

Robert Todd Martin, Science teacher

and the Classes of 2004 and 2005

Blast Off!

You're in charge but don't touch the controls.

— Shannon Lucid, recounting what the cosmonauts told her every time they left for a space walk, 1996.

- Students are constructing knowledge uniquely, in multiple ways, through a variety of authentic tools and resources. Student-initiated and student-controlled learning that places a good deal of the responsibility in the hands of the learner.
- Eleven CHS graduates are pursuing degrees in engineering and computer science

Dr. Nagi Wakim
Bowie State University

Presentation Available on line
http://nasa.utep.edu/muspin/nwakim.ram

Dr. Fred Okoh
Morris Brown College

Presentation Available on line
http://nasa.utep.edu/muspin/fokoh.ram

MURED SHOWCASE

Mr. Bill Staderman, Virginia Tech University

Presentation Available on line

http://nasa.utep.edu/muspin/bstaderman.ram

Dr. Horton Newsom, University of New Mexico

Presentation Available on line

http://nasa.utep.edu/muspin/hnewsom.ram

Dr. Tom Chyba, Hampton University

Presentation Available on line

http://nasa.utep.edu/muspin/tchyba

Mr. Reggie Eason

Deputy Program Manager, MU-SPIN

No Visuals were presented

http://nasa.utep.edu/muspin/reason.ram

NASA Earth Science Update with Information Science Technology

Dr. Milton Halem
NASA Goddard Space Flight Center

MU-SPIN 2000 10th Anniversary

NASA Earth Science Update with Information Science Technology

By

Dr. Milton Halem

Assistant Director for Information Sciences

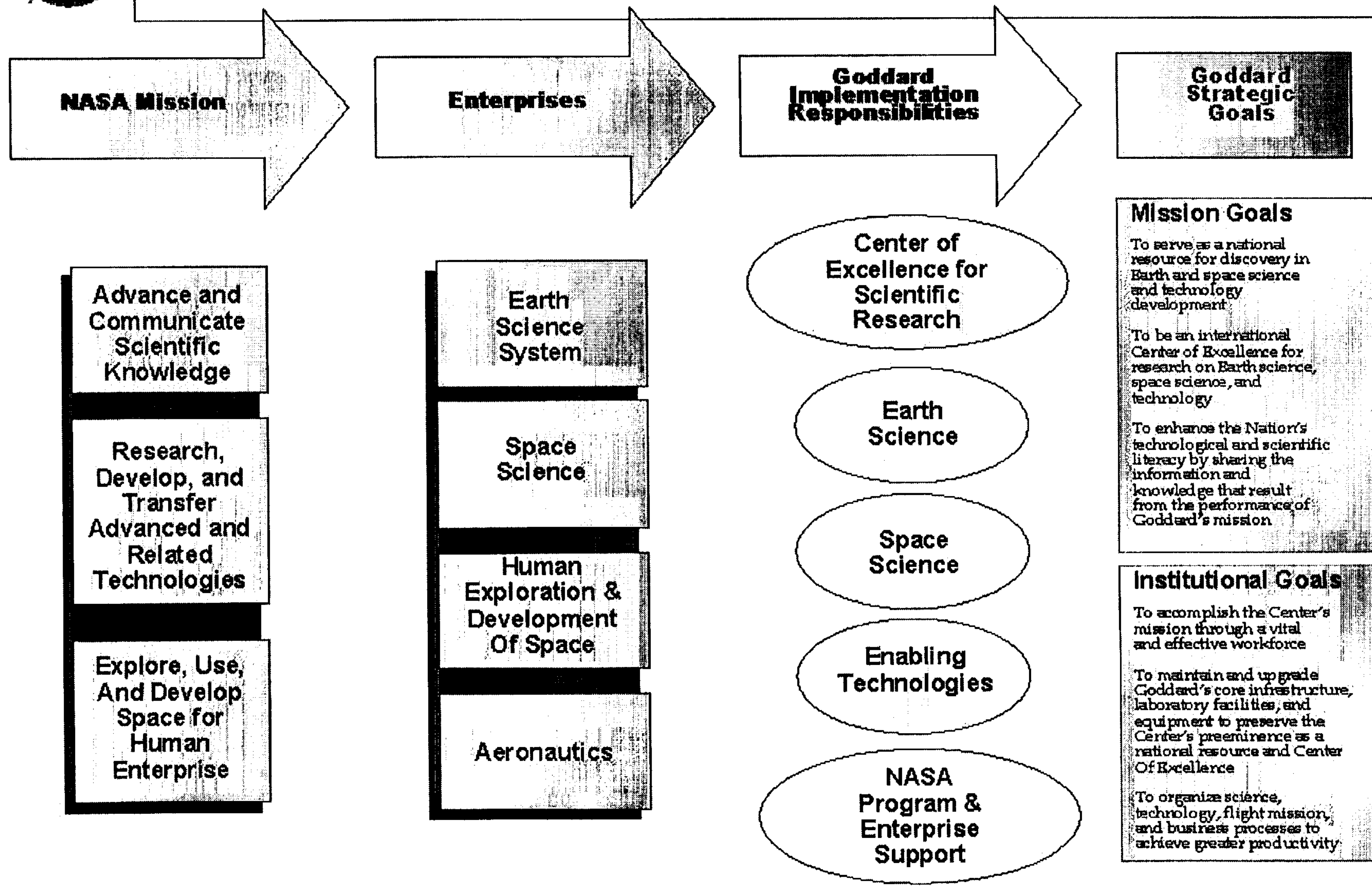
NASA/Goddard Space Flight Center

Presented at
MUSPIN 2000
Atlanta GA.
Sept.13,2000
Halem@gsfc.nasa.gov

Outline

- NASA/ESE/GSFC Strategic Plans
- ESE Missions and Flight Programs
- Roles of Information Science
- ESE Goals Related to MU-SPIN
- Future Thrusts
- Conclusion

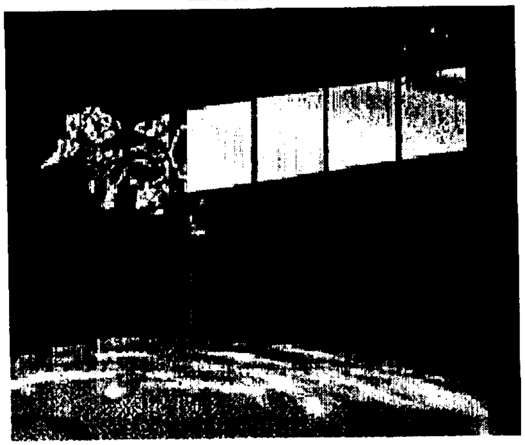
NASA's Strategic Plan & GSFC's Role



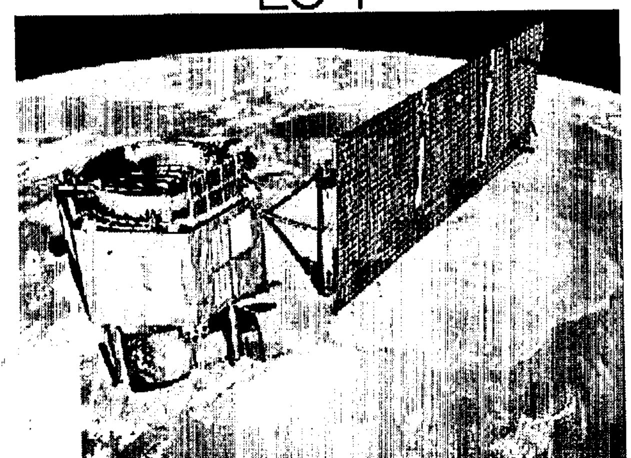
GSFC Earth Sciences

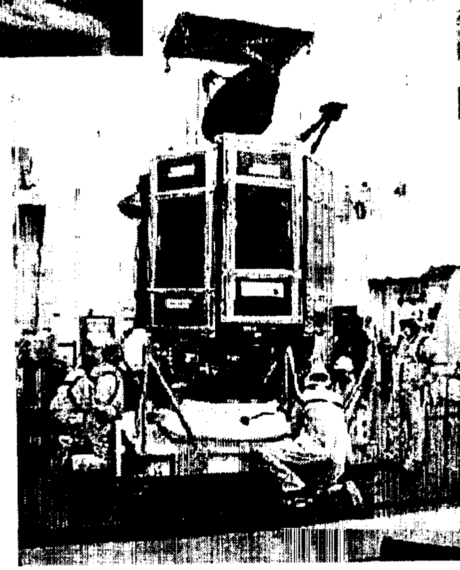
Today's Earth Science Missions

Landsat 7

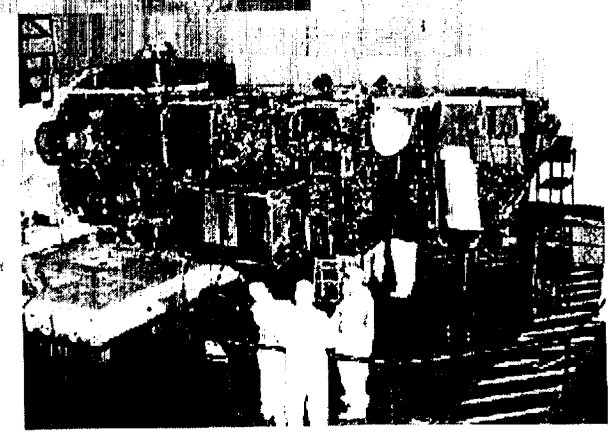


EO-1





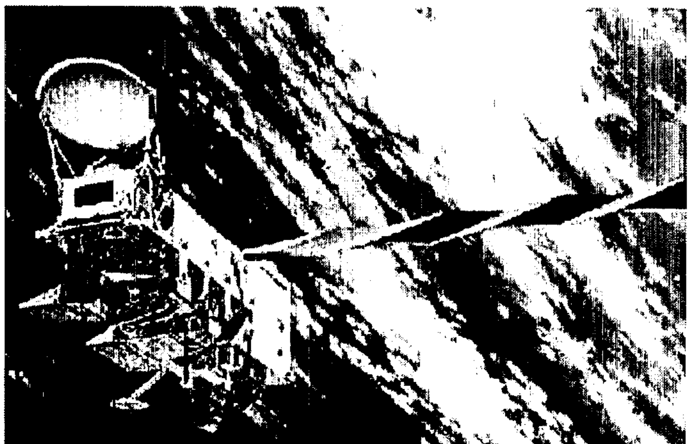
QuikSCAT



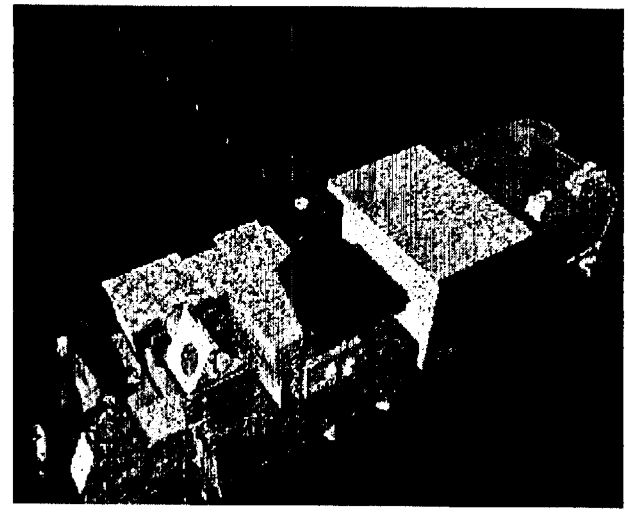
TERRA

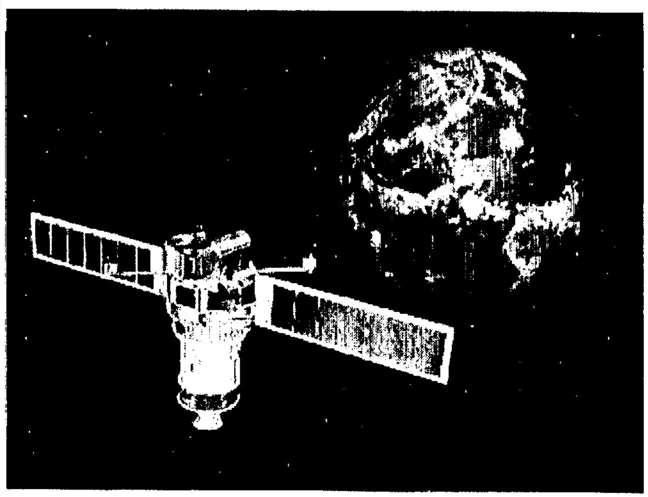
Future Earth Science Missions

EOS PM (Aqua)

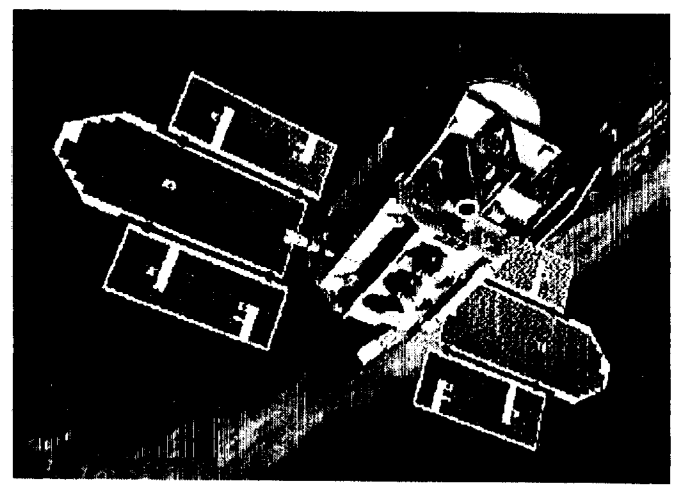


EOS Chem (Aura)





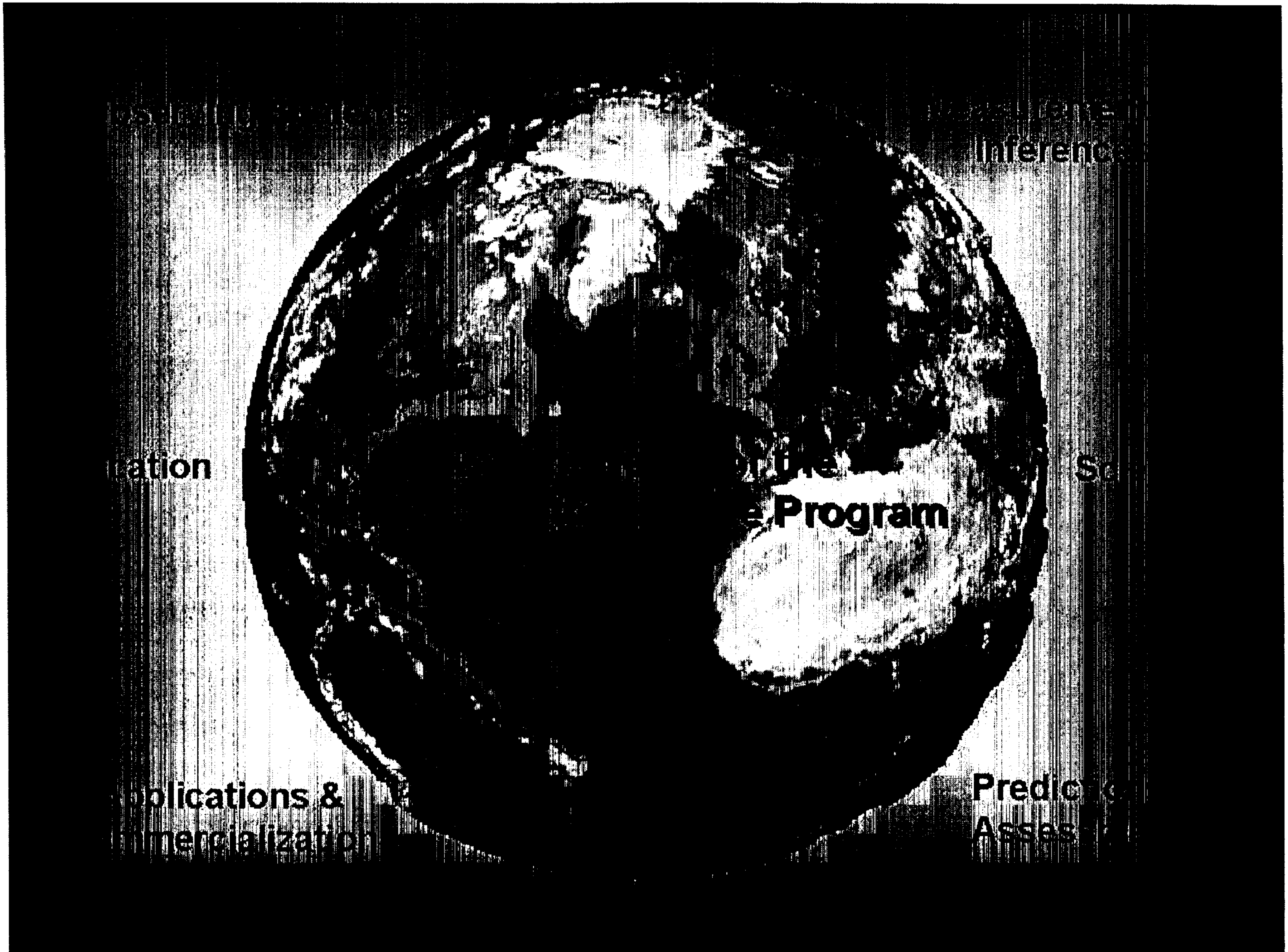
Triana



ICESAT

Earth Science Missions

QuickTime™ and a
GIF decompressor
areneeded to see this picture.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Computing
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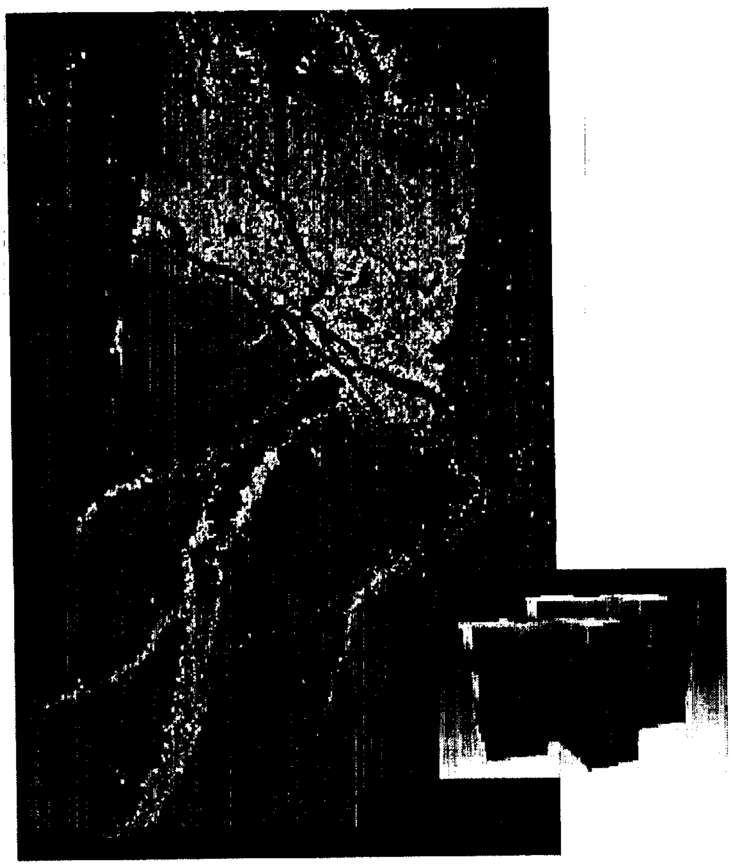
ESE 2000 Goals And Relationship to MU-SPIN

1. Observe, understand, and model the Earth system to learn how it is changing, and the consequences for life on Earth
2. Expand and accelerate the realization of economic and societal benefits from Earth science, Information Science, and Technology
3. Develop and adopt advanced technologies to enable mission success and serve national priorities

All three goals are directly related and supported through the activities of MUSPIN

ESE Goal 1: How do we "Observe, understand, and model the Earth system to learn how it is changing, and the consequences for life on Earth?"



MUSPIN working with NASA/ Goddard provides minority universities access to a <u>complete</u> high end computing environment for the training and collaborative research leading to improved prediction of climate,weather and natural hazards for present and future generations.

Morgan State Univ./UMBC

Collaborative Research

- MSU/UMBC OBJECTIVE: advance understanding of Earth system through computationally intensive Earth system modeling

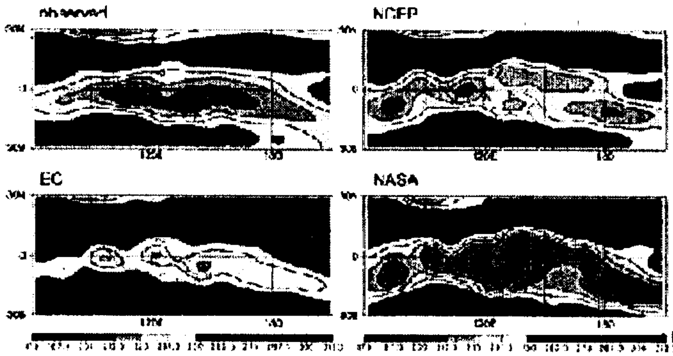
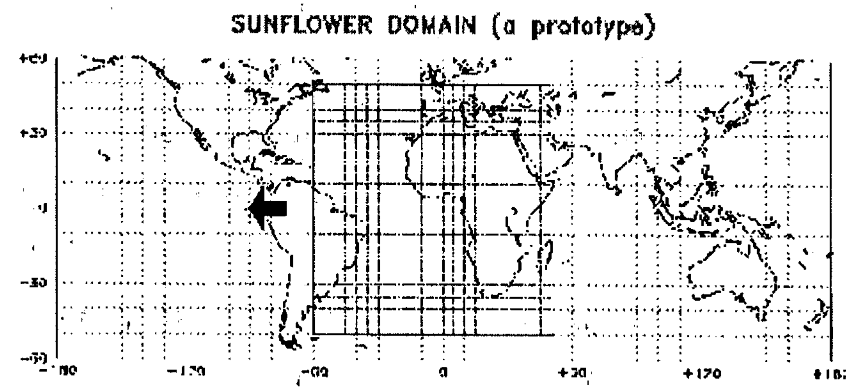


Fig. 2. DJF seasonal mean OLR from satellite observations and the three reanalyses for the winter seasons of 1980/81–1992/93. Contour interval is 12.5 K

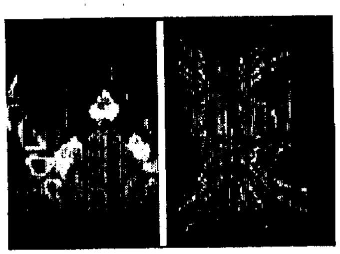
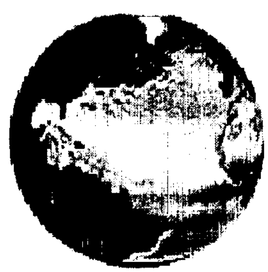


- Activities: mathematical modeling and computational science
  - cloud modeling on large and small scales
  - modeling support for TRIANA mission
  - research into numerical modeling techniques

Goal 1

HPCC/ESS

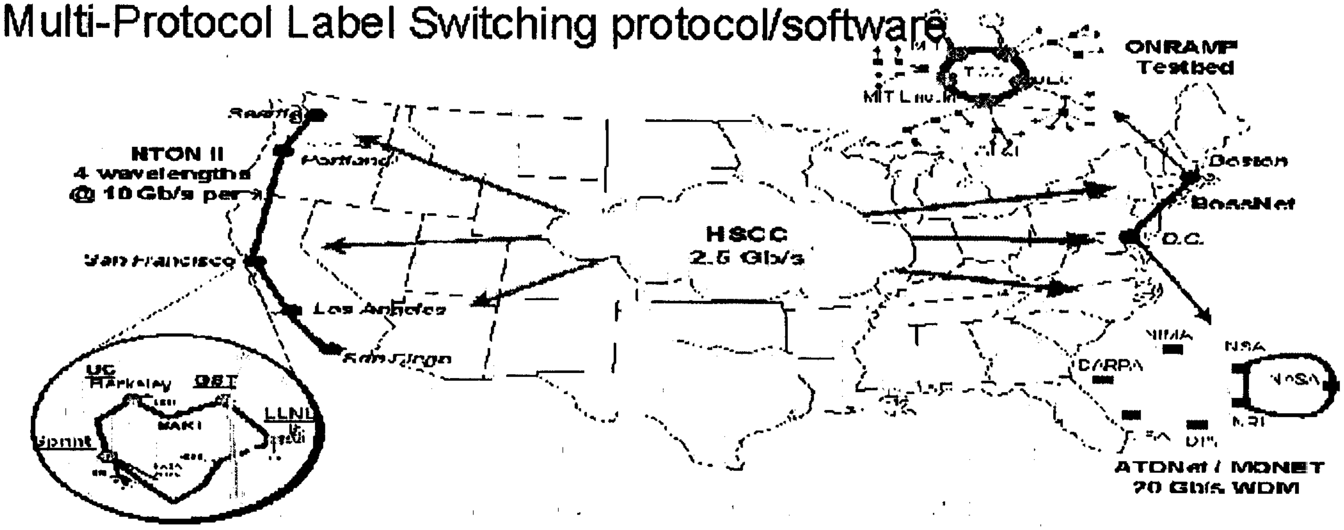
- The ESS CAN (to be issued Sept. 00) will select Grand Challenge Investigations including teams of Earth system modelers with emphasis on use of NASA data.
- The ESS CAN will assist Investigations to improve their applications using negotiated science metrics important to their discipline.
- ESS will provides time allocations on large scalable computer systems to NASA funded researchers allowing them to evaluate their usefulness.

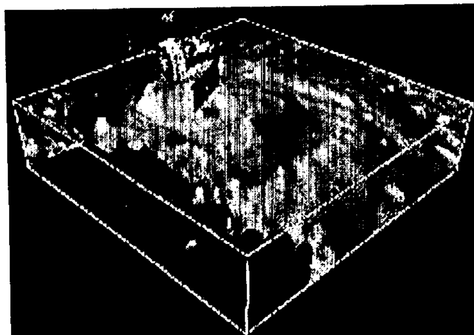




Goal 1

High End Computer Networking (HECN) Project

- Goddard/MU-SPIN is a key node on the 2.4-10 Gbps x 8 wavelength ATDnet which has been augmented with Wave Division Multiplexing technology from the DARPA-funded Multiwavelength Optical Network (MONET) Consortium
- One of the first users of DARPA's coast-to-coast 2.4 Gbps Supernet
  - Real time HPCC/ESS video from GSFC to SC'99 in Portland, OR
  - Evaluation of interoperable NIST, Cisco, & Juniper implementations of Multi-Protocol Label Switching protocol/software



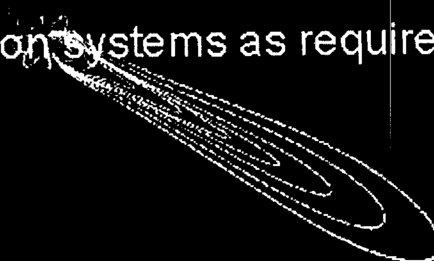


Elements of the Visualization Program

- Creation of scientific visualizations and animations for use by the Earth Science Enterprise for its customers

- ESE Public Communications Project
- TRMM, NSIPP

- Development and integration of visualization systems as required by programs of the Earth Science Enterprise

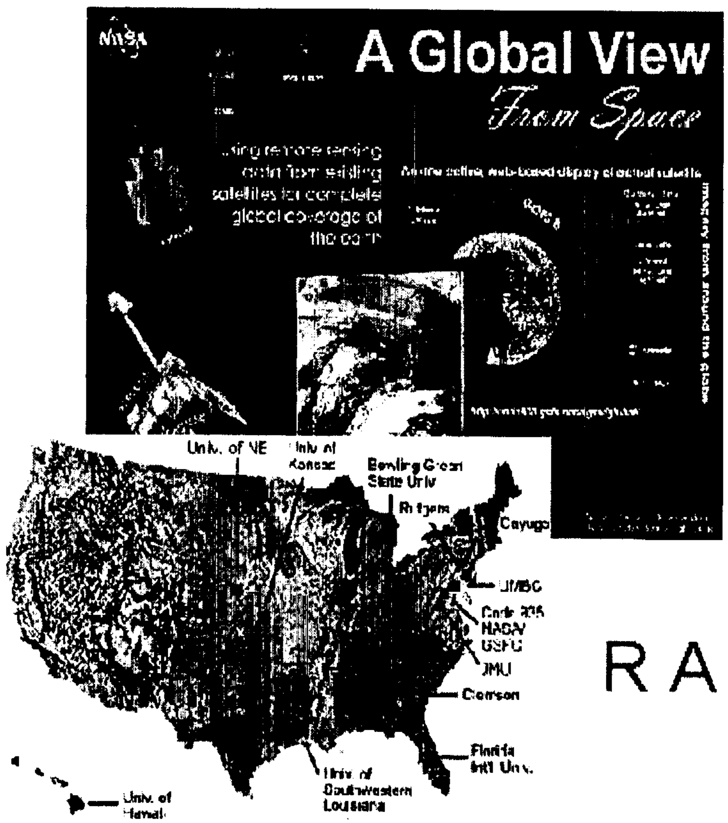


- GLOBE
- Digital Earth

- Investigation and deployment of advanced visualization technology and paradigms to enable researchers to extract information from data and computational results

- HPCC ESS
- Digital Earth
- NSIPP

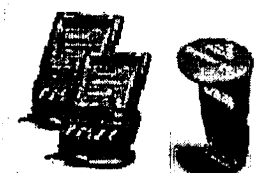
ESE Goal 2: How do we "Expand and accelerate the realization of economic and societal benefits from Earth science, information, and technology?"

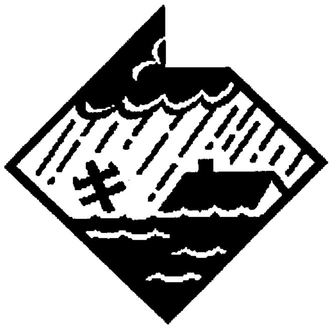


RAC

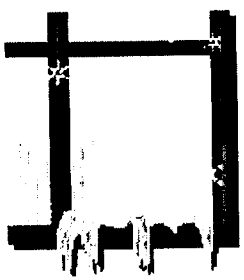
- By enabling productive use of Earth system science results, data, and technology in the public and private sectors
- By fostering the self-supporting use of environmental and Earth resource data (from satellites and other sources) by regional minority universities including state and local governments, consortia, and industry.

Earth Alert System

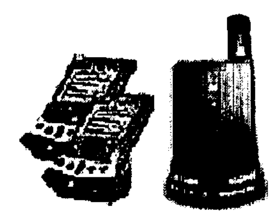




Project Objective:
Deliver the right disaster warning information to the right people at the right time within a community in a timely manner through communication infra-structures such as paging network.



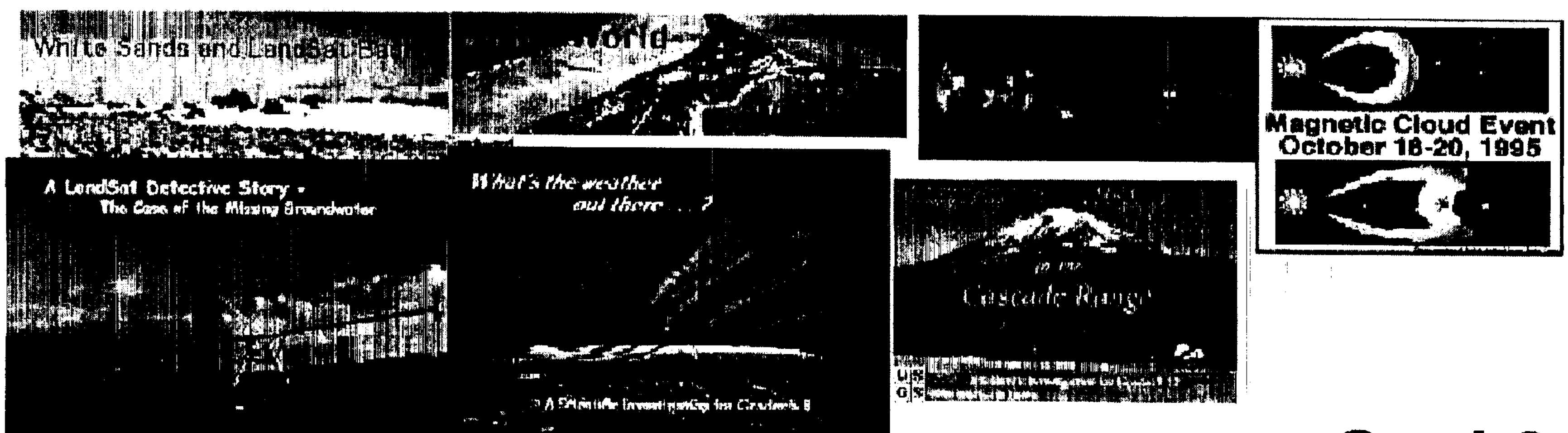
Code 933's Functional Area:
Provide managerial and technical guidance of prototype communication systems being developed by private industry under incubator programs sponsored by NASA and established strategic alliances with other government agencies.



Goal 2

HPCC/ESS

- HPCC support of the GSFC Earth and Space Science Education Project (GESSEP) develops interactive Internet learning modules for the K-12 community using NASA mission data.
- The ESS CAN contains incentives for proposers to include tasks that benefit education, the public, or state and local governments.



Goal 2

FY1999 Visualization Accomplishments

- Delivered separate animations totaling hours views Antarctica, views Mars, flybys, North Carolina flooding, Maryland drought, El Niño/La Niña updates, imagery, Greenland Ice Changes, and animations, Ozone, Hurricanes and Biomass burning, pre-launch, Vegetation Canopy LIDAR
- Established server as the first public NASA image server using Web Mapping Testbed protocols
- Developed as first fully-functioning Digital Earth prototype

GOAL 2

Space Hope

- establishing an urban multi-tiered IT training program with academia and industry to produce trained personnel with IT skills applicable to space-related job opportunities

Digital Earth

- enabling the public to explore and interact with the vast amounts of natural and cultural information gathered about the Earth

Learning Technologies

- enhancing K-12 science, mathematics, technology and geography education through Internet-based products derived from content on NASA's mission

Global Learning and Observations to Benefit the Environment (GLOBE)

- developing a Web-based interface for a world-wide network of students, teachers and scientists from 8,233 schools in 86 countries, working collaboratively to collect earth science data and understand the global environment

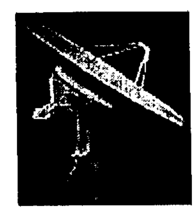
ESE Goal 3: How do we "Develop and adopt advanced technologies to enable mission success and serve national priorities?"

The Hive

Highly-parallel Integrated Virtual Environment

- 64 IBM compatible rack mounted PCs
- 128 - 200Mhz Intel Pentium Pro processors
- 4 Gbyte EDO RAM
- 160 Gbyte hard disk storage
- 100 Mhz switched fast ethernet
- 6.4 Gbit/sec maximum aggregate inter-processor communication

Satellite Direct Readout Commercialization Development - Terra System -

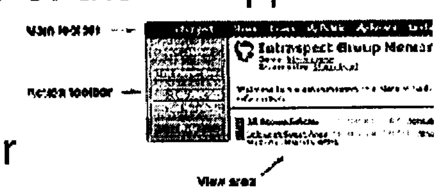


•"Terra" Data Rates
Less than 30MSymbols

Cost: ~200K

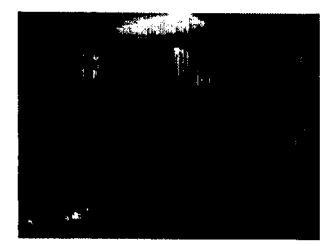
Knowledge Management

Implement the state-of-the-art approach in Info Technology for internal and external collaboratior



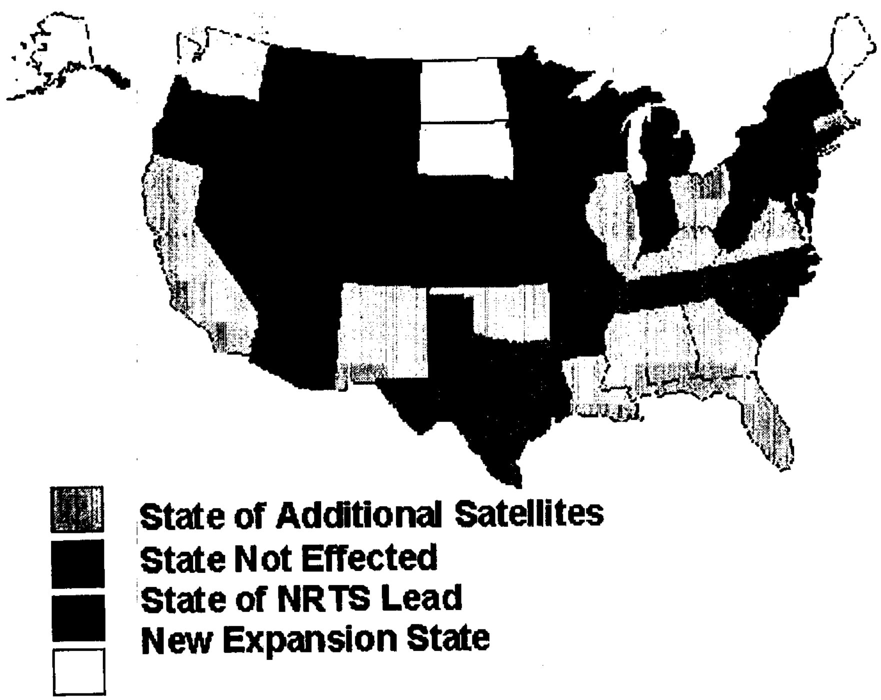
HPCC/ESS

- The ESS CAN will assist Investigations to engineer model and analysis codes without having to start from scratch.
- The ESS CAN will facilitate simultaneous achievement of high performance and code interoperability.
- The ESS CAN will assist the Earth system modeling community to jointly define and develop a software framework for code interoperability and high performance.
- ESS plans to "demonstrate 50 Gigaflop/s sustained applications performance at $250K for 50% of Round-3 Investigations" by FY04 using inexpensive commodity based clusters.
- ESS supports development of high performance
- middleware packages, such as Adaptive Mesh Refinement, for the science community.



Goal 3

MU-SPIN 2K Program



- Maintain networking MU-SPIN infrastructure to assist students and faculty of HBCU's/OMU's and competitively select new HBCU's/OMU's research consortiums that directly support the science and technology missions.

- NASA Code E providing support for HBCU's/OMU's facility instrumentation, computational resources, and networking infrastructures for enterprise missions and projects.

- Focus HBCU partnerships with industry and majority/minority institutions to better compete for NASA sponsored science and technology projects.

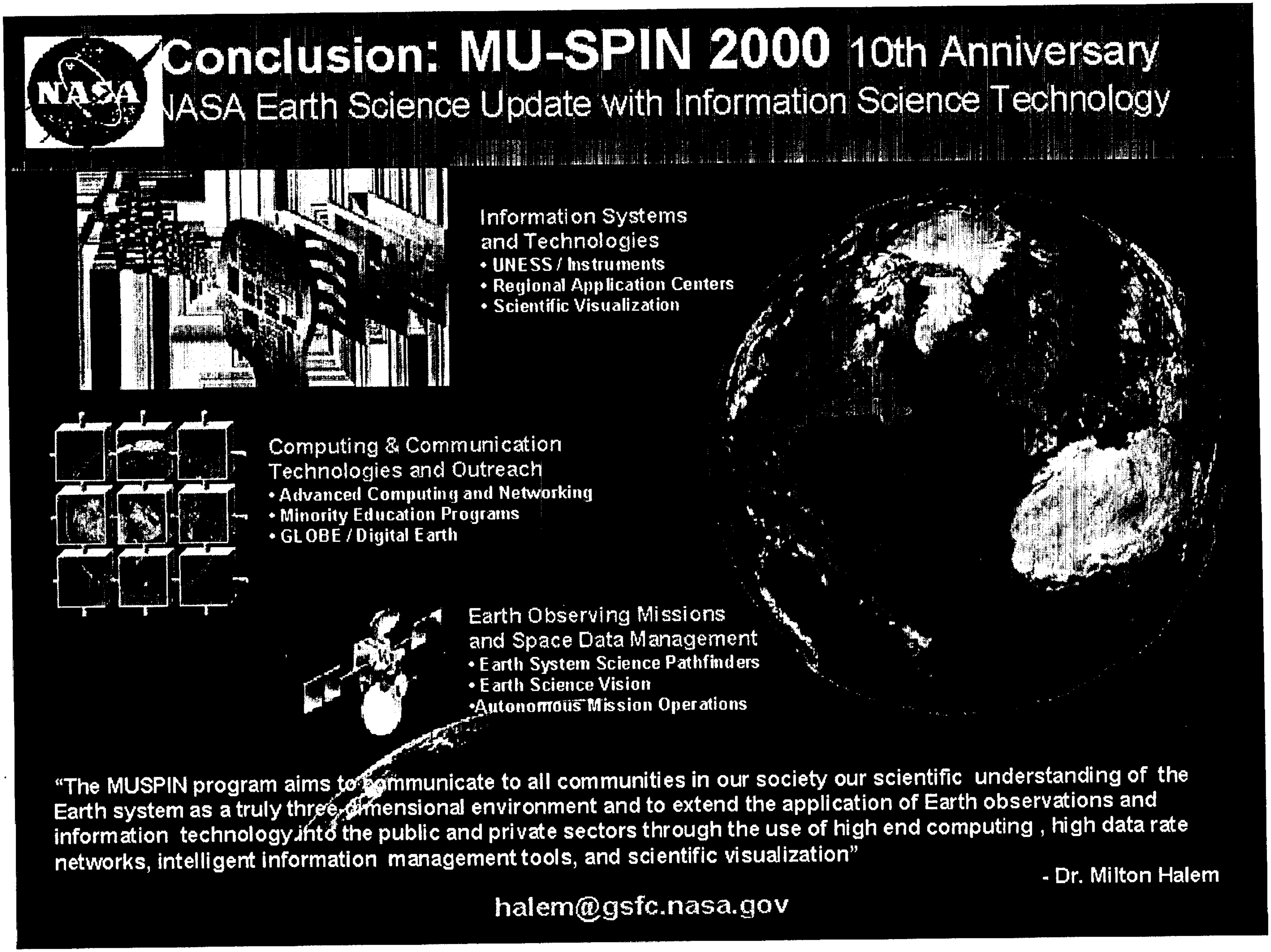
Goal 3

Future Thrusts: e-MUSPIN

- 10 years ago, MUSPIN started with a vision for the 90's as a unique training and education program needed to engage minority universities in the emerging network communication technologies

- As networking evolved from science enabling to a ubiquitous technology, MUSPIN also evolved in a broad range of IT science related applications

- As the revolution in telecommunications explodes in the next decade, MUSPIN can draw on its expertise gained in the 90's to address the IT opportunities offered by the Earth and space sciences missions of the 2000's (e.g. areas of opportunity include wireless communication, mobile computing, knowledge management, data management, distributed computing and e-space incubators)


Conclusion: MU-SPIN 2000 10th Anniversary
NASA Earth Science Update with Information Science Technology
Information Systems and Technologies
• UNESS / Instruments
• Regional Application Centers
• Scientific Visualization
Computing & Communication Technologies and Outreach
• Advanced Computing and Networking
• Minority Education Programs
• GLOBE / Digital Earth
Earth Observing Missions and Space Data Management
• Earth System Science Pathfinders
• Earth Science Vision
•Autonomous Mission Operations
"The MUSPIN program aims to communicate to all communities in our society our scientific understanding of the Earth system as a truly three-dimensional environment and to extend the application of Earth observations and information technology into the public and private sectors through the use of high end computing, high data rate networks, intelligent information management tools, and scientific visualization"
- Dr. Milton Halem
halem@gsfc.nasa.gov

END

Accomplishments

Future Thrusts in Visualization

- Obtain Production awards by offering to provide projects (TRMM, LandSat, space science, etc.) products at competitive costs produced by Mu-Spin students
- Solidify Systems funding through aggressive involvement in Digital Earth programs and partnerships
- Seek out and develop new Discovery programs in order to:
  - move more into the scientific mainstream of the Earth Science Enterprise,
  - begin publishable scientific visualization research efforts within the ESDCD, and
  - stay at the forefront of visualization technology.
- Continue to leverage activities across the Production, Systems, and Discovery efforts in order to sustain a robust visualization capability.

Major Computing Technology Accomplishments

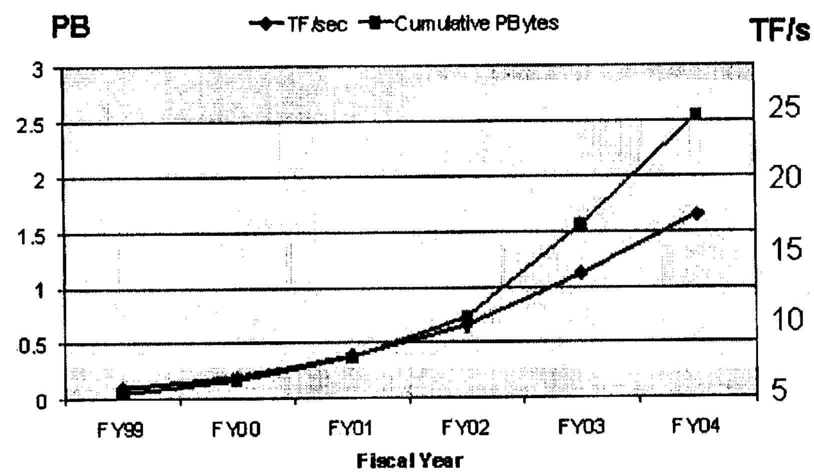
- HPCC/ESS triggered a new breed of vendor-produced Beowulf-type architectures based on commodity chips. (Beta testing IBM, SGI, Gateway, and DELL systems)
- SGI/Cray T3E with 1360 processors (1296 user) 170 GB memory, 1024 dedicated to NSIPP and 272 dedicated to HPCC/ESS. Largest T3E in the world.
- SGI Origin 2000 with 64 processors dedicated to DAO research, 32 gigabytes of memory, and 1.5 terabytes of disk storage.
- SGI/Cray J90se systems with 48 SV1 processors (quadrupling performance over the previous J90 processors)
- Over 120 TB of total data in an non-classified mass storage facility (77 TB unique data). Approaching 250 GB/day total traffic, 155GB/day input and , 95 GB/day retrievals.

Earth Science Computing Challenges

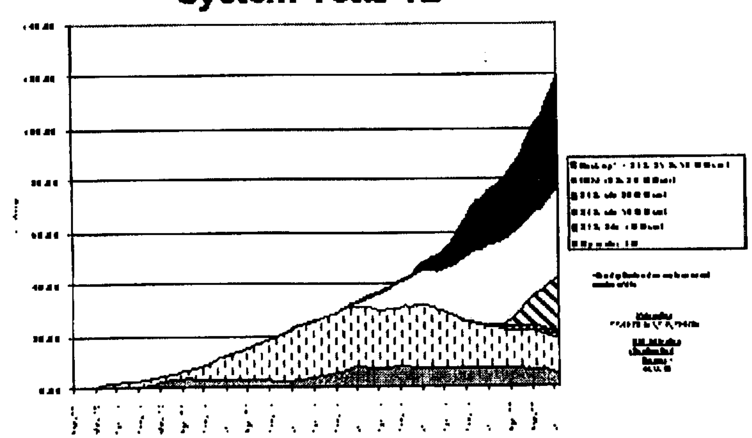
- The processing requirements are very large
  - 1.6 TFlops and 2.5 PBytes (single copy) total storage in FY04
  - Large single image jobs (20 GFlops-NSIPP, 80 GFlops-DAO in FY02)
- Serious applications software issues
  - Software not designed for distributed-memory architectures; software uses ~10% of peak performance
  - Programming models are complex (MPI, OpenMP, etc)
  - Software not designed for reuse and portability, legacy vector codes
- Systems software issues
  - Shortage of robust programming tools (compilers, debuggers, etc)
  - Systems software weaknesses (schedulers, network administration)
- Basic computer science needs
  - Needed improvements in data analysis (data mining and management, data interrogation and visualization)

Establish GSFC Earth Sciences Computing Center

Earth Science Computing and Mass Storage Requirements



NCCS Mass Data Storage and Delivery System Total TB



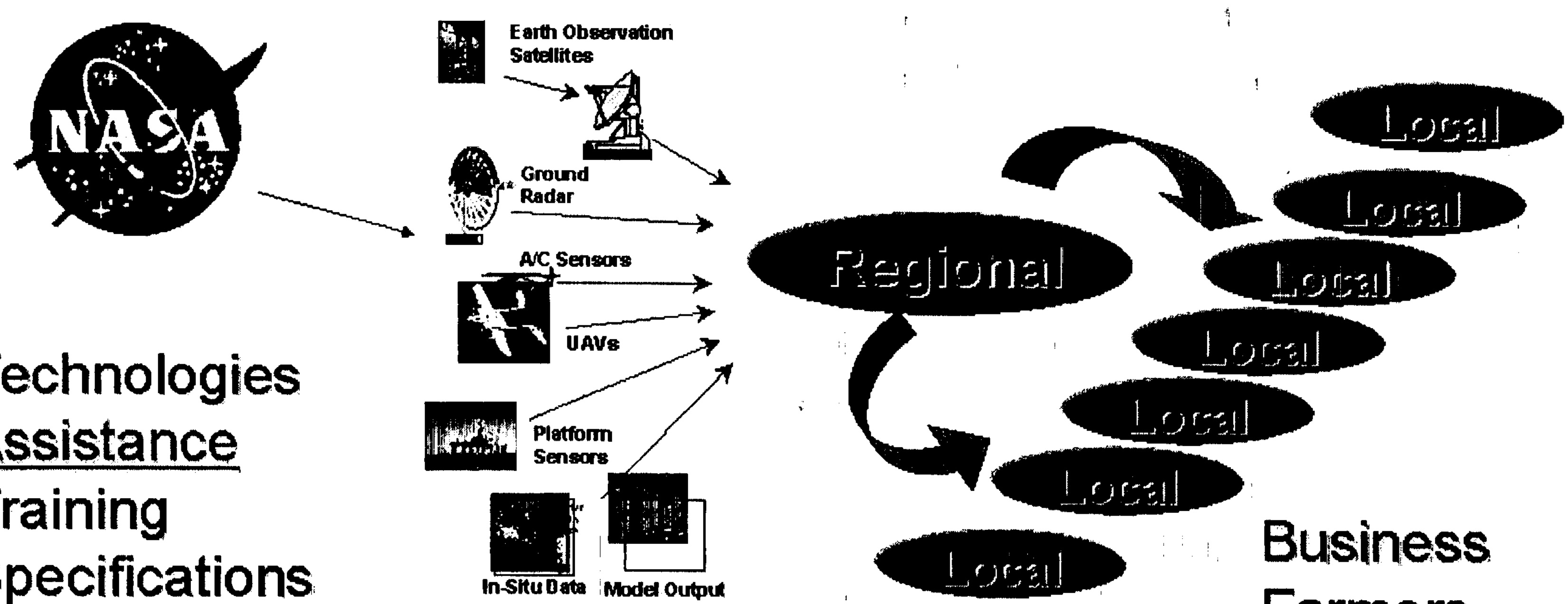
- Build an Advanced Software Engineering Group to improve scalable software modeling
- Conduct a "needs-based" acquisition to provide a world-class computing environment
- Develop a customer-focused management plan

Goal 1

31

RAC Approach

Working with regional information providers allows NASA developed data and technologies to benefit a broader and more public constituency than NASA can possibly reach alone.



Technologies
Assistance
Training
Specifications
Data
Basic RAC functions
NO MONEY

Business
Farmers
Public
Students

Enable the development of a robust commercial remote sensing industry

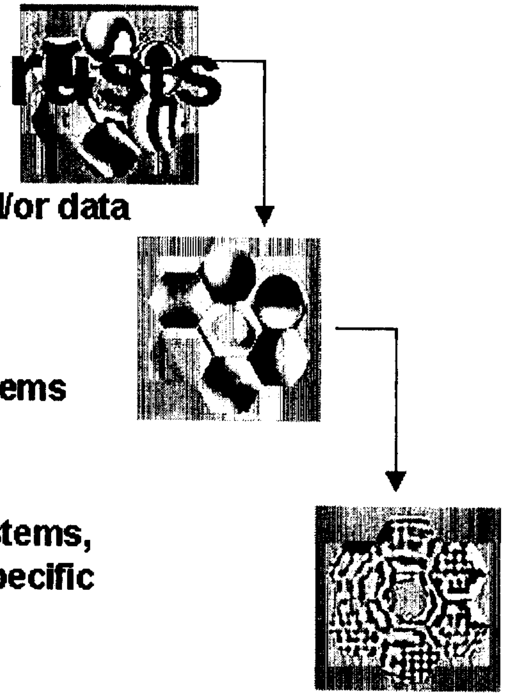
All Development activities are conducted in partnership with a commercial organization for long term sustainability

Also, Code 935 provides Tech management of several SBIR's

ESRI -GIS software
ORACLE - Database and information delivery
INFORMIX - Database Sw
3DI- Airborne Hyperspectral
AEPTEC - Communications Networking
Resource 21- Hyperspectral products
Global Science and Technology - Direct Met
Dupont Agricultural Services
Flightland Data- New sensors
Avtec-Realtime satellite ingest systems
Smartech-Front-end ground systems
Data Control Systems- satellite downlink demodulating systems
EMP- High data rate satellite receiving systems
Boeing - Remote sensing satellite mission
Also, Each RAC has individual commercial partnerships

Goal 2

GESTC Technology Thrusts

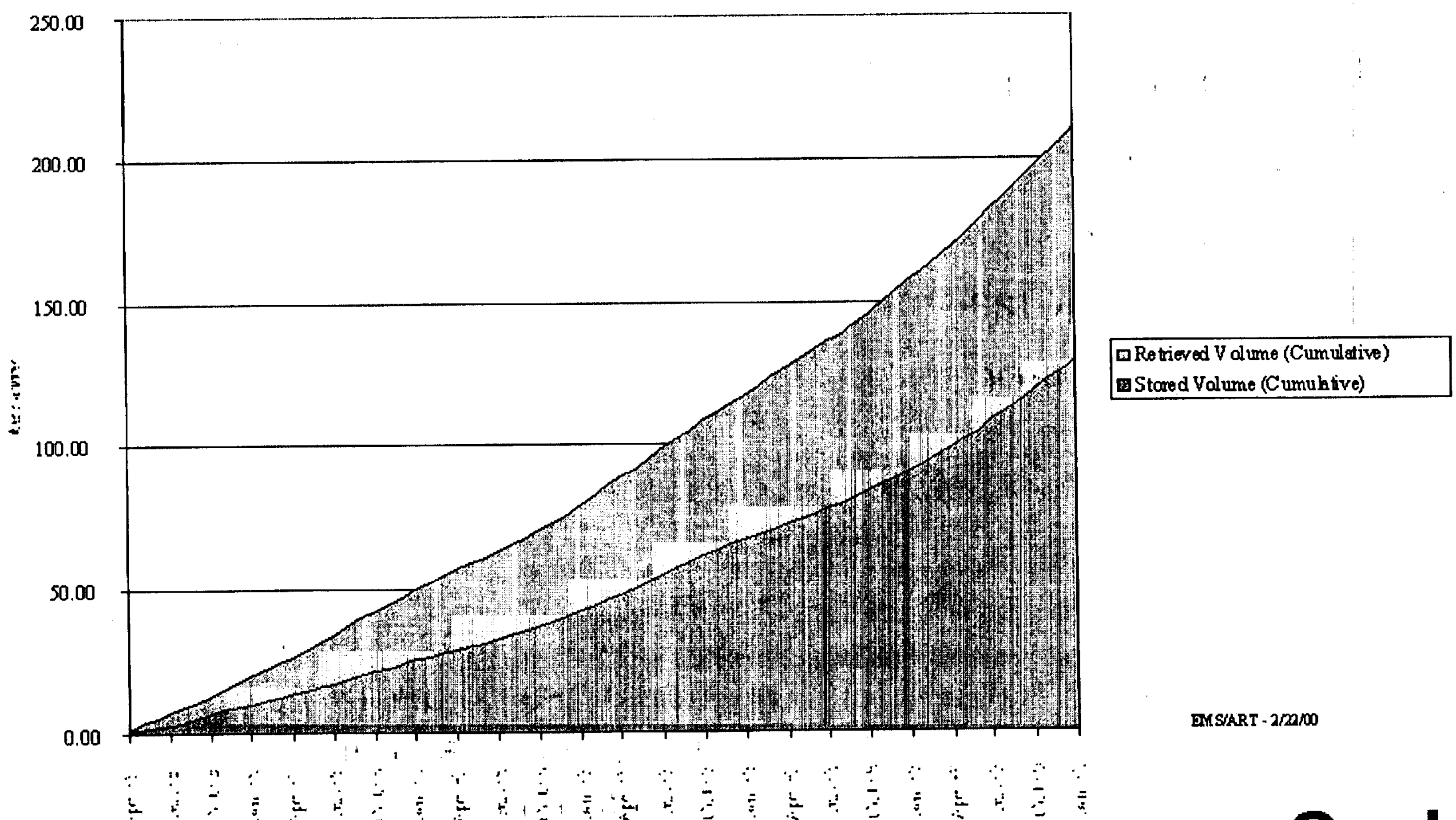


- Develop advanced technologies for computationally and/or data intensive applications
- Computational Optics
  - using sophisticated computational and information theoretic techniques to actively control optical systems and/or generate high resolution imagery
- Beowulf
  - providing COTS (Commodity off the shelf) base systems, essentially networking a "pile of PCs", to satisfy specific high-performance computational requirements
  - intensive Linux-based software development

- a Warehousing, Data Mining, and Data Preservation
  - improving science return on data intensive missions through information technology
- Knowledge Management
  - developing IT for more effective organizational management

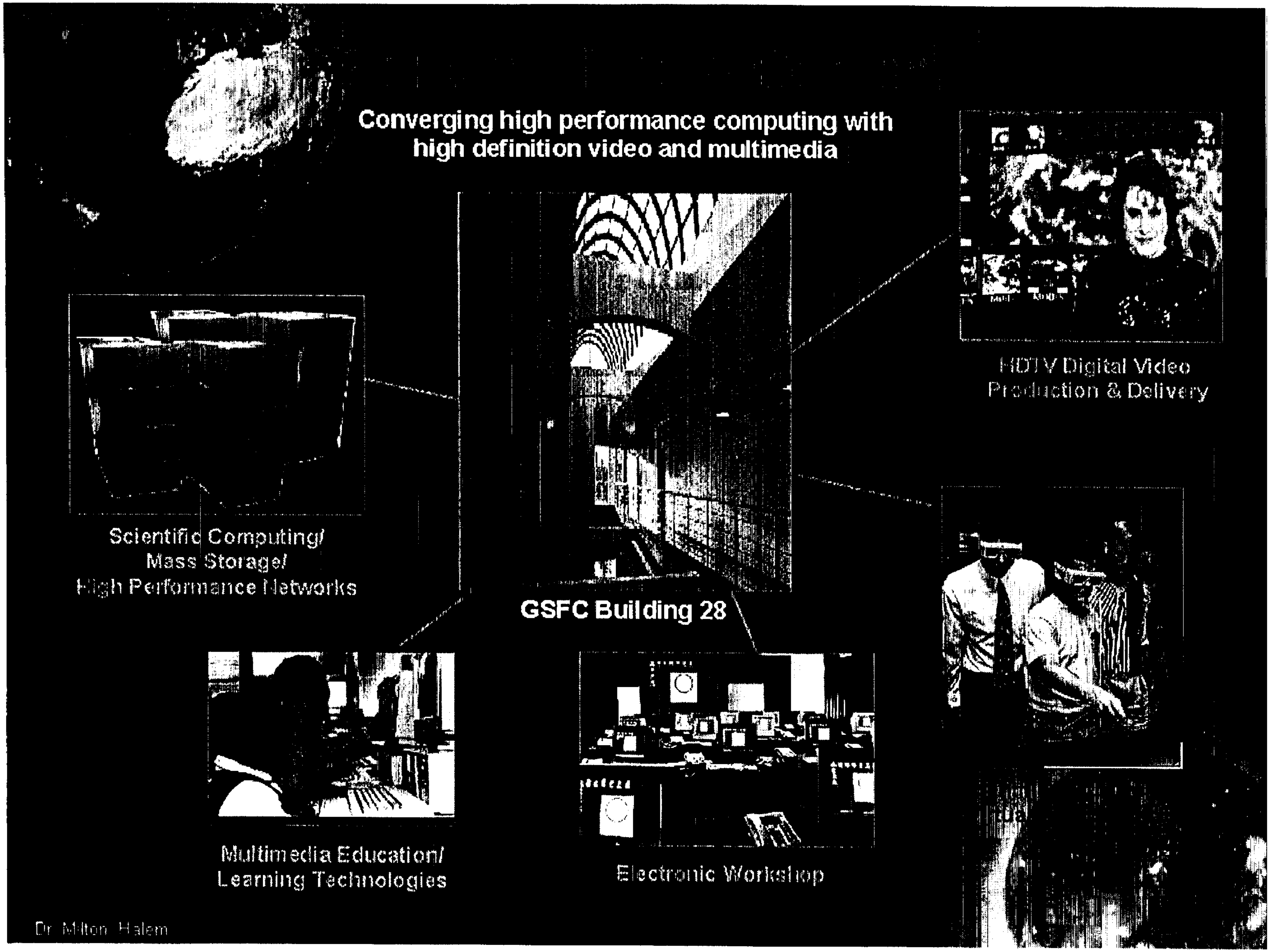
Data Mining Warehousing

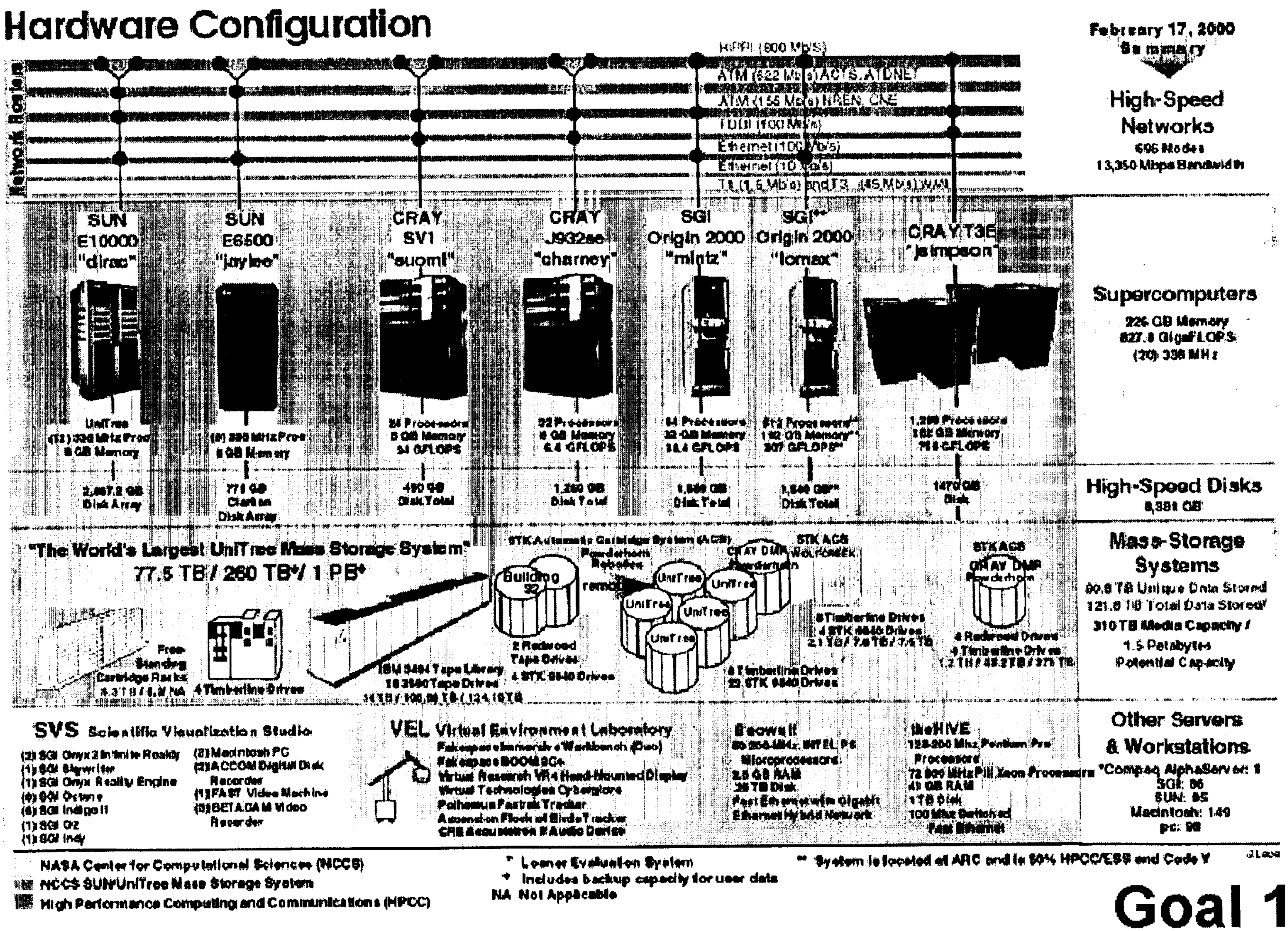
NCCS Mass Data Storage and Delivery System Cumulative Data Transferred 4/94 - 1/00



EMS/ART - 2/22/00

Goal 1


Converging high performance computing with high definition video and multimedia
Scientific Computing/
Mass Storage/
High Performance Networks
GSFC Building 28
HDTV Digital Video
Production & Delivery
Multimedia Education/
Learning Technologies
Electronic Workshop
Dr. Milton Halem


Hardware Configuration
February 17, 2000
Summary
High-Speed Networks
696 Nodes
13,350 Mbps Bandwidth
Network Region
HIPPI (800 Mb/S)
ATM (622 Mb/s) ACTS, ATDNET
ATM (155 Mb/s) NREN, CNE
FDDI (100 Mb/s)
Ethernet (100 Mb/s)
Ethernet (10 Mb/s)
T1 (1.5 Mb/s) and T3 (45 Mb/s) WAN
SUN E10000 "dirac"
UniTree
(12) 336 MHz Proc
6 GB Memory
2,667.2 GB Disk Array
SUN E6500 "jaylee"
(8) 336 MHz Proc
8 GB Memory
771 GB Clariion Disk Array
CRAY SV1 "suomi"
24 Processors
8 GB Memory
24 GFLOPS
490 GB Disk Total
CRAY J932se "charney"
32 Processors
8 GB Memory
6.4 GFLOPS
1,260 GB Disk Total
SGI Origin 2000 "mintz"
64 Processors
32 GB Memory
38.4 GFLOPS
1,596 GB Disk Total
SGI** Origin 2000 "lomax"
512 Processors**
192 GB Memory**
307 GFLOPS**
1,640 GB** Disk Total
CRAY T3E "jsimpson"
1,288 Processors
162 GB Memory
758 GFLOPS
1470 GB Disk
Supercomputers
226 GB Memory
827.8 GigaFLOPS
(20) 336 MHz
High-Speed Disks
8,381 GB
"The World's Largest UniTree Mass Storage System"
77.5 TB / 280 TB+ / 1 PB+
Free Standing Cartridge Racks
4 Timberline Drives
IBM 3494 Tape Library
16 3590 Tape Drives
STK Automatic Cartridge System (ACS)
Building 32
2 Redwood Tape Drives
4 STK 9840 Drives
UniTree
STK ACS
CRAY DMF WOLFOWEEK
8 Timberline Drives
4 STK 9840 Drives
4 Timberline Drives
22 STK 9840 Drives
STK ACS
CRAY DMF
4 Redwood Drives
4 Timberline Drives
Mass-Storage Systems
90.9 TB Unique Data Stored
121.8 TB Total Data Stored/
310 TB Media Capacity /
1.5 Petabytes
Potential Capacity
SVS Scientific Visualization Studio
(2) SGI Onyx2 Infinite Reality
(1) SGI Skywriter
(1) SGI Onyx Reality Engine
(8) SGI Octane
(6) SGI Indigo II
(1) SGI O2
(1) SGI Indy
(2) Macintosh PC
(2) ACCOM Digital Disk Recorder
(1) FAST Video Machine
(3) BETACAM Video Recorder
VEL Virtual Environment Laboratory
Fakespace BOOM 3C+
Virtual Research VR4 Head-Mounted Display
Virtual Technologies Cyberglove
Polhemus Fastrak Tracker
Ascension Flock of Birds Tracker
CRE Acoustetron II Audio Device
Beowulf
Microprocessors
theHIVE
Processors
72 500 MHz PIII Xeon Processors
100 Mhz Switched Fast Ethernet
Other Servers & Workstations
*Compaq AlphaServer: 1
SGI: 86
SUN: 85
Macintosh: 140
pc: 98
NASA Center for Computational Sciences (NCCS)
NCCS SUN/UniTree Mass Storage System
High Performance Computing and Communications (HPCC)
* Loaner Evaluation System
+ Includes backup capacity for user data
NA Not Applicable
** System is located at ARC and is 50% HPCC/ESS and Code Y
Goal 1

Concerns

- Gaining approval for Earth Science computing implementation plan, the HPCC round 3, the Digital Earth initiative, MU-SPIN Round 2, and near-term support for Regional Application Centers.

- Implement a process to improve the IT environment within the Earth science directorate dealing with promotions, hiring, and retention policies.

Science Computing Branch

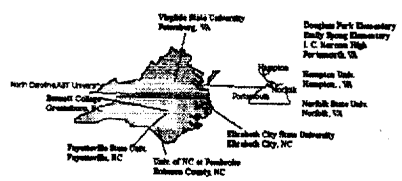
- Collaborates with industry (via Beta- and field-tests) to improve advanced mass storage technologies and integrate them into reliable, robust, heterogeneous storage systems.
- Offers software technologies such as object-oriented design process-based development which lowers long-term development costs, fosters software reuse and provides for software quality assurance.
- Facilitates the dissemination of scientific data and data analysis capabilities to the broader research community.
- Collaborates with the private sector and academia to facilitate the development of commercial products.
- Leverages advanced software and hardware technologies developed by the HPC community (e.g. NAS, NOAA, NCAR and ECMWF) when they are available.

Goal 3

Earth System Science Academy

Dr. Linda Hayden, Elizabeth City State University

ECSU Expert Site in Earth Science
The Great Dismal Swamp



ECSU-NRTS Partnership Report:
Earth System Science Expert Site

http://nia.ecsu.edu/nrts/nrts.html

Dr. Linda Bailey Hayden, Principal Investigator
Elizabeth City State University 114 Lester Hall
Box 672 1704 Weeksville Road
Elizabeth City, NC 27909
lhayden@umfort.cs.ecsu.edu

In 1975 ECSU acquired 639 acres of land in the Dismal Swamp from the Department of Health, Education and Welfare.

The U.S. Department of Education, Title III Program funded the construction of a half-mile long boardwalk and observation tower.

The U. S. NAVY has licensed ECSU to construct 900 feet of boardwalk over NAVY wetlands in order to reach the University property.

The property is surrounded by a large buffer zone of swamp and it is there well protected from the effects of human activities.

It is an unspoiled area of fresh water wetlands with no visible signs of use

Parts of the area are always under water, while other parts are seasonally or rarely flooded

Primary purpose of the property is to provide access to a pristine wetlands environment and to promote public awareness of the crucial role played by wetlands in the coastal plain biome.

Without the wetlands there would be no fishing industry in Albermarle or Pamlico Sounds

Atlantic White Cedar (endangered)

Expert Site in Earth System Science

Expert Site Goals

- Increased participation within NC/VA in NASA's Earth Science Enterprise Existing Programs.
- Support for student & faculty research in Earth Science.
- Development of new Earth Science Initiatives.

Increased participation within NC/VA in NASA's Earth Science Enterprise

- Earth Science Education Funding Videoconference
- National Science Teachers Association Conference
- Earth Science Education Forum in Austin, TX
- IEEE IGARSS 2000 Conference
- Coalition for Earth Science
- GSFC's Coolspace Satellite Imagery Program
- Satellites in Education Conference

Support for student research in Earth Science

- Scholarships
- Travel Awards
- Research Awards
- Training Awards

The Dismal Swamp Mapping Project

Purpose

1. Create a basemap of the Dismal Swamp Property.
2. Entering the information into a geographic information system for theme overlay and spatial analysis.

The Atlantic White Cedar Project

Purpose

1. To inventory Atlantic White Cedar (a threatened species) on ECSU's Dismal Swamp property.
2. To investigate massive deaths of AWC on the property.
3. To identify diseases observed on AWC on the property.

Dismal Swamp Ground Water Testing

Purpose

1. Testing of 6 wells in the Dismal Swamp for a variety of water quality parameters.
   - Dissolved Oxygen
   - pH (Acidity)
   - Conductivity (Salinity)
   - Turbidity
   - E-coli
   - Total Dissolved Solids
2. Determine the microbiology of groundwater.

Earth System Science Undergraduate Research Awards

Mentor: Dr. Maurice Powers, ECSU Geoscience Professor

Total Coliform Bacteria

Sherica Williams is carrying out research on Escherichia coli and Total Coliform bacteria in surface waters in northeastern North Carolina, particularly Pasquotank County. She has been very successful in finding background information on E. coli and Total Coliform bacteria, and plans to add nitrate testing to water samples collected. She is contacting agencies for information on any outbreak/illnesses from contamination and infection caused by E. coli in Elizabeth City, Pasquotank, Camden, Gates and Perquimans County. Sherica is also working on learning computer tactics to improve the analysis and interpretation of her data. Sherica is adding nitrat to her testing agenda because there may be a direct correlation between nitrate levels and microbiota, including pfisteria.

Development of new Earth Science Initiatives

*Mathematics of the Great Dismal Swamp

*You Be the Scientist with Satellite Imagery

*CET Earth Science On-Line Courses

*Earth System Science Academy

Each of these projects is now listed in the NASA Earth Science Education Directory of approved programs.

Earth System Science Academy

•Brings NASA Scientist, University Researchers and Educators together.

•Focus on the health of local waterways and

•Focus on The Great Dismal Swamp Project

The Earth Science Enterprise is NASA's contribution to developing a vastly-improved understanding of the Earth. The unique vantage point of space provides information about the Earth's air, land, water, and life -- and their interactions-- not available using any other means. To effectively and efficiently contribute to Earth System Science Education, one focus of the Earth Science Enterprise is to train the next generation of scientist to use an interdisciplinary approach..."

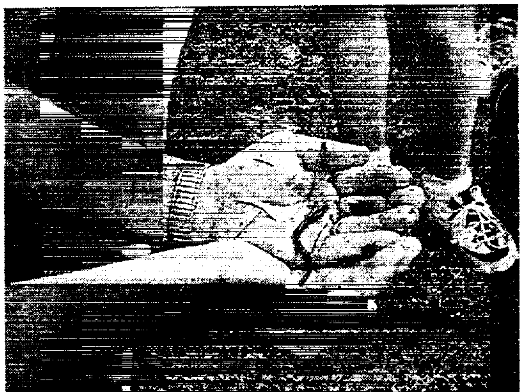
Day #1: Focus on The Great Dismal Swamp Project

Day #2: Focus on the health of local waterways

Earth System Science Academy

Shown are Mattie Hubbard (participant), Jim Harris (Chairman, Earth System Science Advisory Board), George Currothers (Naval Astrophysicist).

(Handout and Invitation to the next Aademy)

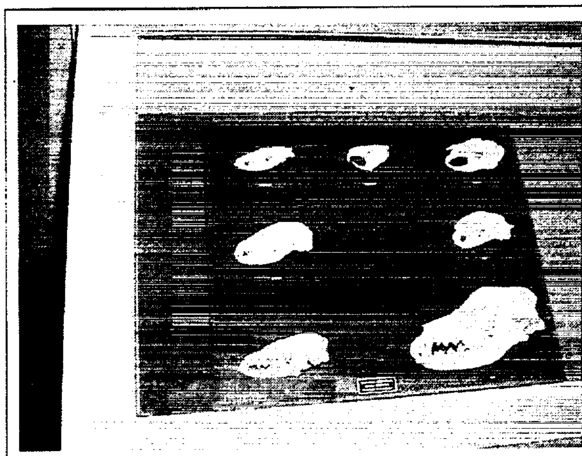


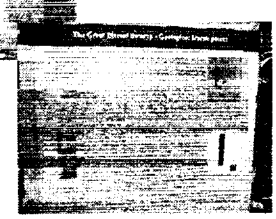
Earth System Science Academy 2000

Earth System Science Academy 2000

Wanda Hathaway, Elizabeth City Middle School
IEEE IGARSS 2000 Grantee

Participants examine the extensive resources available online at NASA's Earth Science Websites

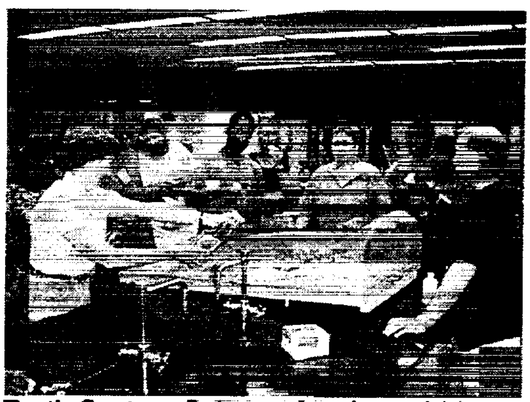




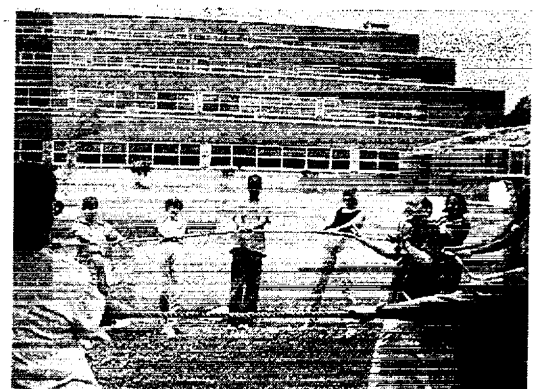
Earth System
Science Academy
May 1999

Tim Julian and Frederic Wilson
of the STREAMS Project

Earth System Science Academy 2000



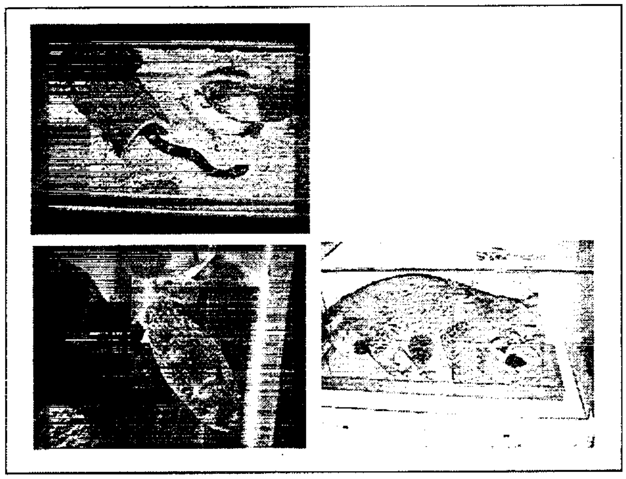
Earth System Science Academy 2000

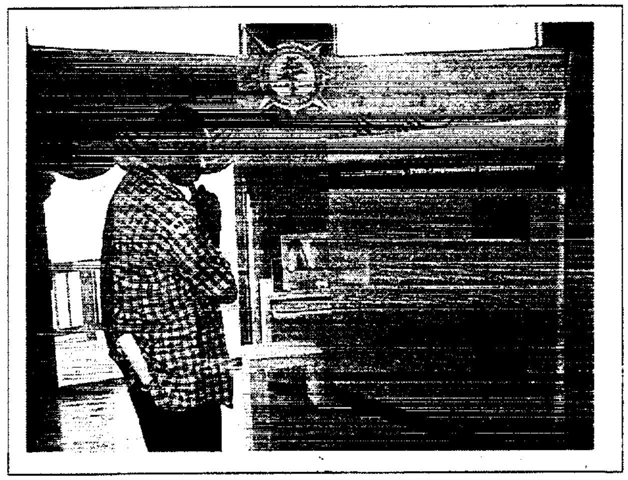


Earth System Science Academy 2000

Earth System Science Academy 2000

Earth System Science Academy 2000





Earth System Science Academy 2000

Past Plenary Speakers:
Robert Lee III, NASA LaRC ASD
Maurice Powers, ECSU
George Curuthers, Navy Astrophysicist
Jim Harris, NASA retired

http://nia.ecsu.edu/nrts.html

Follow the Earth Science Link

June 1-2, 2001
Next Academy

Weather Watcher Institute

Dr. Shermae Austin
City College of New York

Spin-off: Research on soils/estuaries.

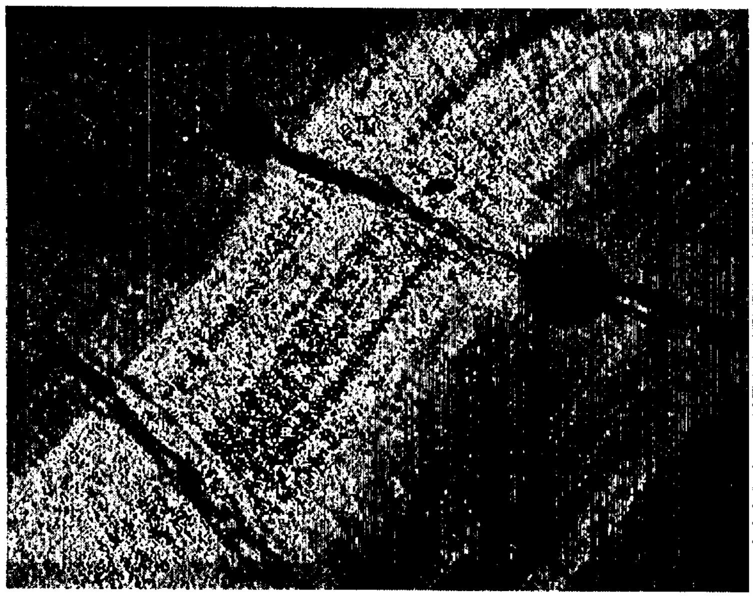
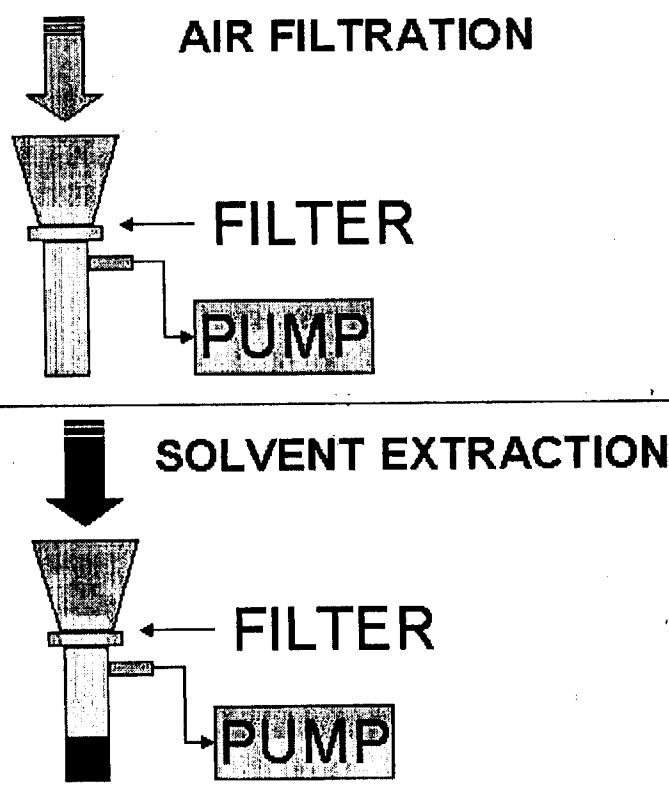


Image: Electron microprobe digital map of lead (red) superimposed on optical image of shell (100x)

- Soils in Crooksville, Ohio schoolyards – lead contaminated – possible aerosol deposits.
- Lead-enriched shells recovered from tidal flats – air versus water contamination.

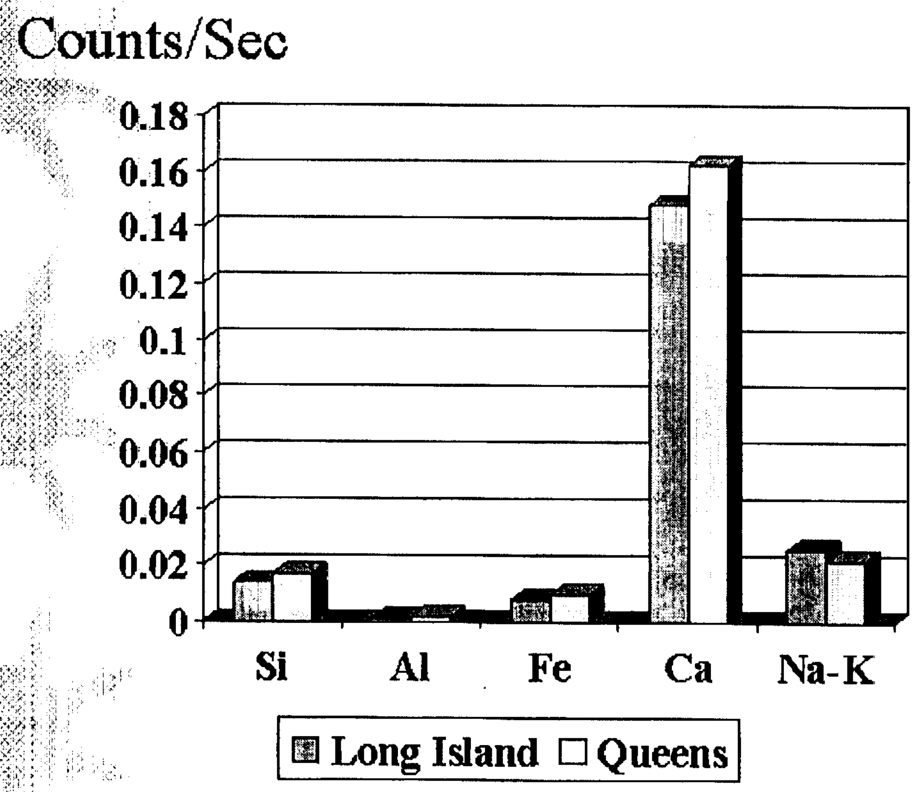
{muspin 2}

Filter Methods



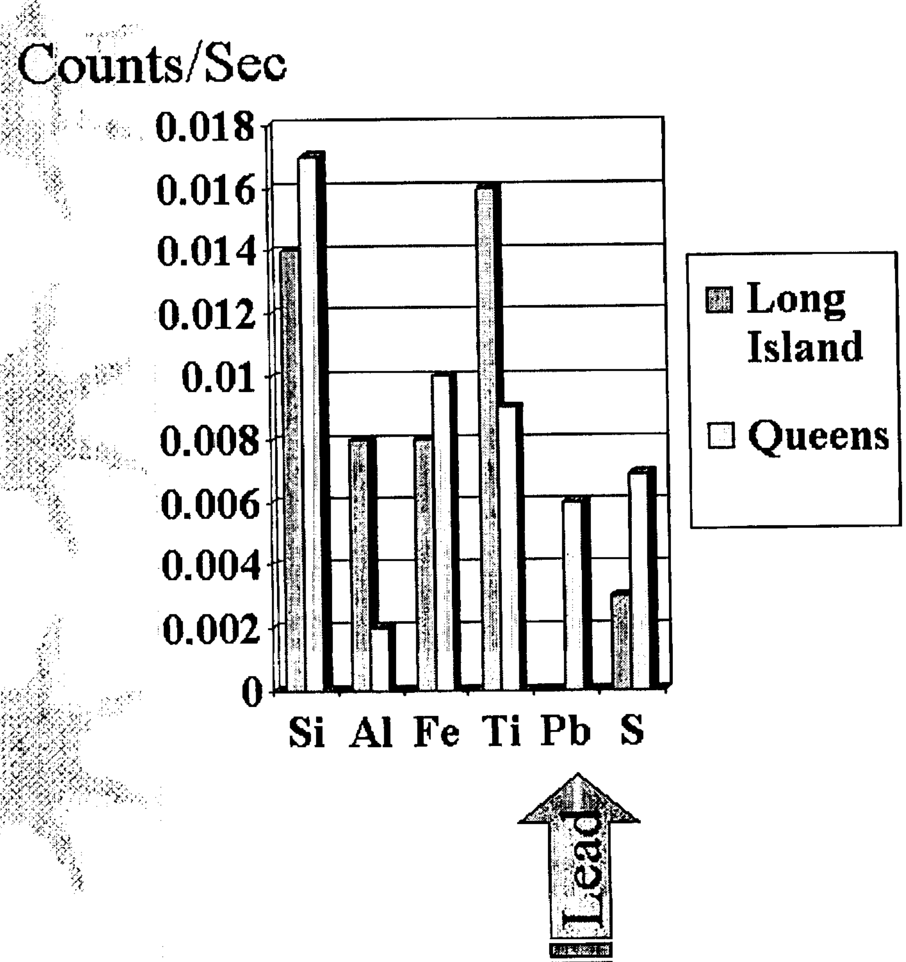
- Active (pumping) and passive collection of particles carried out using an AC generator and a stationary/mobile collection system.
- Generally pump for 1 hr/mobile and 3-4 hours/fixed.
- Particles can be washed and the recovered solutions analyzed.

Particulate Matter Chemistry



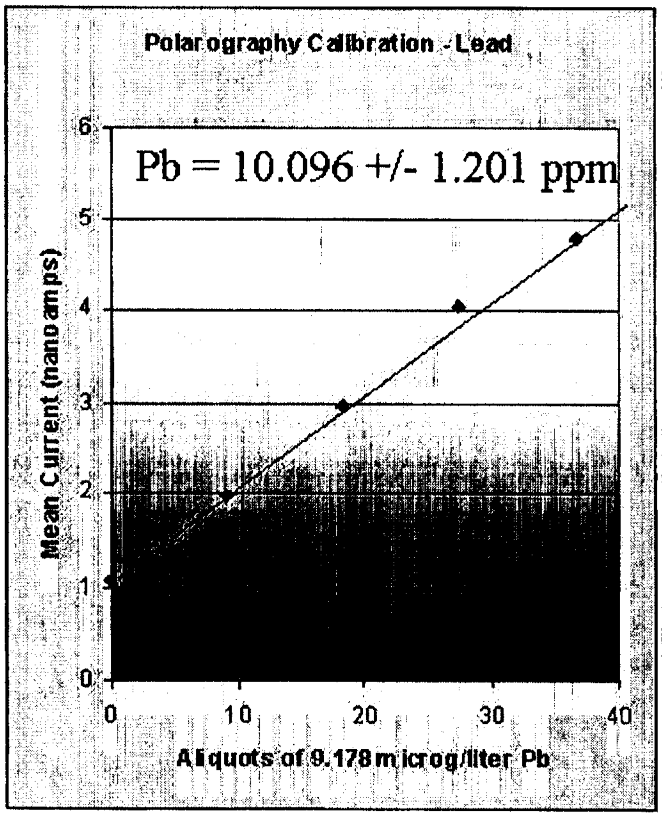
- ✶ In relative terms, ca in rainfall exceeds Na+k five-fold in Colorado, vs two-fold in Pennsylvania.
- ✶ Probable particulates: clay plus iron oxide-hydrate.

Anomalous Lead in Queens Particle Sample



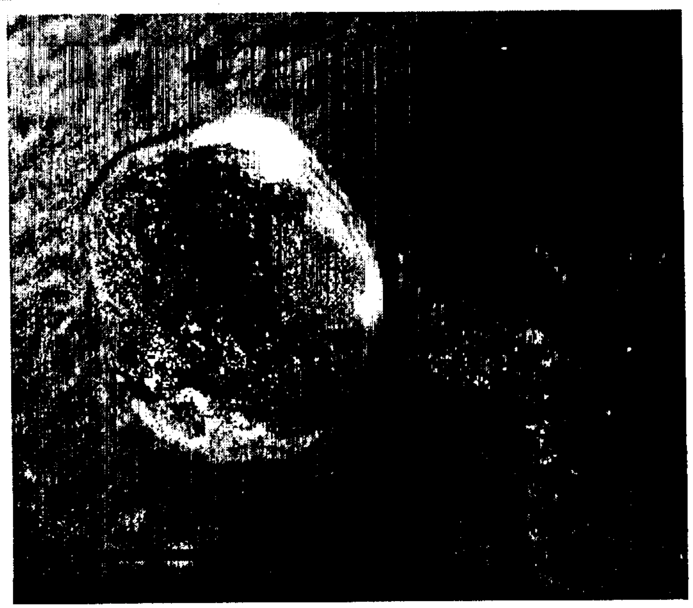
- Samples taken at Townsend high school in Flushing, Queens show lead and titanium contents that approximate silicon and other major elements.
- Samples collected on a 10 micron polycarbonate Millipore filter by pumping for 45 minutes.
- Analysis by Philips 1400 series x-ray fluorescence spectrometer (50kv, 50ma 300 sec.).

Polarography - Standardize



- Calibrate counts/second using polarography.
- Based on extensive analyses of Hudson molluscs, .006 c/s yields ca. 0.6 ppm.
- About 75 times 'safe' levels in drinking water.

Detailed Examination



Mummy sand (quartz) from Egyptian Tomb via transmitted light microscopy.

- Optical, scanning electron and transmission electron microscopy.
- X-ray diffraction – crystal structures.
- Polarography, atomic absorption for calibration.

Earth System Science Education Alliance Online Courses

Dr. James A. Botti
Wheeling Jesuit University

Presentation Available on line
http://nasa.utep.edu/muspin/jbotti.ram

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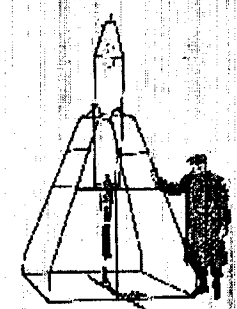
Space Science Update

Mr. Jim Barrowman
NASA Goodard Space Flight Center

Space Science Opportunities for the Visionary



James S. Barrowman

Deputy Director of Space Sciences

NASA Goddard Space flight Center

September 13, 2000

NASA's Space Science Enterprise Mission...

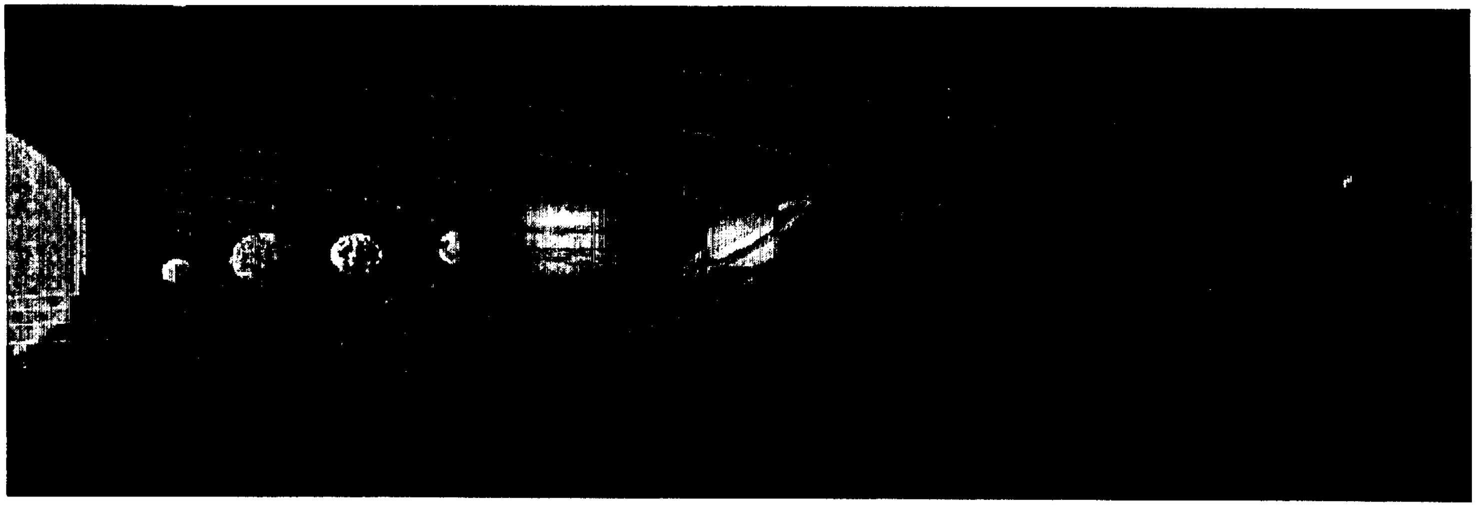
- *How did the universe begin and evolve?*
- *How did we get here?*
- *How does our environment in space affect us?*
- *Where are we going?*
- *Are we alone?*

Space Science Themes

NASA Space Science Seeks to...

- *Explore the Solar System,*
- *Conduct an astronomical search for planetary systems and the Origin and distribution of life in the Universe,*
- *Understand the structure and evolution of the Universe,*
- *Better understand the Sun-Earth Connection*

Exploration of the Solar System (ESS)



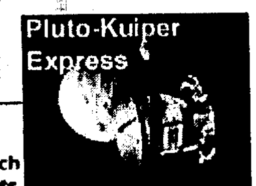
✳ **Goals**

- To seek the origin of life and its existence beyond the Earth
- To chart our destiny in the solar system
- To explain the formation and evolution of the solar system and the Earth within it

NASA Solar System Exploration Launches and Events: 1998–2010

Updated: 07-Aug-00 Home

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1998	Lunar Prospector *NEAR Earth Flyby	*Galileo Europa Flyby	*Galileo Europa Flyby	*Cassini Venus Flyby 1	*Galileo Europa Flyby		*Galileo Europa Flyby		*Galileo Europa Flyby	DS1	*Galileo Europa Flyby	Mars Climate Orbiter NEAR Eros Flyby
1999	Mars Polar Lander/ DS2	Stardust *Galileo Europa Flyby	*Mars Global Surveyor begins mapping Mars		*Galileo Callisto Flyby	*Cassini Venus Flyby 2 *Galileo Callisto Flyby	DS1 Flyby 9969 Braille Lunar Prospector Impacts Moon	*Cassini Earth Flyby *Galileo Callisto Flyby	Mars Climate Orbiter Lost Galileo Callisto Flyby	*Galileo Io Flyby	*Galileo Io Flyby	Mars Polar Lander/DS2 Lost at Mars
2000	*Galileo Europa Flyby *Cassini Flyby Ast. Masursky	*NEAR Eros Orbit *Galileo Io Flyby		Stardust Interstellar Dust Collection Phase 1	*Galileo Ganymede Flyby							Cassini Jupiter Flyby *Galileo Ganymede Flyby
2001	Genesis Stardust Earth Flyby			Mars 01 Orbiter					DS1 Comet Flyby Borrelly	Mars 01 Orbiter Arrives Mars		
2002							CONTOUR			Stardust Interstellar Dust Collection Phase 2		MUSES-CN (Nereus)
2003	Rosetta (ESA)				Mars Rover 1	Mars Express (ESA) Mars Rover 2		Genesis Solar Wind Sample Return CONTOUR Earth Flyby 1			Europa Orbiter CONTOUR Flyby Comet Encke	Mars Express Arrives Mars
2004	Deep Impact Mars Rover 1 & 2 Stardust Comet Flyby Wild 2		Messenger				Cassini Arrives at Saturn	CONTOUR Earth Flyby 2			Huygens Titan Mission	Pluto-Kuiper Express
2005					Rosetta (ESA) Mars Flyby		Deep Impact at Comet Tempel 1	Messenger Earth Flyby	MUSES-CN Rendezvous Asteroid 1998 SF36	Rosetta (ESA) Earth Flyby 1		
2006	Stardust Comet Sample Return	CONTOUR Earth Flyby 3	Pluto-Kuiper Express Jupiter Flyby			CONTOUR Flyby Comet SW3	Rosetta (ESA) Flyby Ast. Otawara	Europa Orbiter arrives Jupiter		Messenger Venus Flyby 1		
2007		Solar Probe CONTOUR Earth Flyby 4	Europa Orbiter Begins Jupiter Tour			MUSES-C Returns to Earth Messenger Venus Flyby 2				Rosetta (ESA) Earth Flyby 2		
2008	Messenger Mercury Flyby 1	CONTOUR Earth Flyby 5			Europa Orbiter Begins Europa Orbit	Solar Probe Jupiter Flyby	Cassini Saturn Tour End Rosetta (ESA) Flyby Ast. Siwa			Messenger Mercury Flyby 2		
2009									Messenger Enters Orbit at Mercury			
2010									End of Messenger Mission	Solar Probe Sun Flyby 1		



*Mars Global Surveyor is mapping Mars
*NEAR Shoemaker is in orbit at asteroid Eros
*Galileo is in orbit at Jupiter
*Cassini is enroute to Saturn

KEY:
Red = Launch
Blue = Events
MSR = Mars Sample Return
LR/MAV = Lander/ Rover/ Mars Ascent Vehicle

2011–2020

5

NASA Solar System Exploration Launches and Events: 1998–2010

Home

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
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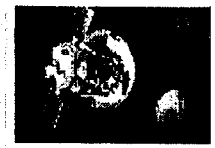
2000	*Galileo Europa Flyby *Cassini Flyby Ast. Masursky	*NEAR Eros Orbit *Galileo Io Flyby	Stardust Interstellar Dust Collection Phase 1		*Galileo Ganymede Flyby							Cassini Jupiter Flyby *Galileo Ganymede Flyby
2001	Genesis Stardust Earth Flyby			Mars 01 Orbiter					DS1 Comet Flyby Borrelly	Mars 01 Orbiter Arrives Mars		
2002							CONTOUR		Stardust Interstellar Dust Collection Phase 2		MUSES-CN	
2003	Rosetta (ESA)				Mars Rover 1	Mars Express (ESA) Mars Rover 2		Genesis Solar Wind Sample Return CONTOUR Earth Flyby 1			Europa Orbiter CONTOUR Flyby Comet Encke	Mars Express Arrives Mars
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2006	Stardust Comet Sample Return	CONTOUR Earth Flyby 3	Pluto-Kuiper Express Jupiter Flyby			CONTOUR Flyby Comet SW3	Rosetta (ESA) Flyby Ast. Otawara	Europa Orbiter arrives Jupiter		Messenger Venus Flyby 1		
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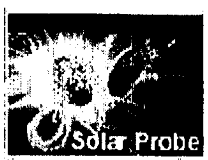
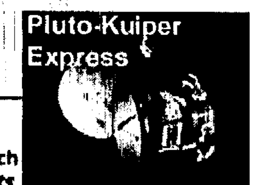
2009	 Solar Probe								Messenger Enters Orbit at Mercury			
2010									End of Messenger Mission	Solar Probe Sun Flyby 1		2011–2020

*Mars Global Surveyor is mapping Mars
*NEAR Shoemaker is in orbit at asteroid Eros
*Galileo is in orbit at Jupiter
*Cassini is enroute to Saturn


Pluto-Kuiper Express

KEY:
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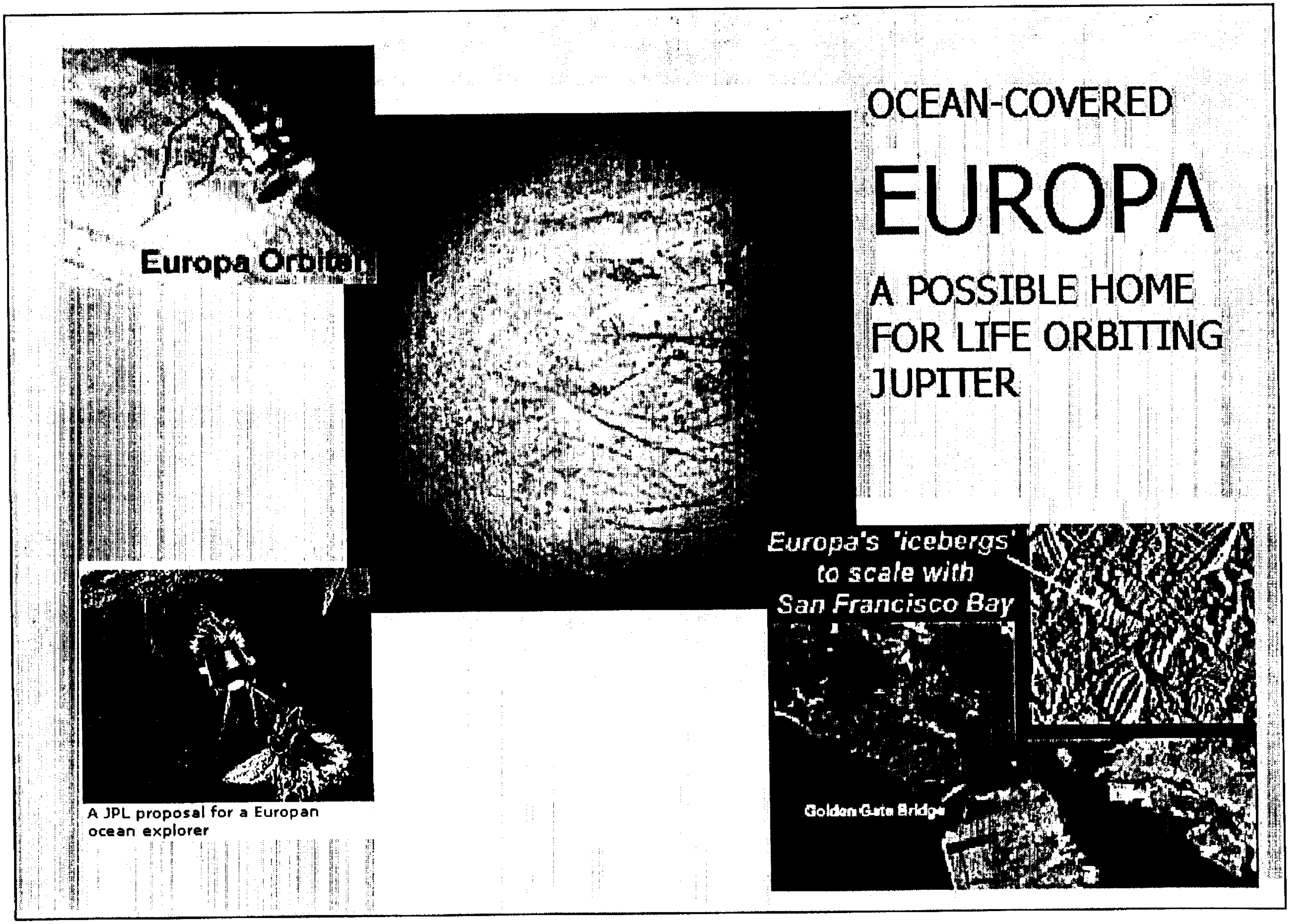
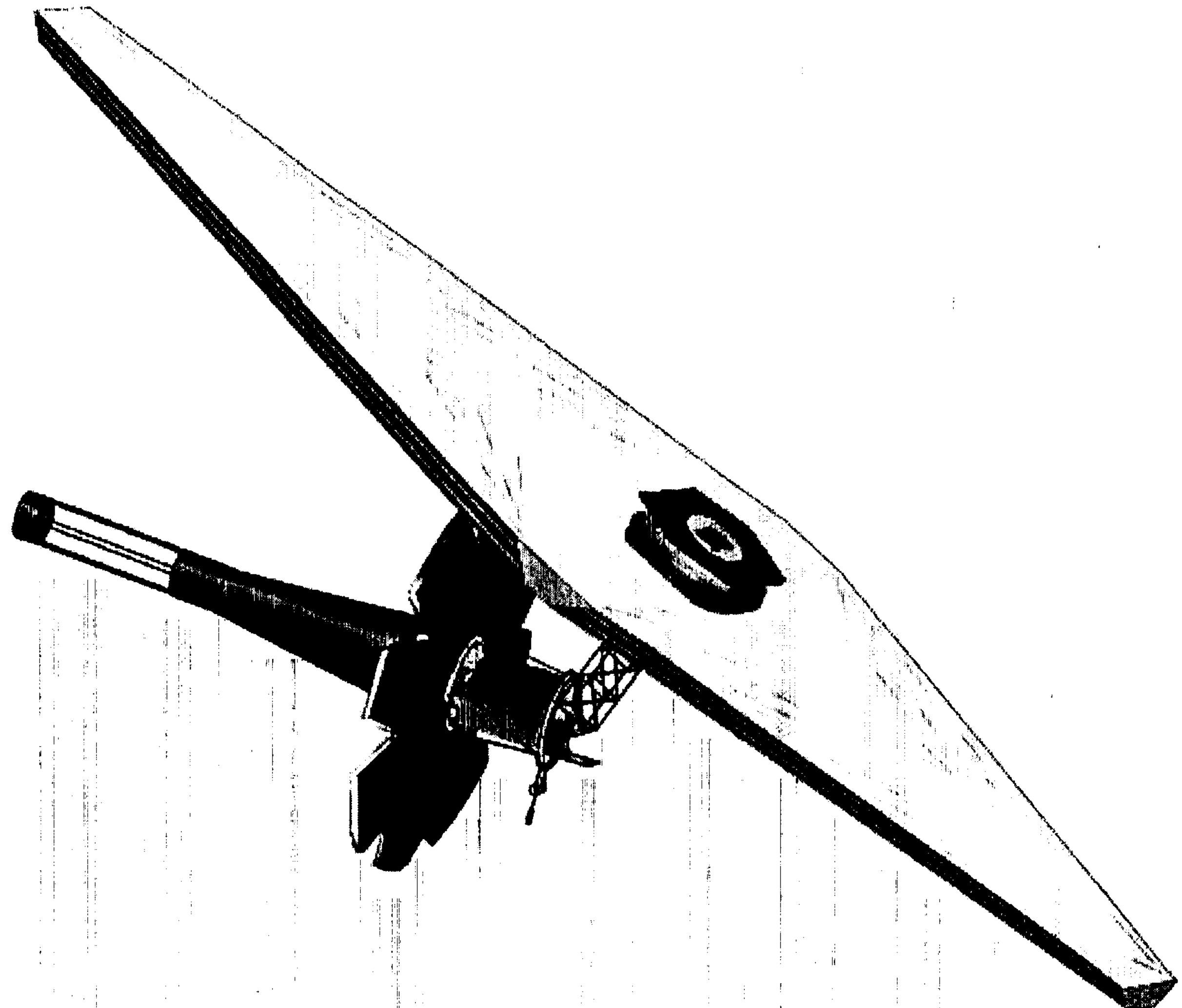


OCEAN-COVERED
EUROPA
A POSSIBLE HOME
FOR LIFE ORBITING
JUPITER
Europa Orbiter
A JPL proposal for a Europan ocean explorer
Europa's 'icebergs' to scale with San Francisco Bay
Golden Gate Bridge

6

Astronomical Search for Origins (ASO)

- **Goals**
  - To understand how galaxies formed in the early universe and to determine the role of galaxies in the appearance of planetary systems and life
  - To understand how stars and planetary systems form and to determine whether life-sustaining planets exist around other stars
  - To understand how life originated on Earth and to determine whether it began and may still exist elsewhere as well

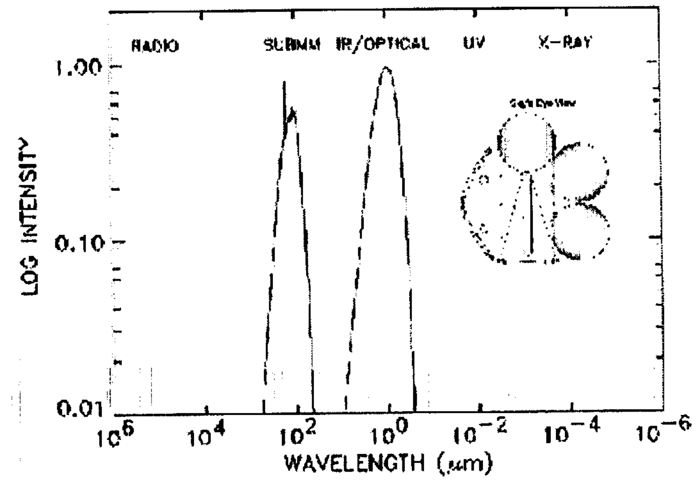


Submillimeter Probe of the Evolution of Cosmic Structure (SPECS) Mission

Science Goal

SPECS is a bold new mission concept designed to address fundamental questions about the Universe, such as:

- How did the first stars form from primordial material, and the first galaxies from pre-galactic structures?
- How did galaxies evolve over time?
- What is the cosmic history of energy release, heavy element synthesis, and dust formation?



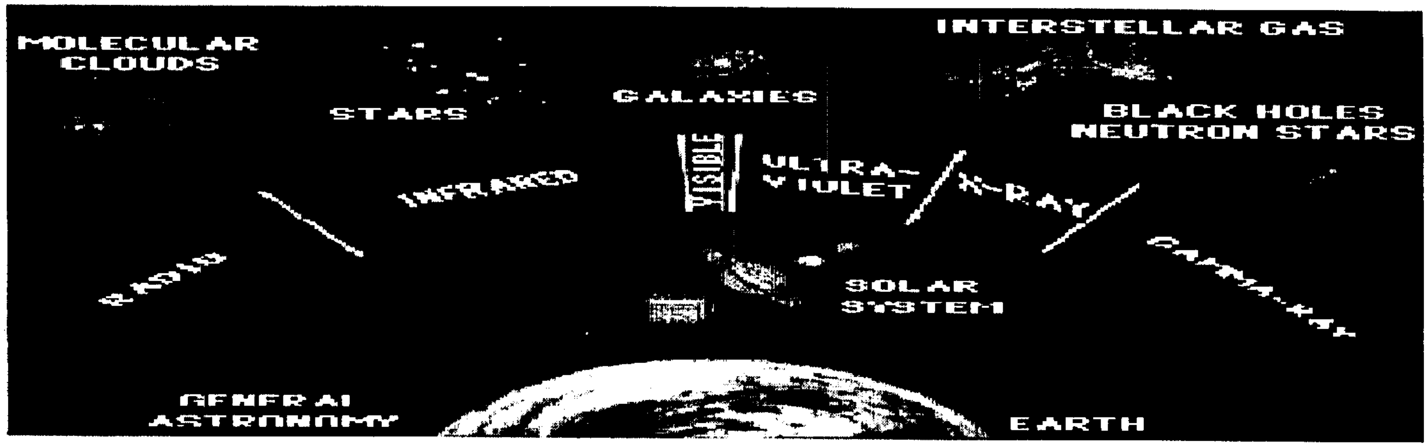
Program Characteristics

- Telescopes: Three, 3 m aperture, 1 km baseline
- High sensitivity, high spatial and moderately high spectral resolution, and a large field of view
  - Wavelength range: 40 - 500 μ
  - Angular resolution: 0.05 arcseconds at 250 μ (1 km maximum baseline)
  - Field of view: 14 arcminuntes at 250 μ
- Typical image size
  - ~17,000 x 17,000 resolution elements
- Typical sensitivity
  - ~10^7 Hz-Jy, or 10-19 W/m^2 at 100 μ, 1 σ

Priority:

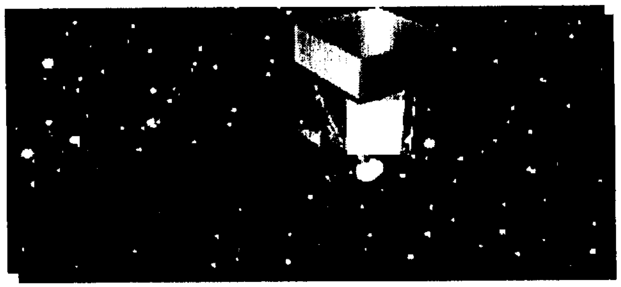
Revolutionary science will be enabled when we have tools to study the sub-millimeter sky with Hubble-class resolution and sensitivity.

Structure & Evolution of the Universe (SEU)



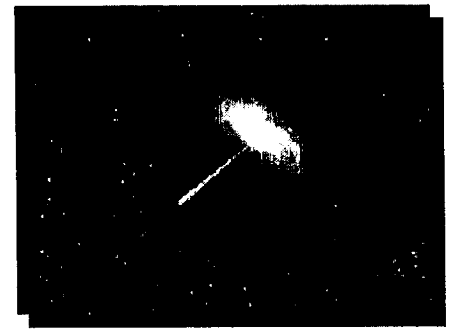
* **Goals**
  - To explain structure in the Universe and forecast our cosmic destiny
  - To explore they cycles of matter and energy in the evolving universe
  - To examine the ultimate limits of gravity and energy in the universe

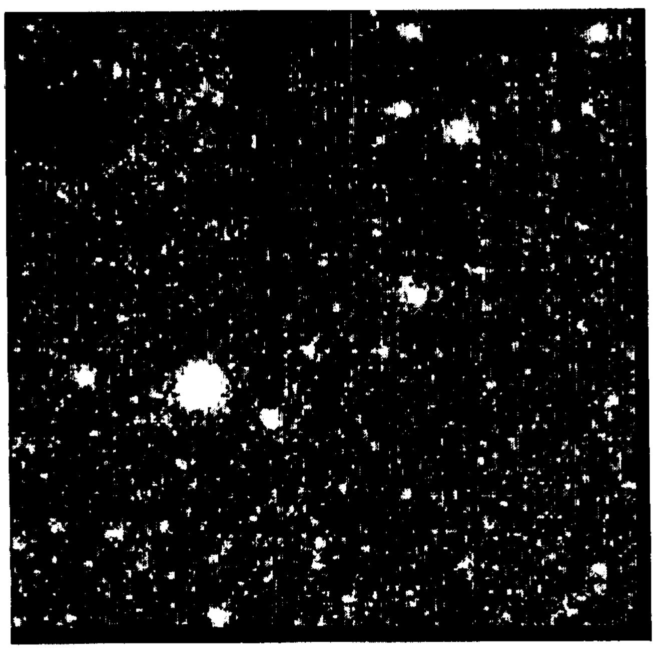
Gamma Ray Large Area Space Telescope



GLAST will have 30-100 times improved Gamma ray sensitivity over Compton GRO

Launch: 2005





GLAST will look down the beam of relativistic jets coming from black holes

GLAST will search for the gamma-ray signature from the decay of exotic particles (e.g., WIMPS)

GLAST connects the DOE and NASA communities

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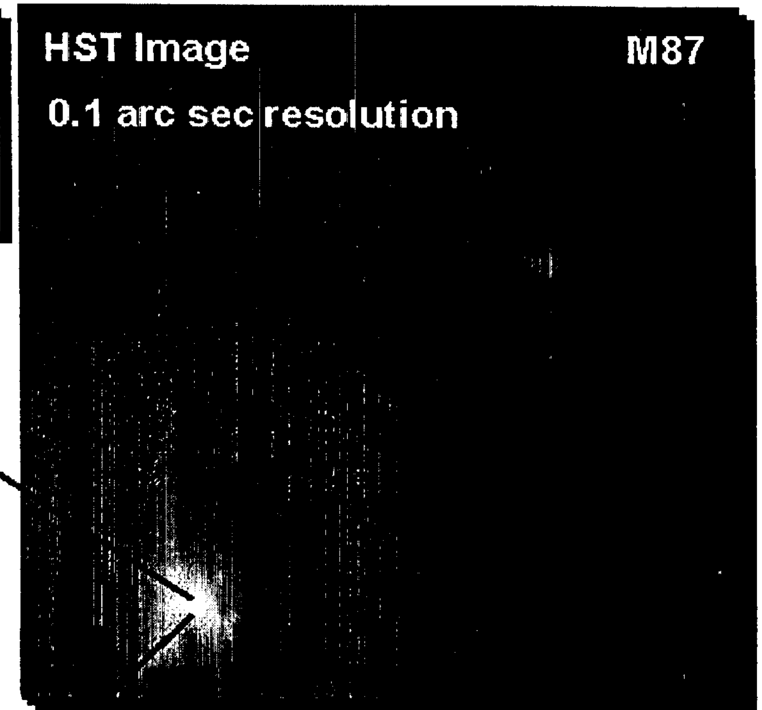
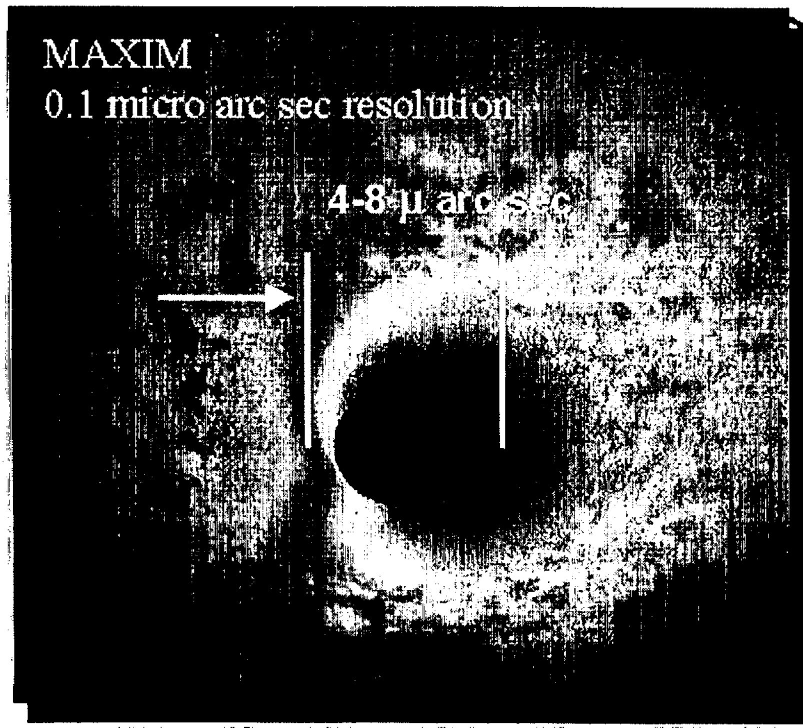
Image a Black Hole!

Direct image of a black hole event horizon

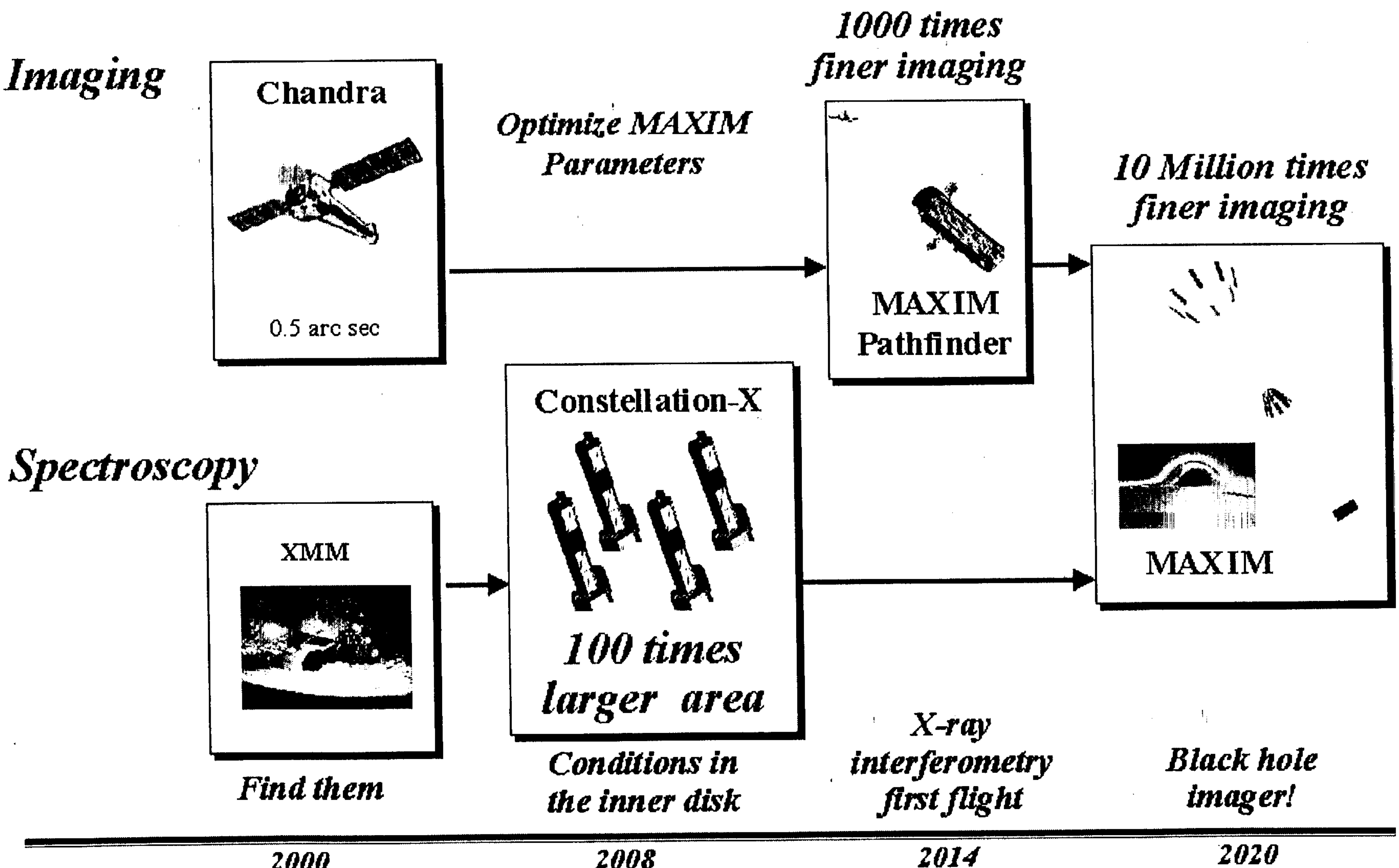
- **Fundamental importance to physics**
- **Captures the imagination**





Close to the event horizon the peak energy is emitted in X-rays

Roadmap to Image a Black Hole



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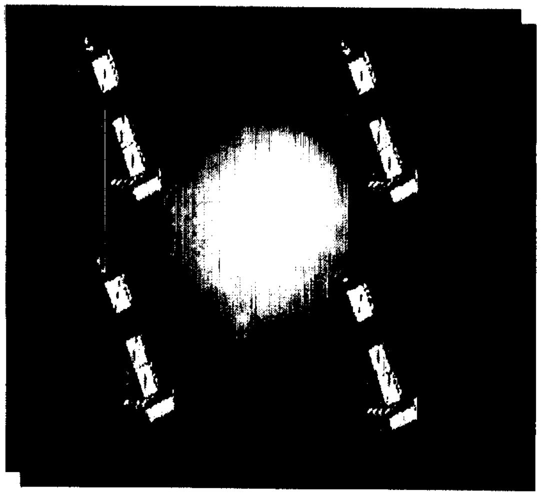
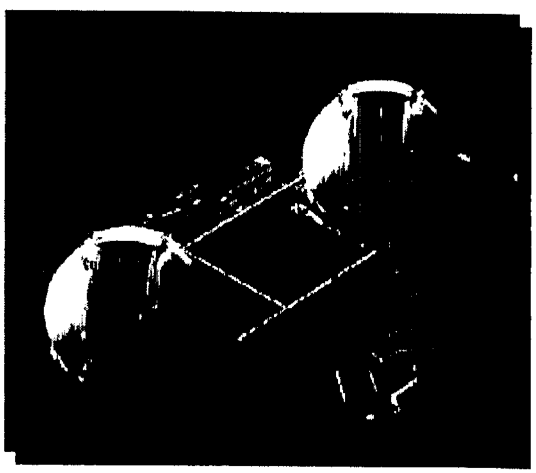
The Constellation X-ray Mission



An X-ray Keck Observatory



- o **Use X-ray spectroscopy to**
  - Determine black hole parameters and environment
  - Observe formation and evolution of dark matter structures throughout the Universe
- o **Mission parameters**
  - **Telescope area:** 3 m^2 at 1 keV
    100 times gain for high resolution spectroscopy
  - **Spectral resolving power:** 300-3,000
    5 times improvement at 6 keV
  - **Band pass:** 0.25 to 40 keV
    100 times more sensitive at 40 keV

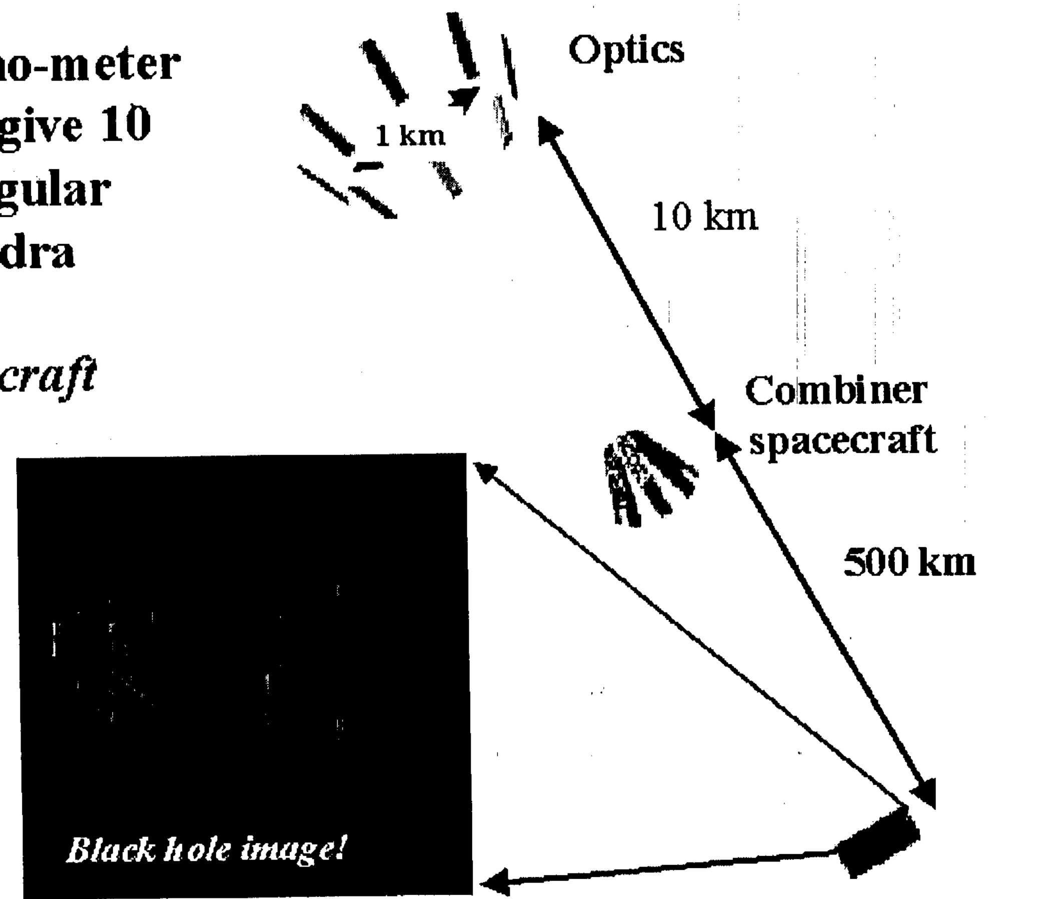
Enable spectroscopy of faint X-ray source populations

The Black Hole Imager:
MAXIM Observatory Concept

32 optics held in phase to nano-meter precision over 1 km will give 10 million times better angular resolution than Chandra

34 formation flying spacecraft

System is adjustable on orbit to achieve larger baselines



Launch: 2020-2025?

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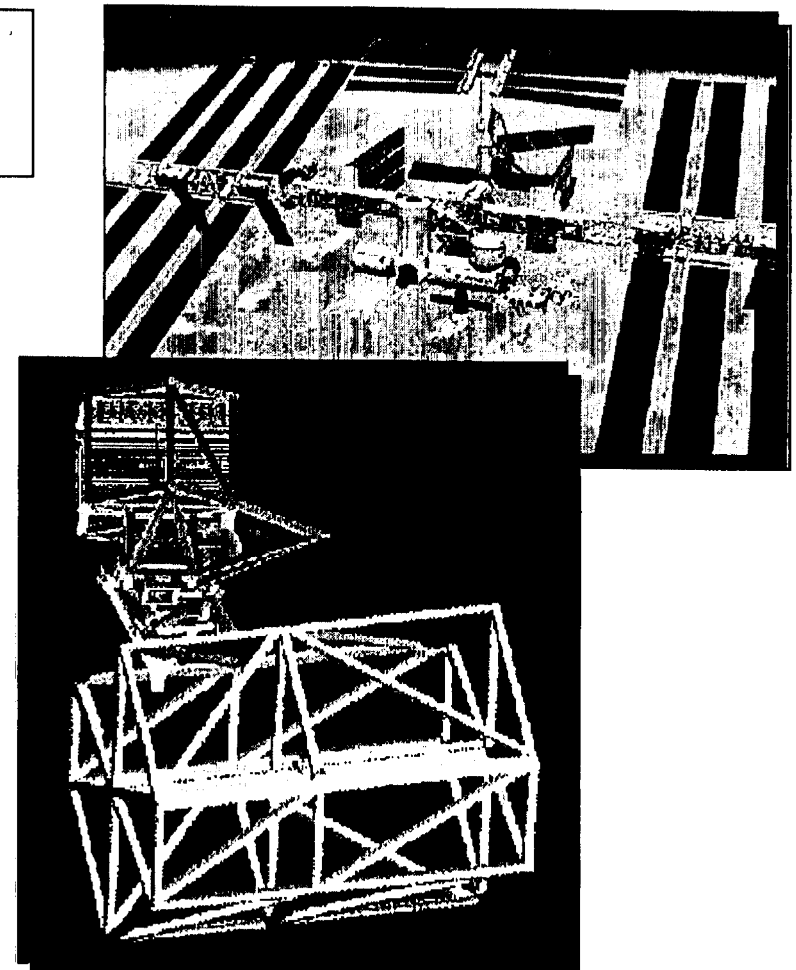
ACCESS: *Search for the Origin of Cosmic Rays*

Medium energy cosmic rays:

$10^{12} \leq E \leq 10^{15}$ eV



Where do they come from?

What are they made of?

How are they accelerated?

- Large Detectors
  - Area > 4 m^2
  - Calorimeter > 0.7 m^2
- Total mass 5225 kg

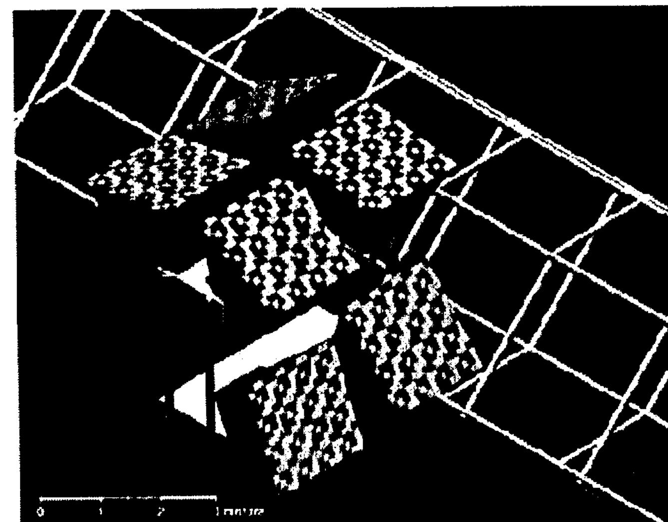
Launch: 2005

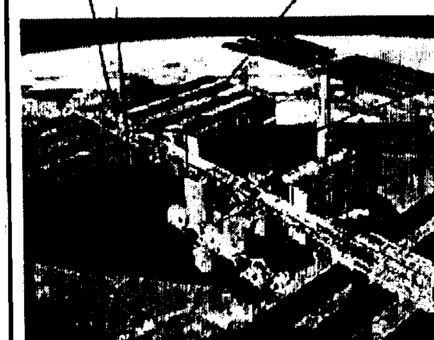
EXIST

All Sky Imaging Deep Hard X-ray Survey

Energetic X-ray Imaging Survey Telescope (EXIST) on ISS

Conceptual Layout of EXIST on ISS Integrated Truss Assembly





The EXIST telescope assembly would mount to one of the Payload Attach System points on the S3 segment of the truss.

Credit: Josh Grindlay

Science:

- **All-sky survey of obscured black holes in AGN**
- **Find thousands of nearby "hidden" black holes**

Mission:

- **8 coded aperture CZT telescopes (each 40deg FOV; 1 m^2)**
- **International Space Station attached payload**
- **All-sky imaging each 90 min orbit**
- **Under study for possible new start in 2008-2013**

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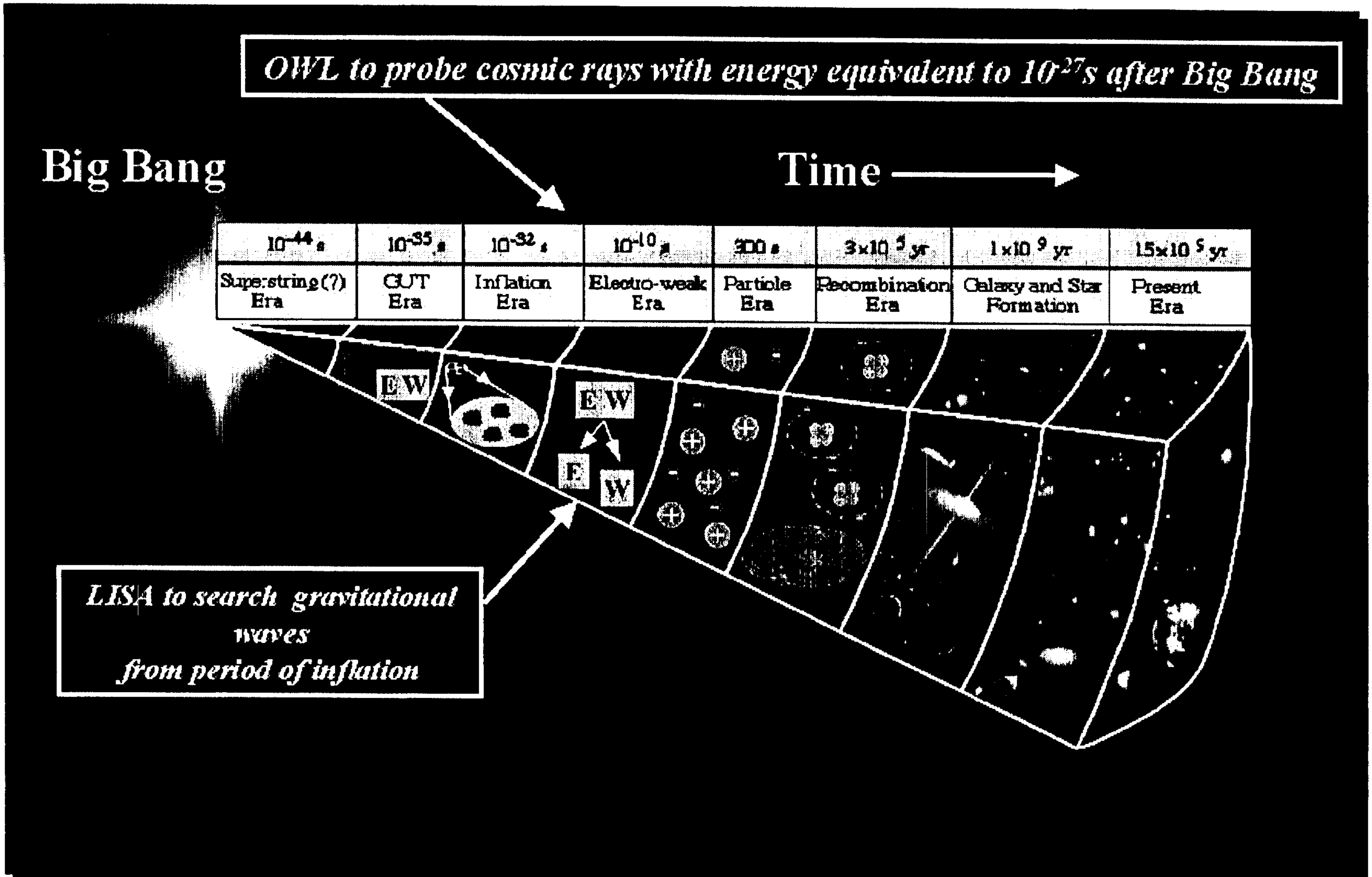
Approaching the Big Bang



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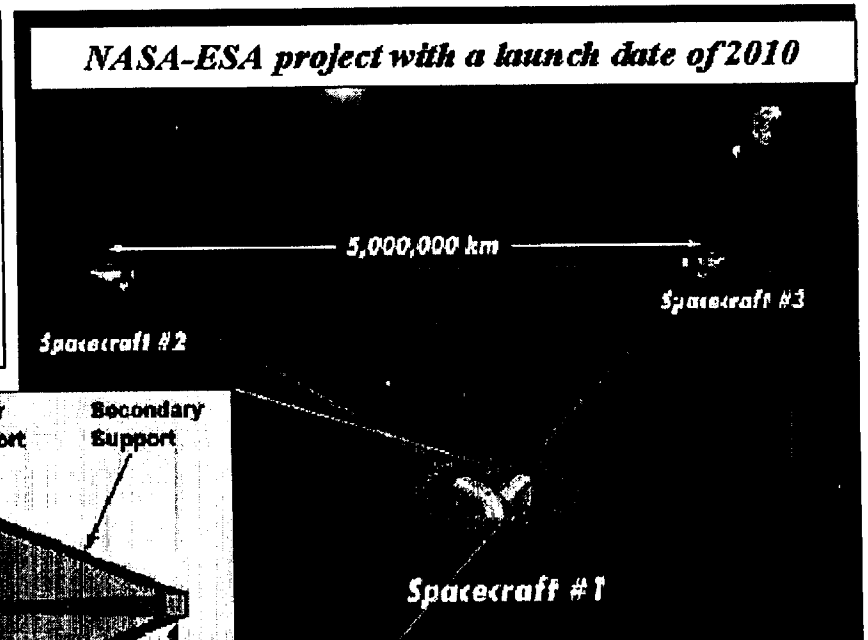
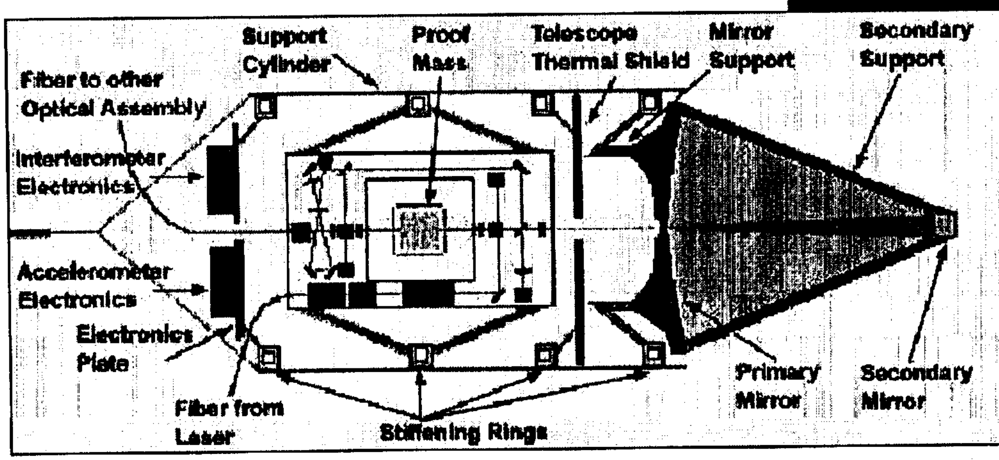
Laser Interferometer Space Array (LISA)

LISA uses a laser based Michaelson interferometer to accurately monitor the separation between *proof masses* in separate spacecraft.





Measure every second, changes in distance of 10 pico-meters over a distance of 3 million miles
That is 100 times smaller than the size of an atom!

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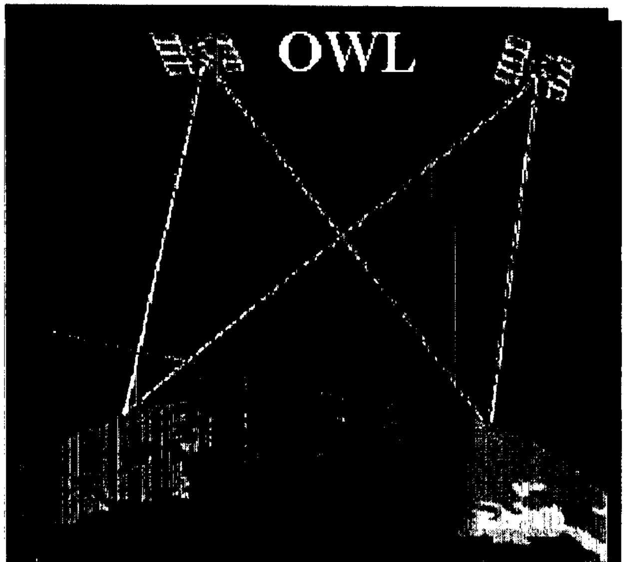
OWL
The Most Energetic Particles Known!



1 particle per sq km per century!

Some rare cosmic rays have an energy of 10^{21} eV, equivalent to that of universe ~10^{-27} s after the big bang!

Acceleration by spinning super-massive black holes in nearby galaxies?

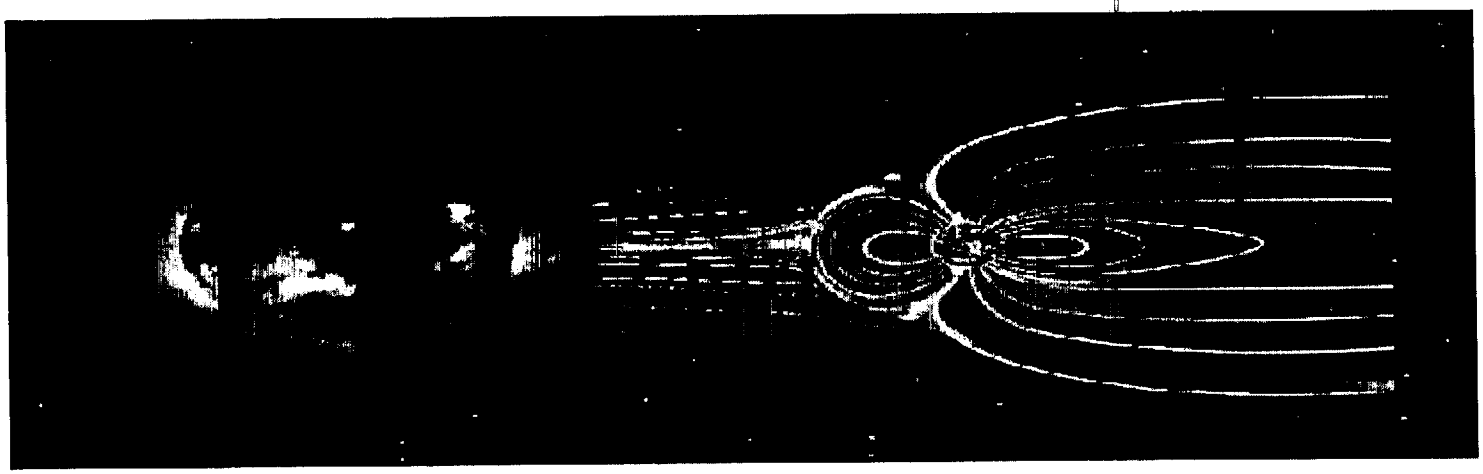
Decay products from processes related to those in the early universe?

OWL will use the Earth as a gigantic detector to observe giant air showers from space using two telescopes pointing downwards

Determine direction, composition, and spectrum of cosmic rays

Launch: 2010-2015

Sun - Earth Connection (SEC)

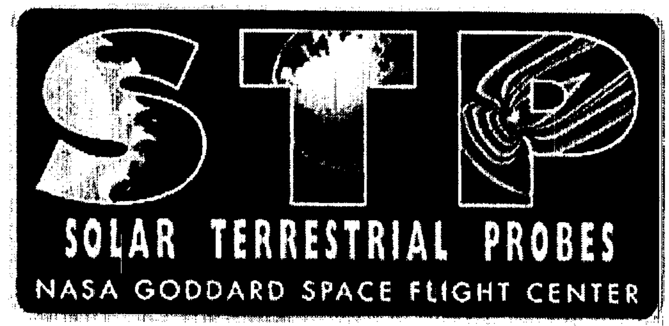


* **Goals**
  - To understand how and why the Sun varies
  - To understand how the Earth and the planets respond to the Sun
  - To explore the implications to humanity

Solar Terrestrial Probe (STP) Program

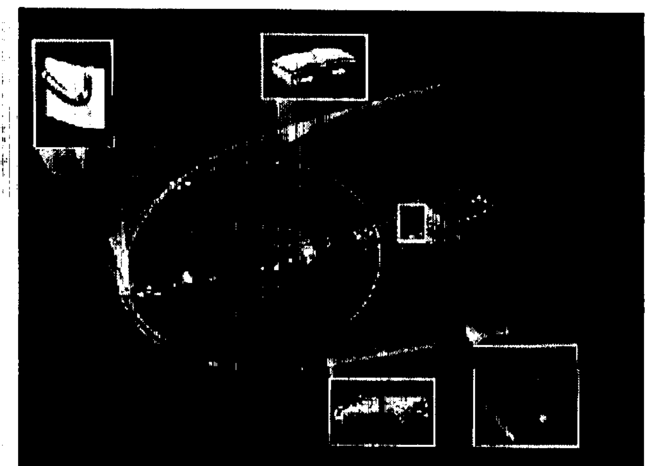
Science Goal

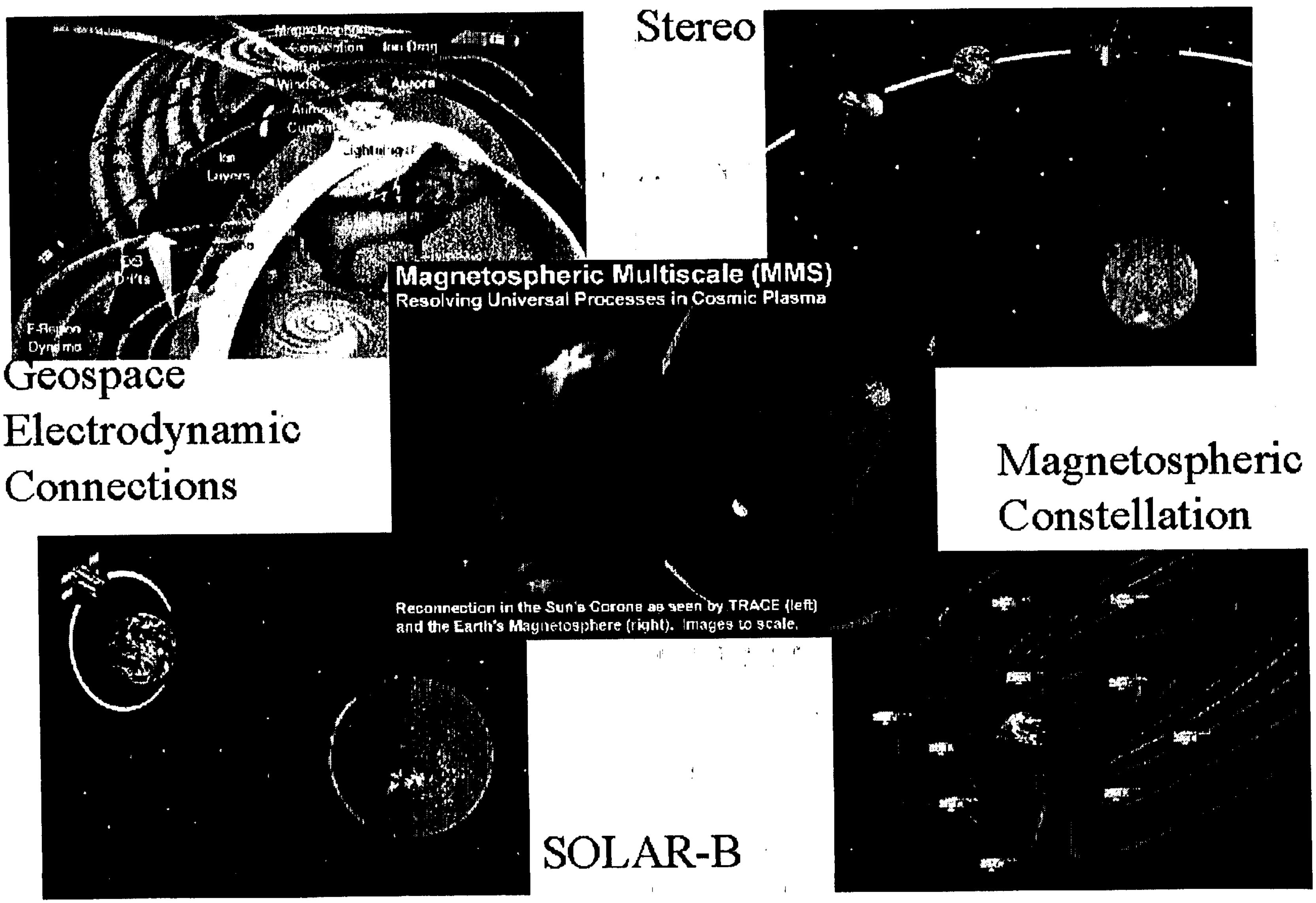
- To describe the system behavior of the magnetic variable star, our Sun, and its interaction with the entire solar system
- To understand the critical physics that link the Sun, Earth, and the interstellar medium
- To understand the boundary processes and dynamics of geospace, the electrical-plasma environment between the Sun and the Earth.



Missions

- TIMED
- Solar-B
- STEREO
- MMS
- GEC
- MC





Magnetospheric
Convection
Ion Drag
Aurora
Lightning
Ion
Layers
E-Region
Dynamo
Geospace
Electrodynamic
Connections
Stereo
Magnetospheric Multiscale (MMS)
Resolving Universal Processes in Cosmic Plasma
Reconnection in the Sun's Corona as seen by TRACE (left)
and the Earth's Magnetosphere (right). Images to scale.
Magnetospheric
Constellation
SOLAR-B

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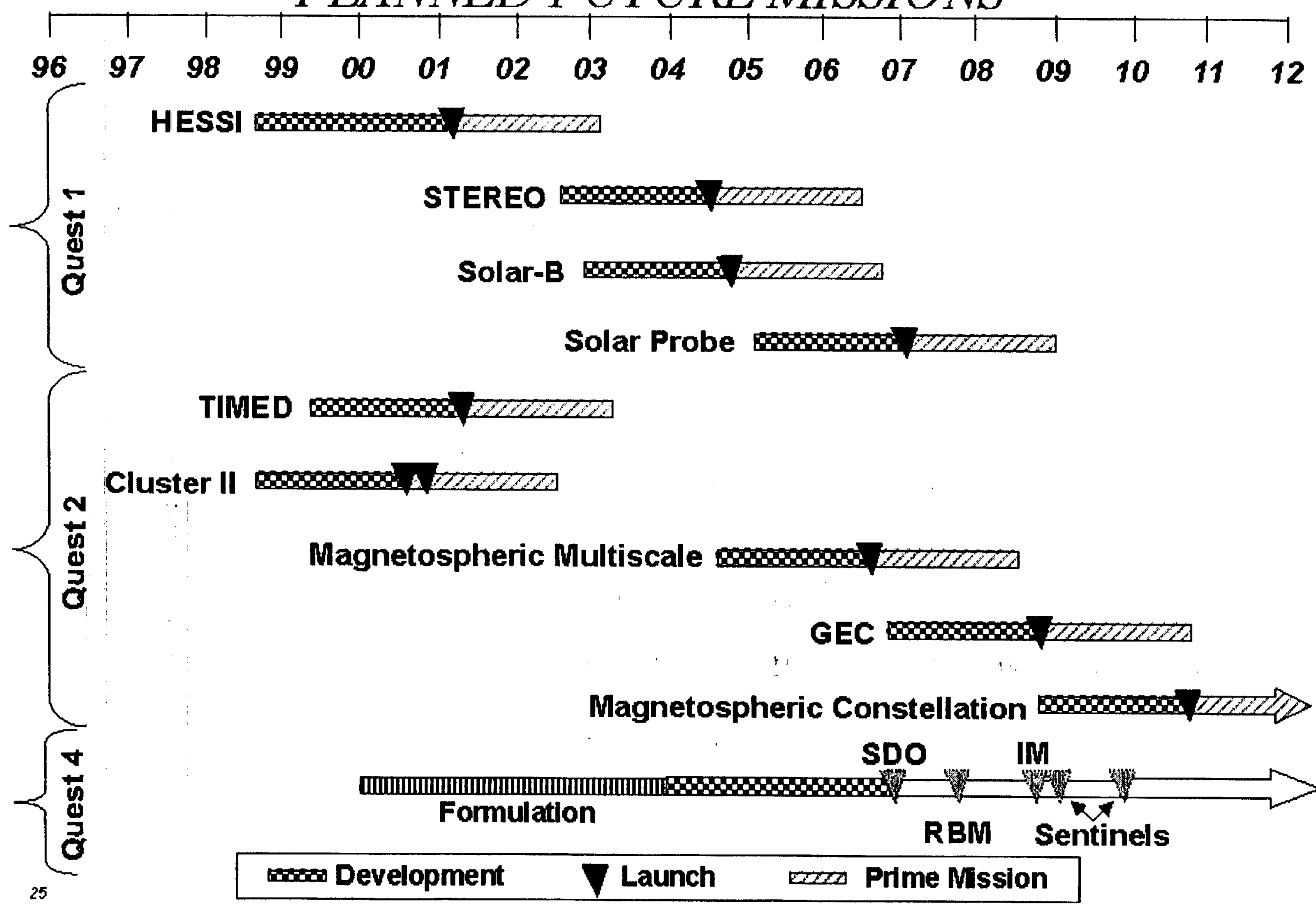
SEC LAUNCH SCHEDULE

PLANNED FUTURE MISSIONS



Living With a Star (LWS) Program

Science Goal

Living With a Star is a new NASA initiative to develop the scientific understanding necessary to effectively address those aspects of the Connected Sun-Earth system that directly affect life and society.

Program Characteristics

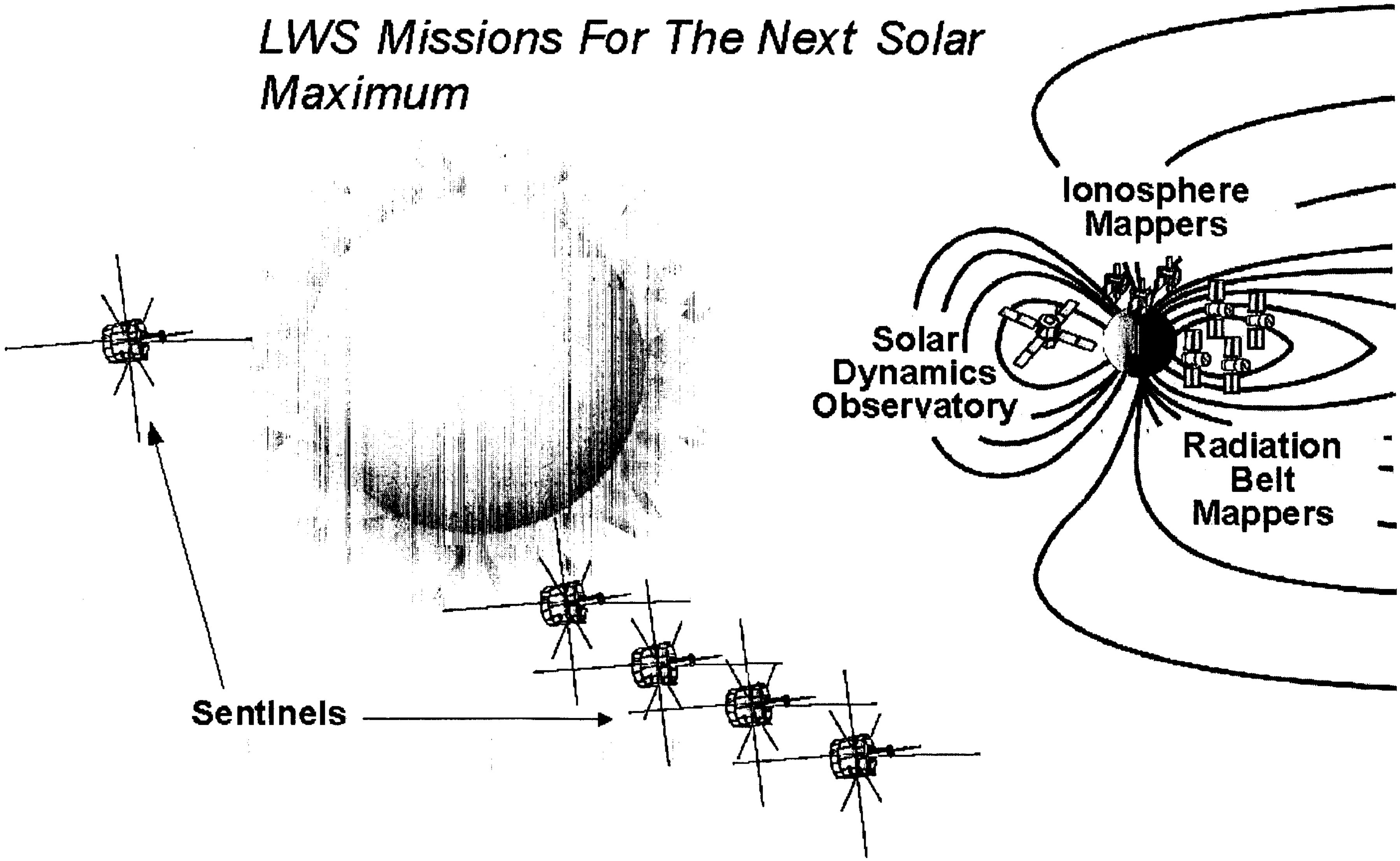
- Set of four missions to be organized and launched prior to the next solar maximum, anticipated for 2011
- The Solar Dynamics Observatory, a single spacecraft mission in geosynchronous orbit.

Priority

The NAS cites the SDO Mission as the first priority project for development of astronomical observing assets in space of intermediate size.

LWS MISSIONS

LWS Missions For The Next Solar Maximum



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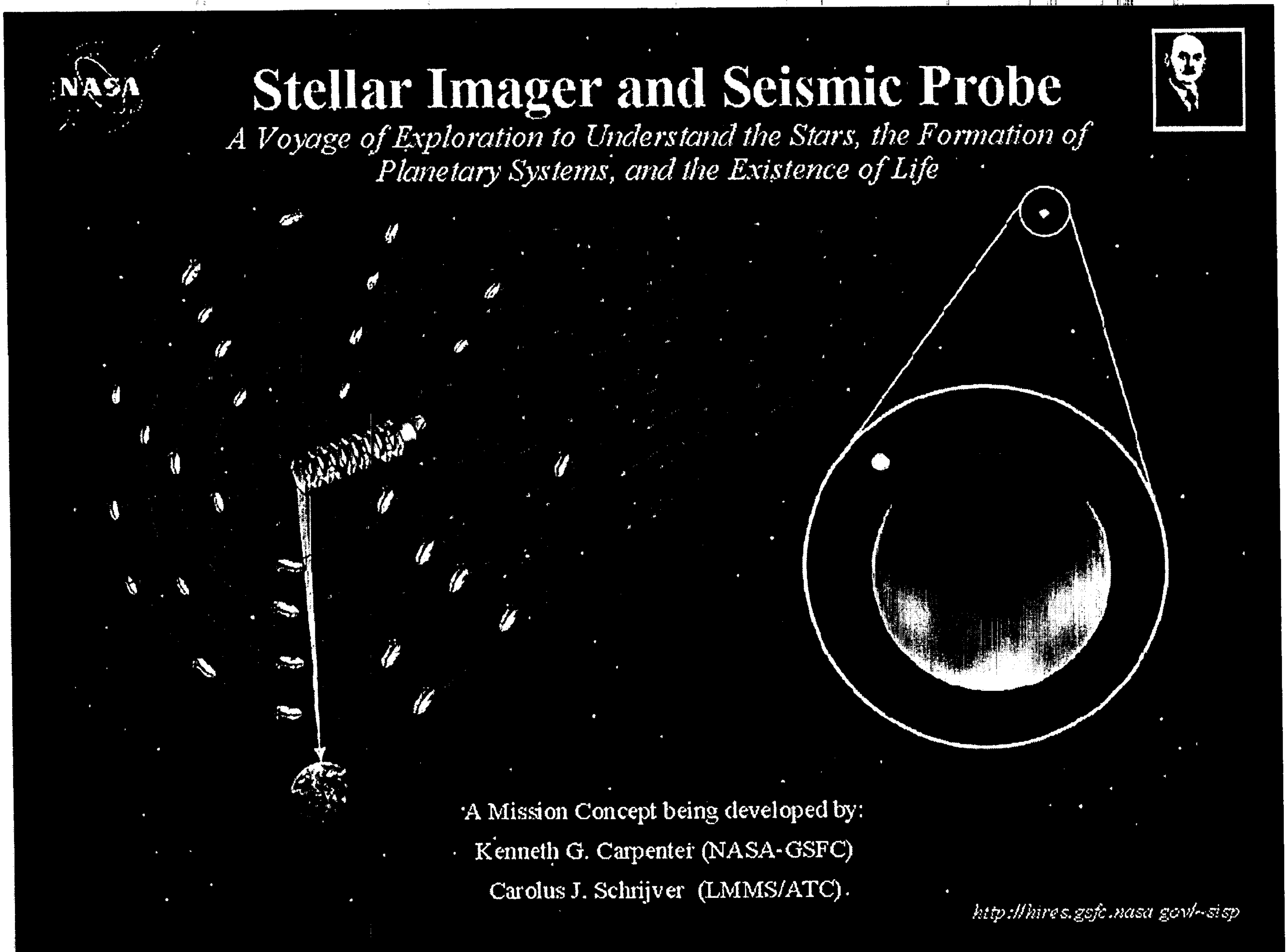

NASA
Stellar Imager and Seismic Probe
A Voyage of Exploration to Understand the Stars, the Formation of Planetary Systems, and the Existence of Life
A Mission Concept being developed by:
Kenneth G. Carpenter (NASA-GSFC)
Carolus J. Schrijver (LMMS/ATC).
http://hires.gsfc.nasa.gov/~si sp

Follow Your Space Science Vision....

Start At

✳http://spacescience.nasa.gov/

Space Science/OEOP NRA Overview

Dr. Phil Sakimoto
NASA Headquarters

SPACE SCIENCE UPDATE

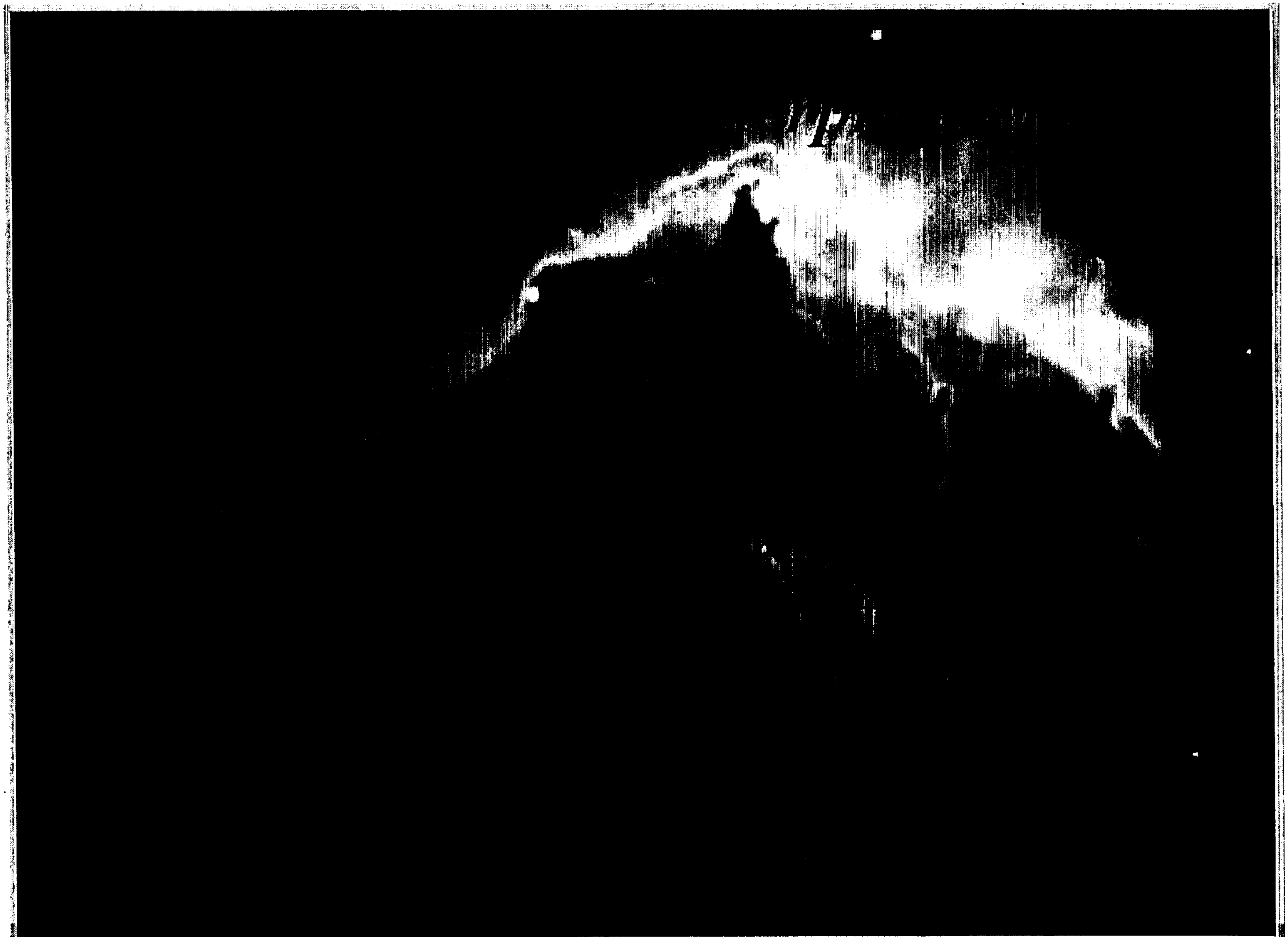
MU-SPIN 10TH Anniversary Users' Conference

Atlanta, Georgia
September 13, 2000

QuickTime™ and a
Photo - JPEG decompressor
are needed to see this picture.

Dr. Philip J. Sakimoto
Program Planning Specialist
Education and Outreach
Office of Space Science
NASA Headquarters

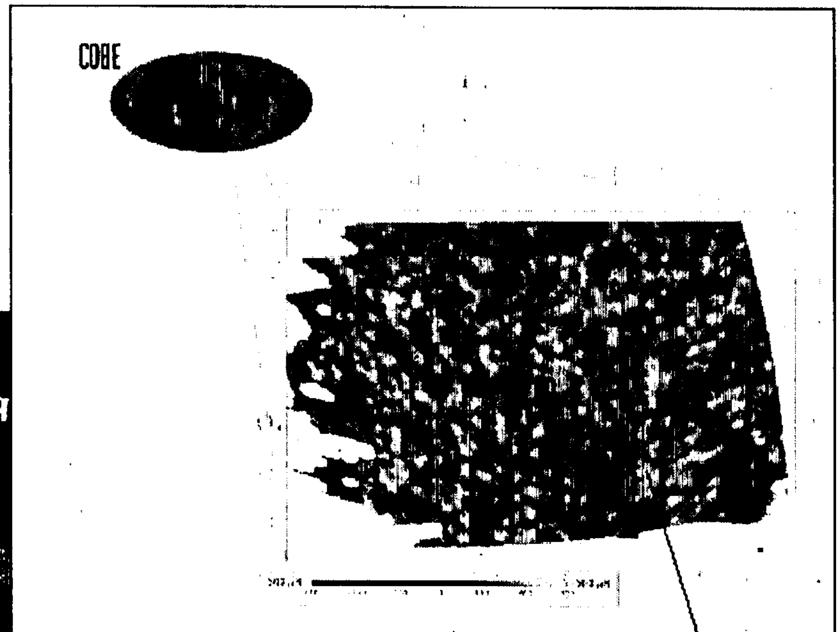
phil.sakimoto@hq.nasa.gov (202) 358-0949



Structure and Evolution of the Universe

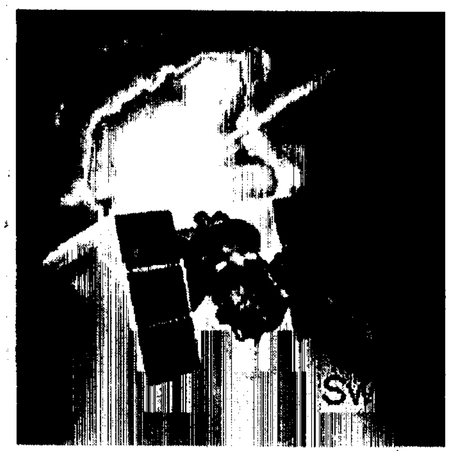
What is the nature of the Universe?
How did it come into being?
How does it work?

Current Missions
Chandra
XMM
Rossi XTE
SWAS
EUVE
HALCA/VLBI
ASCA



Sound waves in the embryonic Universe, revealed by the BOOMERANG balloon-borne telescope

Future Missions
GP-B
HETE-II
SWIFT
FIRST
GLAST
Integral
MAP
GALEX
CATSAT
CHIPS
Planck



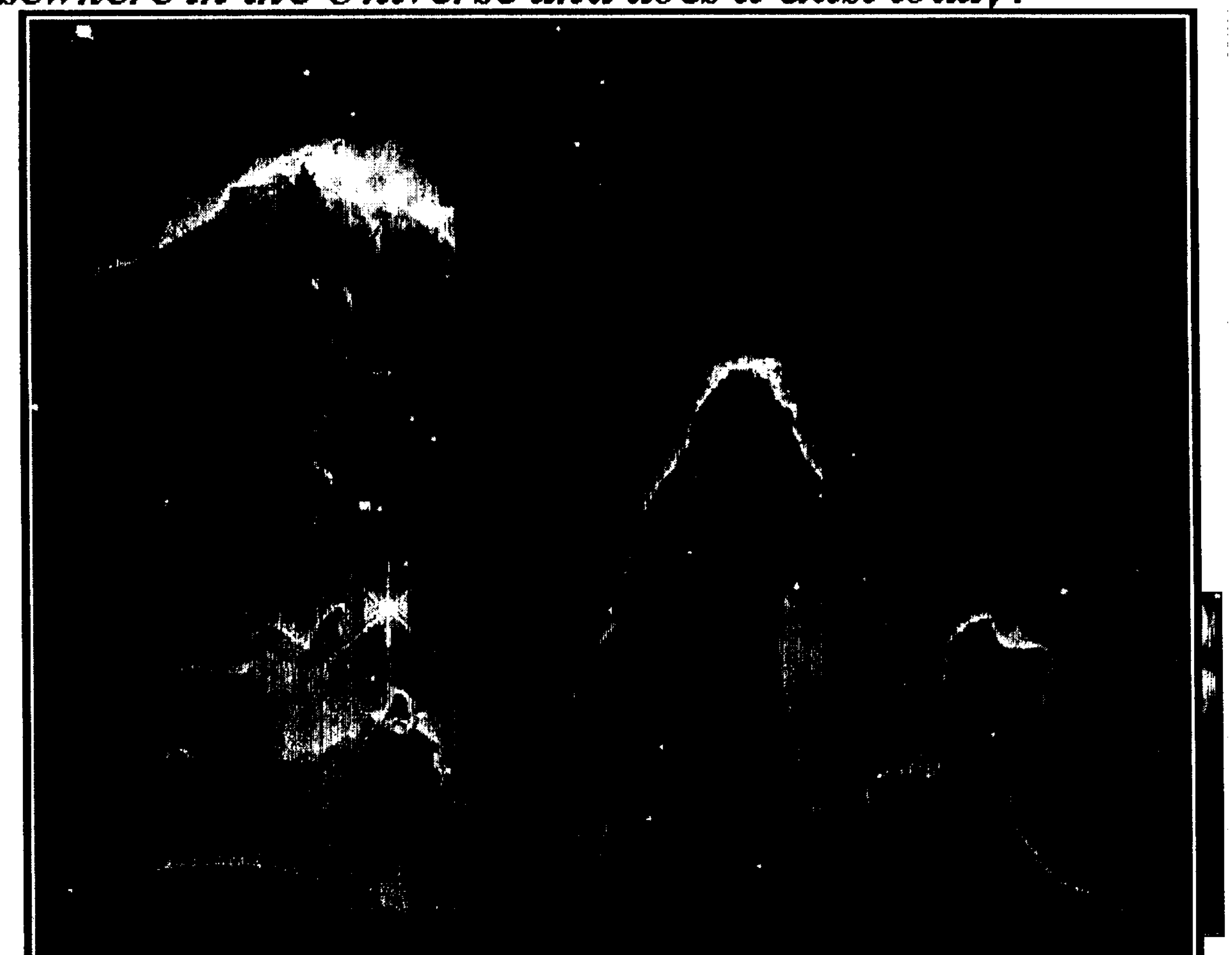
Astronomical Search for Origins

How did galaxies first form?

Are there worlds around other stars?

How did life on Earth arise?

Did life arise elsewhere in the Universe and does it exist today?

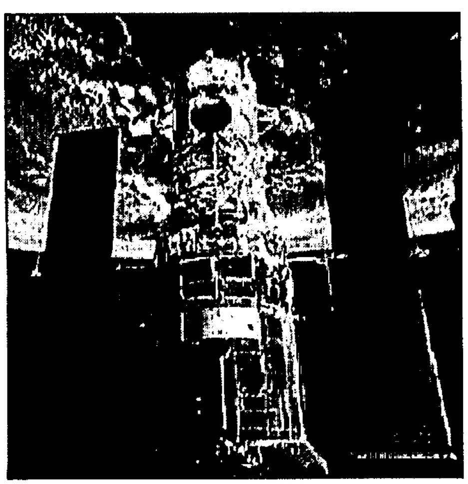


Current Missions

HST

Keck Observatory

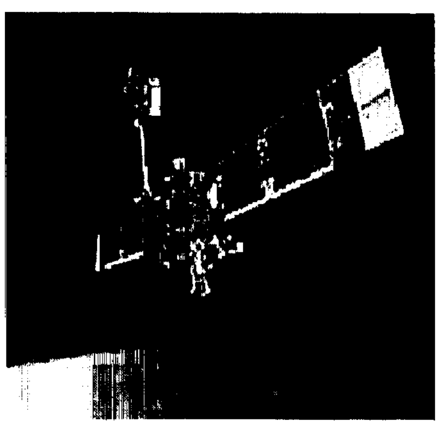
FUSE



Solar System Exploration

How did the Sun, Earth and planets form and evolve?
Did life arise elsewhere in the solar systems?
What is the future habitability of Earth and other planets?

Current Missions
Galileo
Cassini
Voyager
Mars Global Surveyor
NEAR
Stardust



Gullies eroded into the wall of a meteor impact crater in Noachis Terra

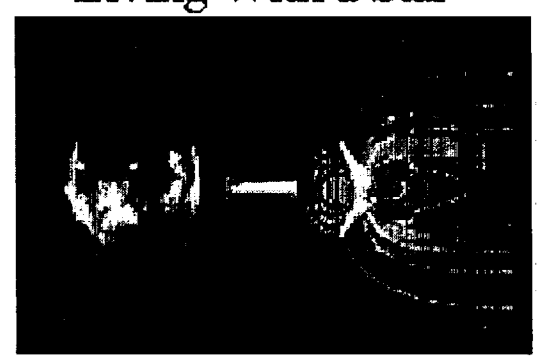
Future Missions
Mars 2003 Landers
Genesis
Europa Orbiter
Pluto-Kuiper Express
CONTOUR
Deep Impact
MESSENGER

Sun-Earth Connection

What causes solar variability?
How does solar variability affect the Earth and other planets?
How does solar variability affect life and society?
How does the Sun interact with the Interstellar Medium?

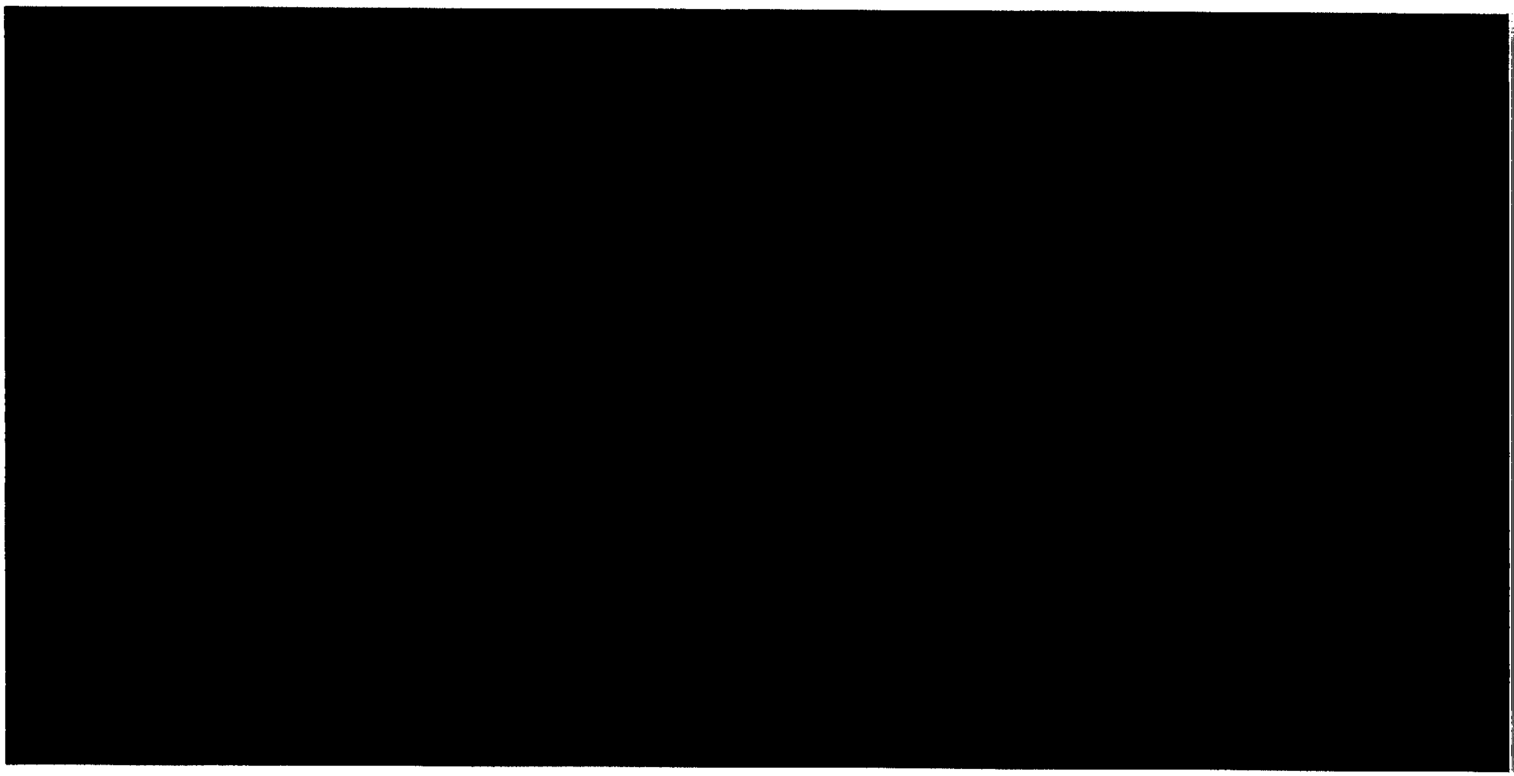
Current Missions
IMAGE
ISTP
Yohkoh
Ulysses
TRACE
ACE
SOHO
FAST
Voyager
Cluster-II

Future Missions:
TIMED
HESSI
IMEX
Solar B
Solar Probe
STEREO
TWINS
Living With a Star



Office of Space Science
Education and Public Outreach

Goals



Office of Space Science
Education and Public Outreach

The Strategy

- **Embed education and outreach in all missions and research programs**
  - Involve scientists
- **Amplify individual efforts through high leverage**
  - Build upon existing institutions' education/outreach efforts
- **Involve underserved/underutilized groups**
- **Evaluate effort for quality, impact, effectiveness**

Educators will fly onboard SOFIA to participate in the scientific research experience.

Accomplishments

- **All OSS missions have required, funded programs and dozens of smaller activities are underway.**
- **Education Forum Activities**
  - Coordinating mission education/outreach programs
  - Created EPO Resource Directory/ debut Fall 2000
  - Developing web-based resources for informal science institutions
- **Broker/Facilitator Activities**
  - Connections with education/outreach organizations
  - Regional pilot programs
  - "Match-making", partnership and proposal support
- **Coordinated presence at education conferences**
  - NSTA, NCTM, ASTC, AISES, ITEA, etc.
- **OSS is working with science museums, planetariums, and public television ~ 30 shows and exhibits underway**
  - *Passport to Knowledge - Live From...* TV series
  - HST, Mars, and *Electric Space* traveling exhibits
  - Solar System Scale Model on the National Mall
- **OSS/OEOP Minority University Initiative**
  - NRA Released in Winter 2000
  - 60 proposals received
  - 15 proposals selected for funding

Space Science Involvement - Research

- **Participation in AO's and NRA's**
  - Announcements of Opportunity (AO's) - flight projects
  - NASA Research Announcements (NRA's) - research
- **Direct participation as PI's, Co-I's, or collaborators is strongly encouraged:**
  - MI participation is explicitly called for in most AO's.
- **Current MI participation includes**
  - Tennessee State: ground-based observations for SWIFT
  - UPR Mayagüez: ground-station for FUSE
  - Fisk: detector materials for SWIFT
  - Hampton: Lead institution for AIM (SMEX study selection)

http://spacescience.nasa.gov/

Office of Space Science
Education and Public Outreach

Space Science Involvement - E/PO

- **E/PO funding through missions and research programs.**
  - **1-2% of mission/research funding is devoted to E/PO, providing the major source of OSS E/PO activities.**
  - **Partnerships and collaborations encouraged.**
  - **MI's may plan a vital role in bringing expertise in minority student programs to mission/research program E/PO activities.**
- **Build relations with the OSS Education Support Network**
  - **Forums**
  - **Broker-Facilitators (or become a Broker-Facilitator!)**

http://spacescience.nasa.gov/

Office of Space Science
Education and Public Outreach

Space Science Involvement - IDEAS

- **Initiative to Develop Education through Astronomy and Space Science (IDEAS)**
  - **Start-up funding for innovative education projects that feature collaboration between astronomers/space scientists and education professionals**
  - **Administered by Space Telescope Science Institute**
  - **Funding:**
    - **Up to $10,000 for small projects that are expected to be completed within one year; OR**
    - **Up to $40,000 for large projects that are provided a two-year funding period, if needed.**
  - **Deadline Friday, October 27, 2000**

http://ideas.stsci.edu/

NRA 00-OSS-02

MINORITY UNIVERSITY EDUCATION AND RESEARCH PARTNERSHIP INITIATIVE IN SPACE SCIENCE

A Joint Initiative of the

Office of Space Science
and
Office of Equal Opportunity Programs

National Aeronautics and Space Administration

MINORITY UNIVERSITY INITIATIVE IN SPACE SCIENCE

- Motivated by recognition that critical steps must be taken to broaden the participation of underrepresented groups and minority institutions in NASA research programs and missions:
  - According to *NASA's 1996 Science Policy Guide*, "The economic vitality of our nation depends increasingly on new scientific knowledge and its application. For NASA, this means ensuring that the ideas and capabilities of the widest possible talent pool are brought to bear on its missions."
  - Furthermore, to ensure that a continuing supply of scientists, engineers, and technologists will be available to meet the needs of the twenty-first century in the Space Science Enterprise, the *Space Science Enterprise Strategic Plan* "promotes the involvement of underserved/underutilized groups in Space Science education and outreach programs and their participation in Space Science research and development activities..."
- Developed through extensive visits, meetings, and discussions with representatives of minority institutions to ascertain the most effective strategies for achieving common goals.

MINORITY UNIVERSITY INITIATIVE
Goals

- Long-Term Goals
  - Enhance minority college (2-year and 4-year) and university participation in Space Science education and research programs.
  - Increase the understanding of science, technology, and the role of research in contemporary society by a broad and diverse segment of the American population.
- Near-Term Goals
  - The development of space science-related <u>academic capabilities</u> at minority colleges and universities and, working through those institutions, the development of space science-related education programs and materials aimed at many levels in the education system; and
  - The enhancement/development of the <u>educational and research capabilities of faculty and students</u> in space science-related fields through the establishment of partnerships and exchange programs in research and education with NASA-supported space science research groups at colleges and universities, NASA Centers, other federal laboratories, and industrial organizations throughout the country.

Establishing strong linkages among OSS, the space science research community, and minority institutions . . . is a key element in . . . realizing these goals.

MINORITY UNIVERSITY INITIATIVE
Eligibility

- Proposals must originate from a U.S. college or university designated by the Department of Education as a minority institution:
  - Historically Black College or University (HBCU)
  - Hispanic-Serving Institution (HSI) [>25% Hispanic enrollment]
  - Tribal College or University (TCU)
  - Other Minority University (OMU) [>50% combined minority enrollment]
- In addition, HBCU's, HSI's, TCU's, and OMU's that have received a total of $1 million or more of funding support from NASA's Space Science Enterprise over the past three years are ineligible to participate.
- A portion (up to 25%) of the funds awarded to a minority institution may be spent at nonminority institutions to support the development of academic and research partnerships and exchange programs with such institutions.

MINORITY UNIVERSITY INITIATIVE
Selection Criteria

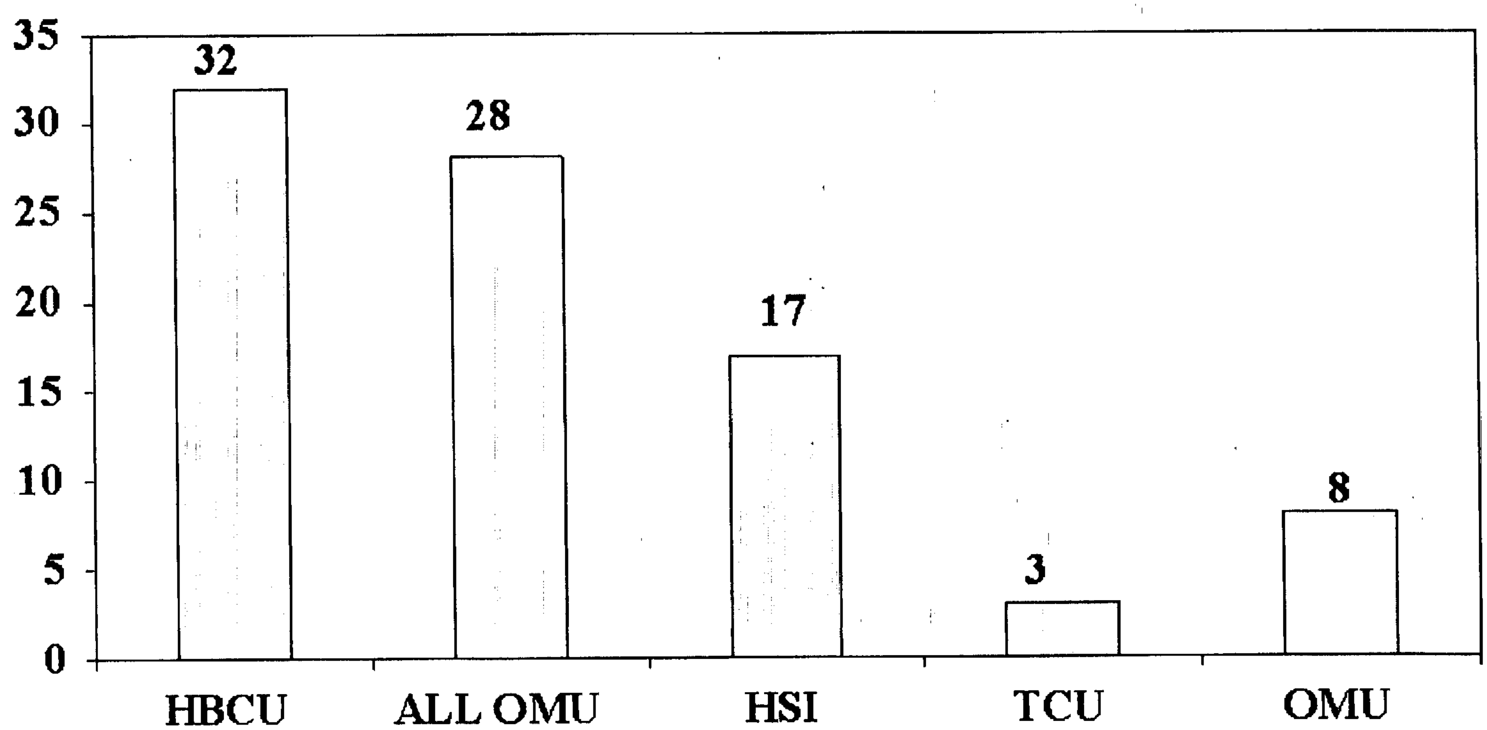
- Project Significance and Quality (30%) - A compelling argument that the project is actually worth doing; a carefully thought out approach and clear case for the project's intrinsic educational or scientific merit.
- Project Feasibility (30%) - The project can actually be done for the requested funds; the proposing team has the capability and experience to carry out the project; appropriate facilities or institutional capabilities are available; appropriate commitments have been obtained from potential partners.
- Prospects for Institutional Development (20%) - Contributions to improving the institution's capabilities to carry out space science-related educational or research programs. Long-term plans for academic and institutional development and prospects for sustainability.
- Adequacy of Management Approach (20%) - Clear responsibilities for each participant and clear lines of authority. Timelines and milestones clearly defined and outlined. The effort can be successfully carried through to completion on time and within budget.

NASA plans to deliberately select proposals of different scales with diverse approaches to implementing these concepts from different types of minority colleges and universities located in many regions of the country, and to evaluate the effectiveness of a broad range of approaches to meeting the goals of this announcement as a basis for possible follow-on activities.

MINORITY UNIVERSITY INITIATIVE
Key Dates

- January 31, 2000 — NRA Issued. Extensive distribution via OSS lists, OEOP lists, and MU-SPIN.
- Dear Colleague letter issued by OSS AA encouraging participation of all OSS researchers.
- Website for institutions seeking partners established.
- March 23-May 10 — On-line pre-proposal conference
- March 31, 2000 — Notices of Intent Due. 86 notices received.
- May 10, 2000 — Proposals Due. 60 proposals received.
- May 11-31, 2000 — Compliance checks. 50 proposals found compliant
- June 27-29, 2000 — Review Panel convened in Washington, DC
- September 1, 2000 — Selections
- January 1, 2001 — Awards

MINORITY UNIVERSITY INITIATIVE
60 Proposals Received



MINORITY UNIVERSITY INITIATIVE
Expertise of the 30 Reviewers

- Minority Institution current/former administration/faculty (5)
  - HBCU (2)
  - HSI (2)
  - TCU (0)
  - OMU (1)
- Representatives of minority-serving organizations (2)
  - African American (1)
  - Native American (1)
- Minorities(13)
  - African American (8)
  - Hispanic (2)
  - Asian/Pacific Islander (3)
- Non-minority college/university faculty/staff (5)
- Professionals in K-12 formal education/education program managers (14)
  - NASA (4)
  - NSF (1)
  - External (9)
- Professional scientists (13)
  - NASA (2)
  - NSF (1)
  - External (10)

NOTE: Because of the extensive cross-expertise brought by the panelists, many of the 30 panelists are counted in more than one category.

MINORITY UNIVERSITY INITIATIVE
Proposals Selected for Funding

- Fifteen proposals could be selected within the available program funding:
  - HBCU's
    - Alabama A&M University (T. Arjun): New undergrad courses, degree, and research program. MSFC scientists help develop and teach courses and supervise student research.
    - Florida A&M University (C. Weatherford): Theoretical modeling of x-ray line formation, and new graduate course in atomic and molecular astrophysics.
    - Hampton University (S. Bailey): Expand space science base at Hampton Center for Atmospheric Sciences to encompass other Hampton faculty, education students, community colleges and high schools.
    - Norfolk State University (C. Salgado): nuclear and particle physics research with GSFC particle astrophysics missions, undergrad course/degree development, teacher training and public outreach.
    - South Carolina State University (D. Walter): Extensive multi-institutional research collaborations, addition of new astronomy faculty position, undergrad pipeline development, teacher training and K-12 outreach.
    - Southern University, Baton Rouge (G. Stacy): Bring Southern students and faculty into active participation in SOHO and in a Louisiana State gamma ray balloon project.

MINORITY UNIVERSITY INITIATIVE
Proposals Selected for Funding (continued)

- HSI's
  - Eastern New Mexico University at Portales (S. Nutter): Inter-weave faculty participation on cosmic ray balloon mission with undergrad student research, teacher training, and public outreach.
  - University of Houston-Downtown (P. Morris-Smith): Close collaboration with JSC Earth Science and Solar System Division for student research, teacher training, and high school and public outreach.
  - University of Texas at El Paso (R. Lopez): integration of Sun-Earth Connection content into undergraduate classes, high school outreach, and teacher training.
- TCU's
  - Salish Kootenai College (T. Olson): Develop four new courses in astronomy and astrophysics.
  - Diné College (S. Semken): Use Internet to deliver space science education and research programs throughout a southwest consortium of colleges and universities.
  - Southwest Indian Polytechnic Institute (C. Abeita): establish Meteorite Identification Lab at SIPI and use for undergrad research and high school Upward Bound program.
- OMU's
  - Medgar Evers College (L. Johnson): Coordinated development of space science courses/degrees at six CUNY campuses and creation of high school feeder programs.
  - University of Hawaii at Hilo (R. Crowe): Partnership with Mauna Kea observatories for undergrad course development, faculty and student research, and K-12 outreach to Native Hawaiians.
  - York College (M. Spergel): Link with JPL, Princeton, and Amer Mus of Nat History to establish student research and incorporate space science throughout undergrad curriculum and teacher training.

Building a Program in Astrophysics

Dr. Donald Walter
South Carolina State University

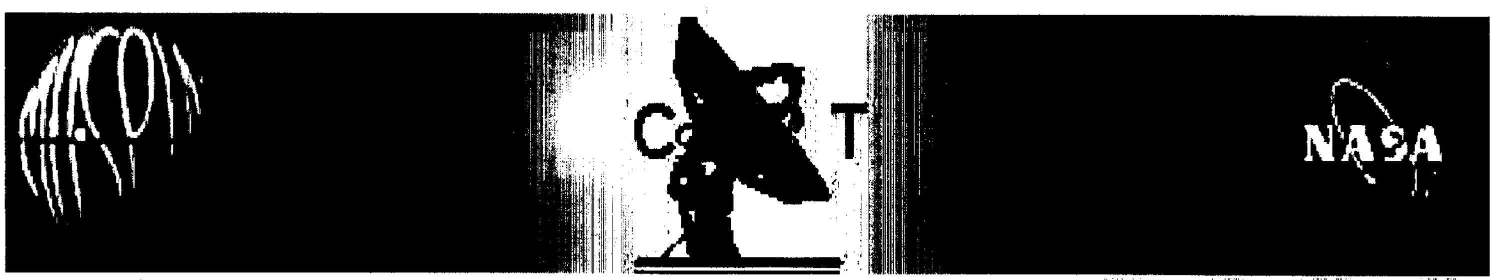
Building A Program in Astrophysics

Donald K. Walter

The Center for Network Resources and Training

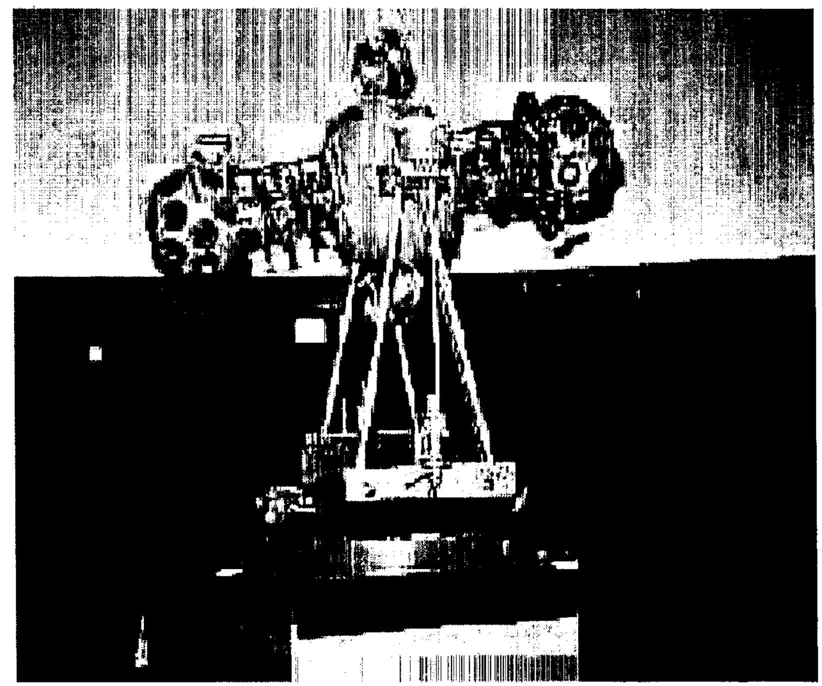
A MU-SPIN NRTS

South Carolina State University



1994 – Existing Resources

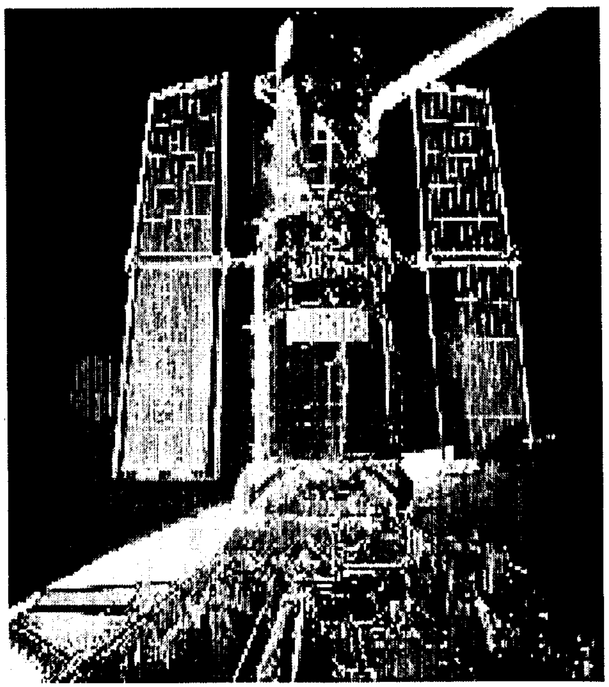
- Space Grant Member
- NASA Educator Resource Center
- Planetarium on Campus
- Faculty interest in Astronomy



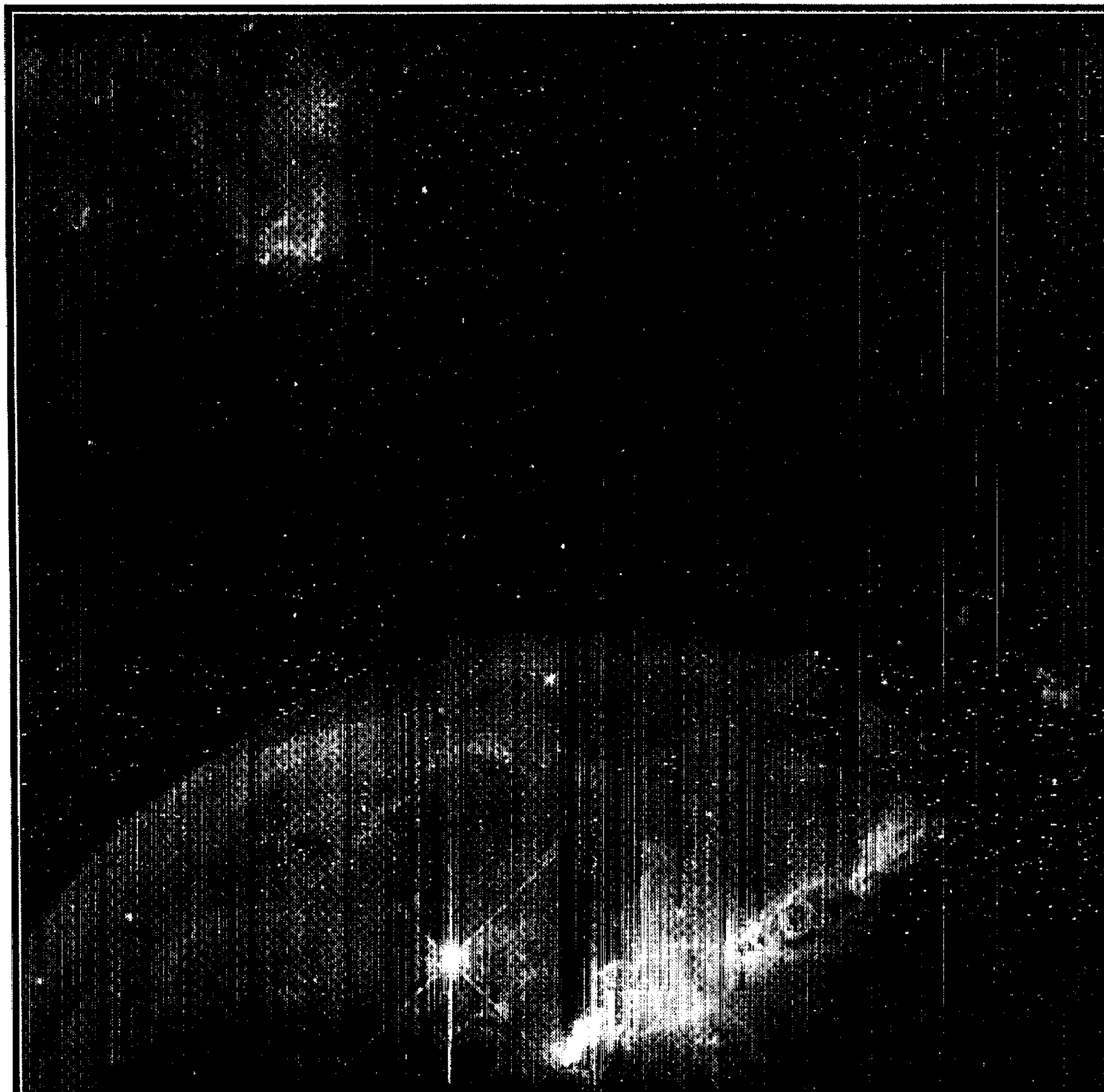
1994 – 97 Initial Buildup

- Hired an astronomer
- Hired physics faculty member with interest in cosmology
- Attended December 1994 NASA meeting
- NASA facilitated partnering with Tennessee State
- TSU – WKU – SCSU awarded MURED URC
- SCSU awarded MU-SPIN NRTS
- MU-SPIN funds SCSU buildup – UNIX, wiring of faculty, training lab, etc.

1997 – 2000 Expansion



- HST PI Award to study Bubble
- HST Co-I Award to study NGC 1569
- Collaborations with Caltech, Arizona State, Rice University
- Access to Palomar & Steward Observatories
- Network access & UNIX essential
- Hubble submission entirely on-line
- Image processing in UNIX



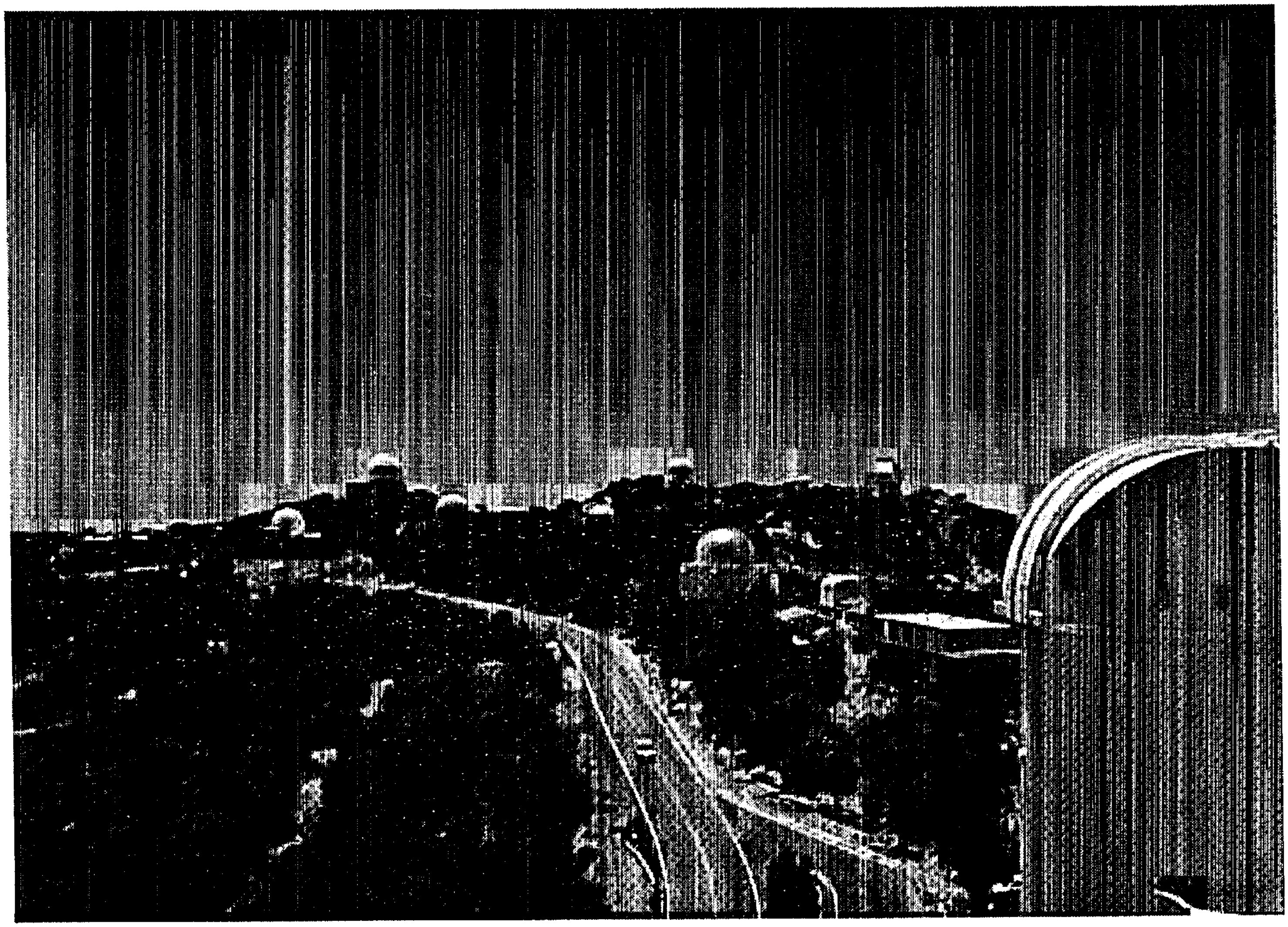
Bubble Nebula • NGC 7635 **HST • WFPC2**
NASA, D. Walter (South Carolina State University)
and P. Scowen (Arizona State University) • STScI-PRC00-04

1997 – 2000 Expansion

- Past 3 summers day camp in space science middle school – partnered with NRTS K-12 schools
- Undergraduate Research Institute in Astrophysics
- 1998 partnered with CCNY NRTS
  - 3 undergrads, residential, 8 week summer research at SCSU in astrophysics
- 1999 expanded to 8 students & other NRTS
- 2000 had 10 students NRTS, New Mexico St., UVI
- Student backgrounds include all MSET fields

URIA tour of Observatories

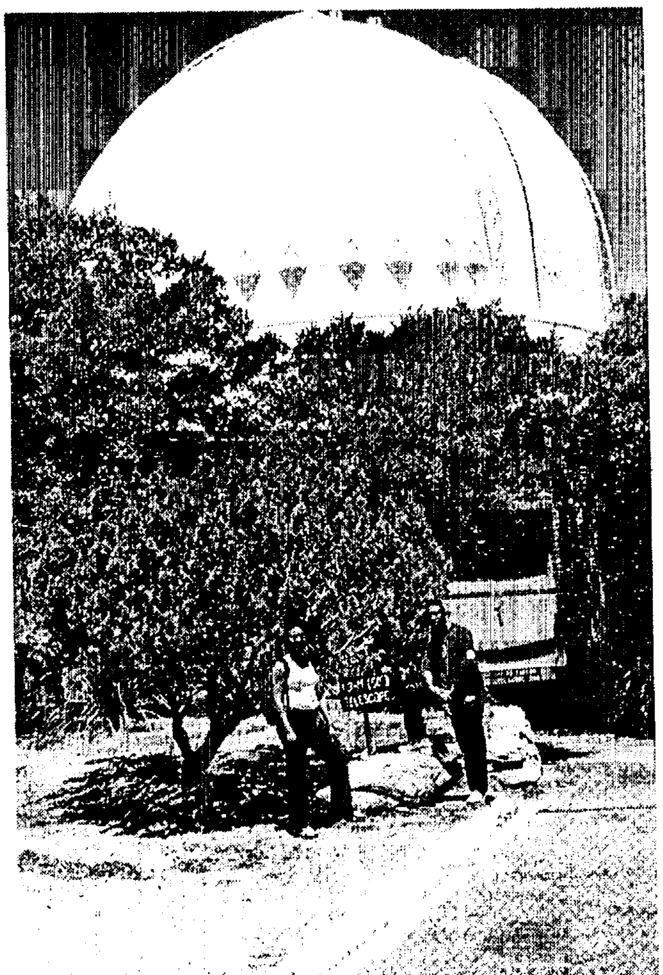
URIA tour of Observatories

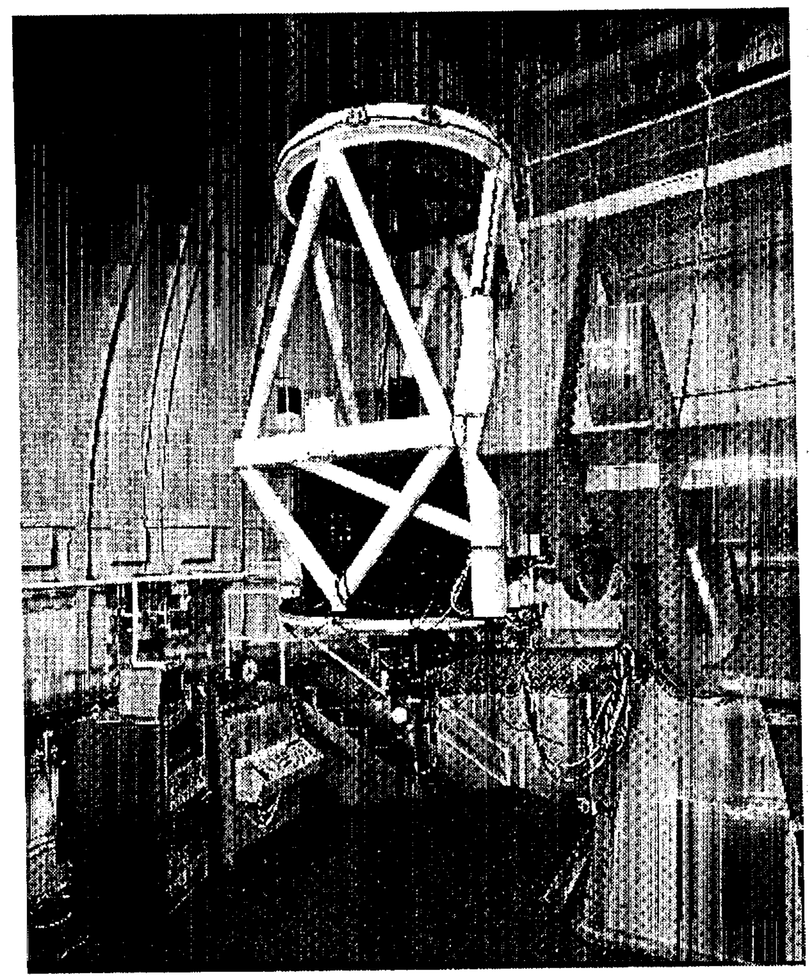


1997 – 2000 Expansion

- SCSU Invited to join consortium of schools to take over management of KPNO 1.3 meter
  - Robotically Controlled Telescope (RCT)
  - Once refurbished will be accessible in an automated mode and in real time over Internet
  - Desktop observing in SC with clear skies of AZ
  - Research education and outreach possibilities

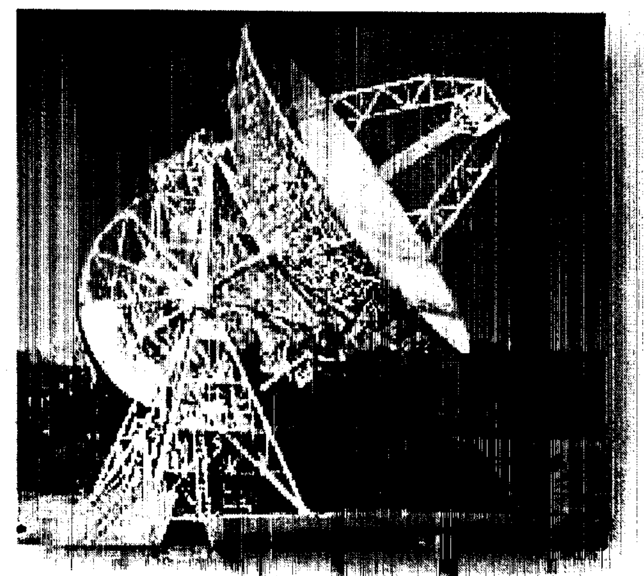
Remote Control of Telescope





1997 – 2000 Expansion

- Awarded MURED-PAIR
  - Curriculum Enhancement
  - 3 SCSU departments
  - Student research teams
  - Robotics, Radio Astronomy, Database management
  - GSFC support, Dr. James Thieman
  - Additional Partners including minority-owned business A-Tech, UVI



1997 – 2000 Expansion

- OSS/OEOP Space Science
  - New tenure-track astronomer
  - GSFC, Dr. Theodore Gull
  - Lawrence Livermore asked to join
  - Student researchers to KPNO, GSFC, LLNL, Clemson
  - Graduate students to SCSU

Summary

- Astrophysics growth
- Summer 1995: (Pre-MU-SPIN)
  - 1 faculty, 2 students, $12,000, SCSU students only
- Summer 2000: (MU-SPIN, MURED)
  - 6 faculty, 26 students, students from 6 schools
  - 5 K-12 faculty, 20 middle school students
  - $200,000 for stipends, salaries, travel & supplies

Critical to our Growth

- Funding & support from NASA and others
- Concentrating on our niche
  - undergrads, existing resources (planetarium, ERC)
- Numerous proposals (success 1 out of 3-5)
- Collaborations (over 30 partners)
- Networking within MU-SPIN, NASA Centers

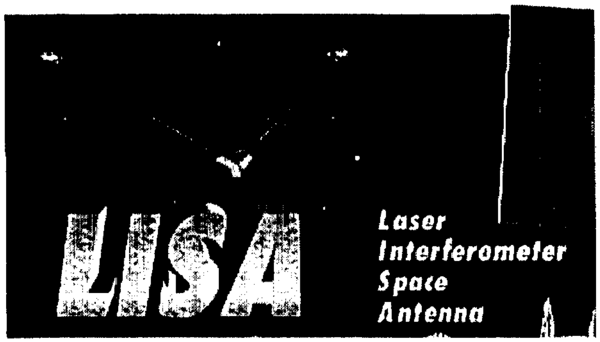
Solar Research Program

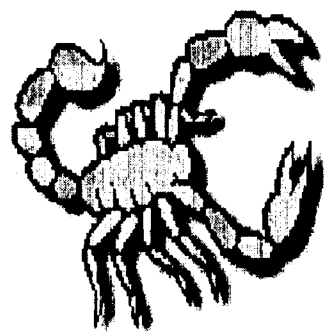
Dr. Tian-Sen Huang
Prairie View A&M University

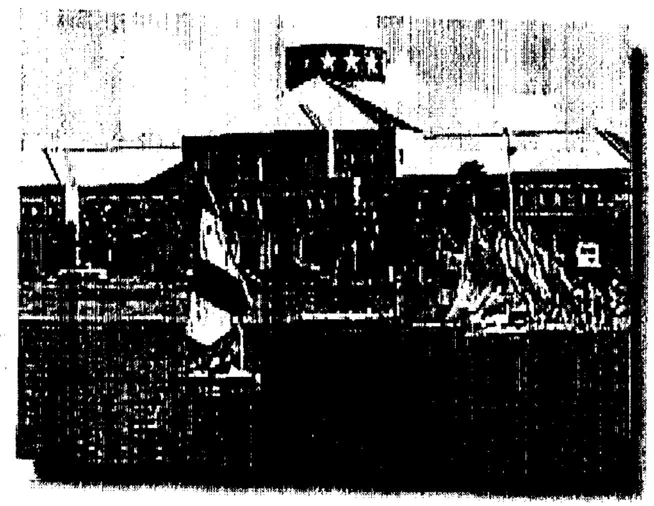
A Successful Story of Collaborative Research

Mr. Mario C. Diaz
University of Texas at Brownsville

A Successful Story of Collaborative Research at a Hispanic Serving Institution







Mario C. Diaz

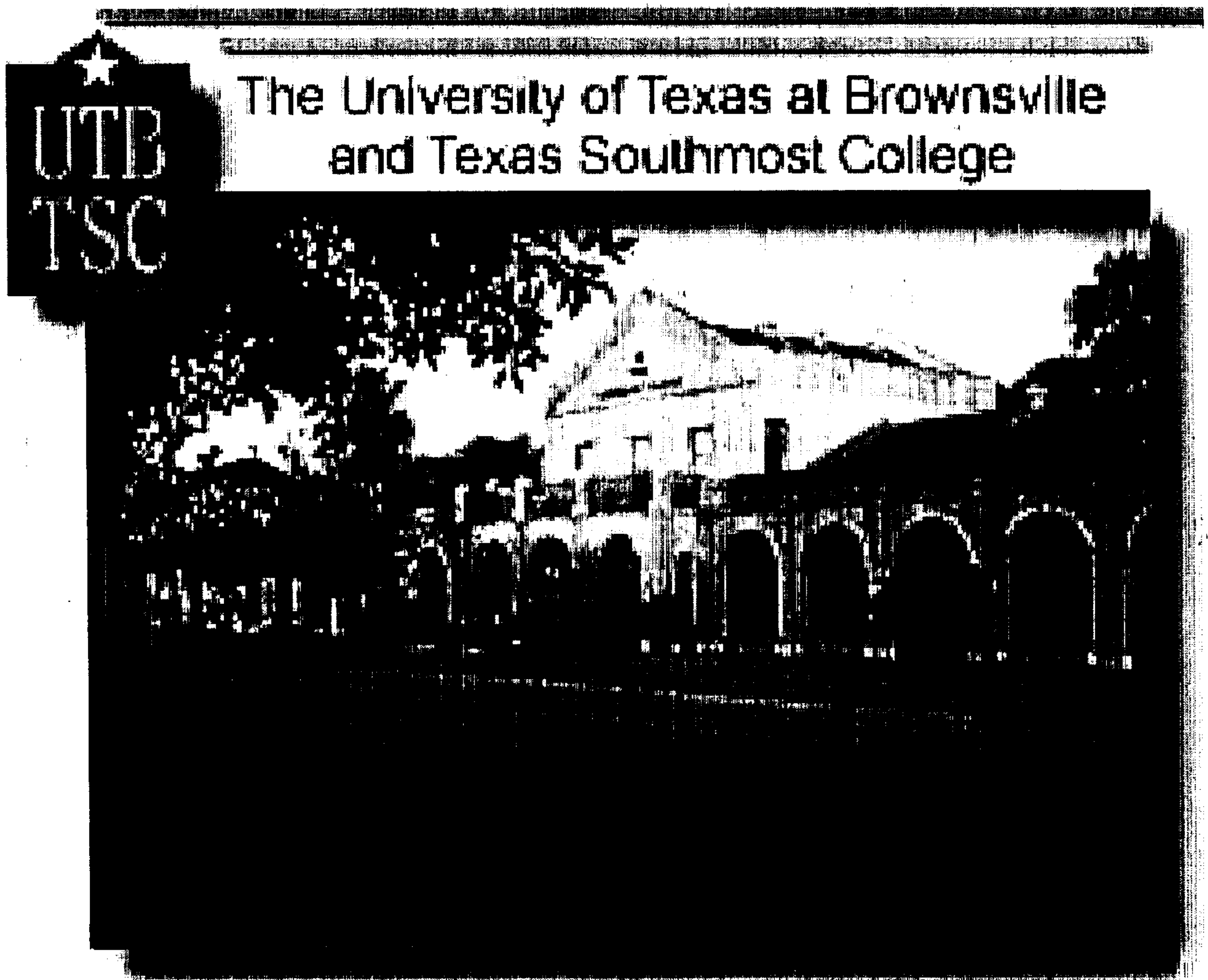
The University of Texas at Brownsville

MU-SPIN 10th Anniversary User's Conference

MURED 2nd Annual Education Conference

September 11-16, 2000

Research partially funded by grants NASA-JPL # 961298 and NSF PHY-9981795



- The youngest component of the U T system.
- About 9500 students. 90% Mexican-Americans.

- **1998 NASA, Faculty Awards for Research.** ***Wave Profiles in Gravitational Radiation Astronomy.*** **NASA-JPL contract N° 961298;1998-2000 ($207,000).**

- **This grant made possible:**

- **to start a vigorous research program in the area of gravitational wave detection.**

- **Initiate a collaboration with other universities (Penn State, University of Wisconsin, Caltech, MIT).**

- **Attract good talented students to the Physics program.**

What are Gravitational Waves?

Predicted in Einstein's General Theory of Relativity, gravitational waves are disturbances in the curvature of space-time caused by the motions of matter.

- Propagating at (or near) the speed of light, gravitational waves do not travel "through" spacetime as such -- the fabric of spacetime itself is oscillating.

- Though gravitational waves pass straight through matter, their strength weakens proportionally to the distance traveled from the source.

- A gravitational wave arriving on Earth will alternately stretch and shrink distances, though on an incredibly small scale -- by a factor of 10^{-21} for very strong sources.

- That's roughly equivalent to measuring a change the size of an atom in the distance from the Sun to Earth!

Are Gravitational Waves real?

- **In the mid 1970s, American researchers observed a binary pulsar system (named PSR1913+16) that was thought to consist of two neutron stars orbiting each other closely and rapidly.**

- **Radio pulses from one of the stars showed that its orbital period decreases by 75 microseconds per year.**

- **In other words, the stars are spiralling in towards each other -- and by just the amount predicted if the system were losing energy by radiating gravity waves.**

Why Should We Care About Gravity Waves?

- Gravitational wave astronomy could expand our knowledge of the cosmos dramatically.

- For starters, gravitational waves, though weakening with distance, are thought to be unchanged by any material they pass through and, therefore, should carry signals unaltered across the vast reaches of space.

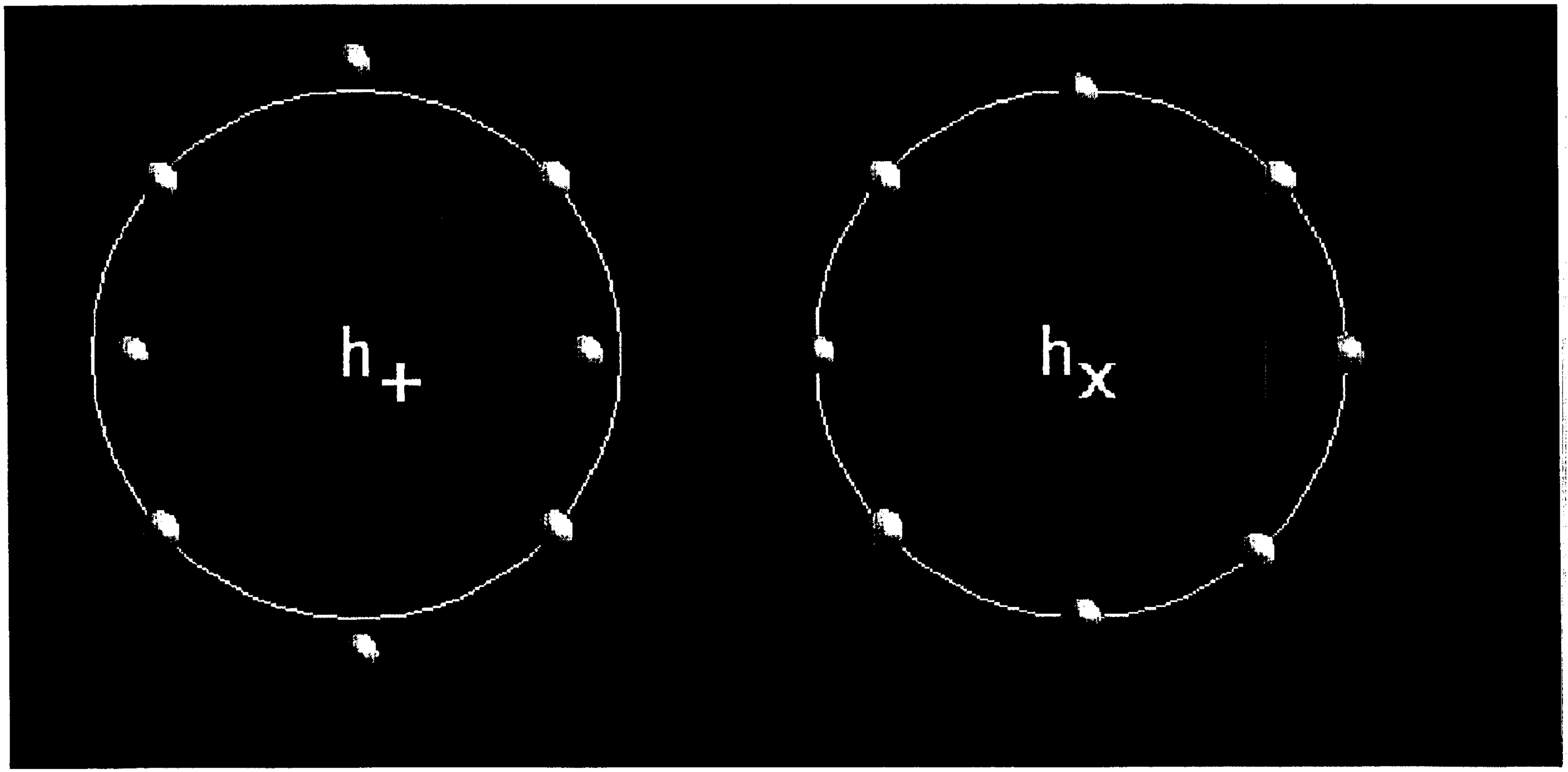
- By comparison, electromagnetic radiation tends to be modified by intervening matter.

- Aside from demonstrating the existence of black holes and revealing a wealth of data on supernovae and neutron stars, gravitational wave observations could also provide an independent means of estimating cosmological distances and help further our understanding of how the universe came to be the way it looks today and of its ultimate fate.

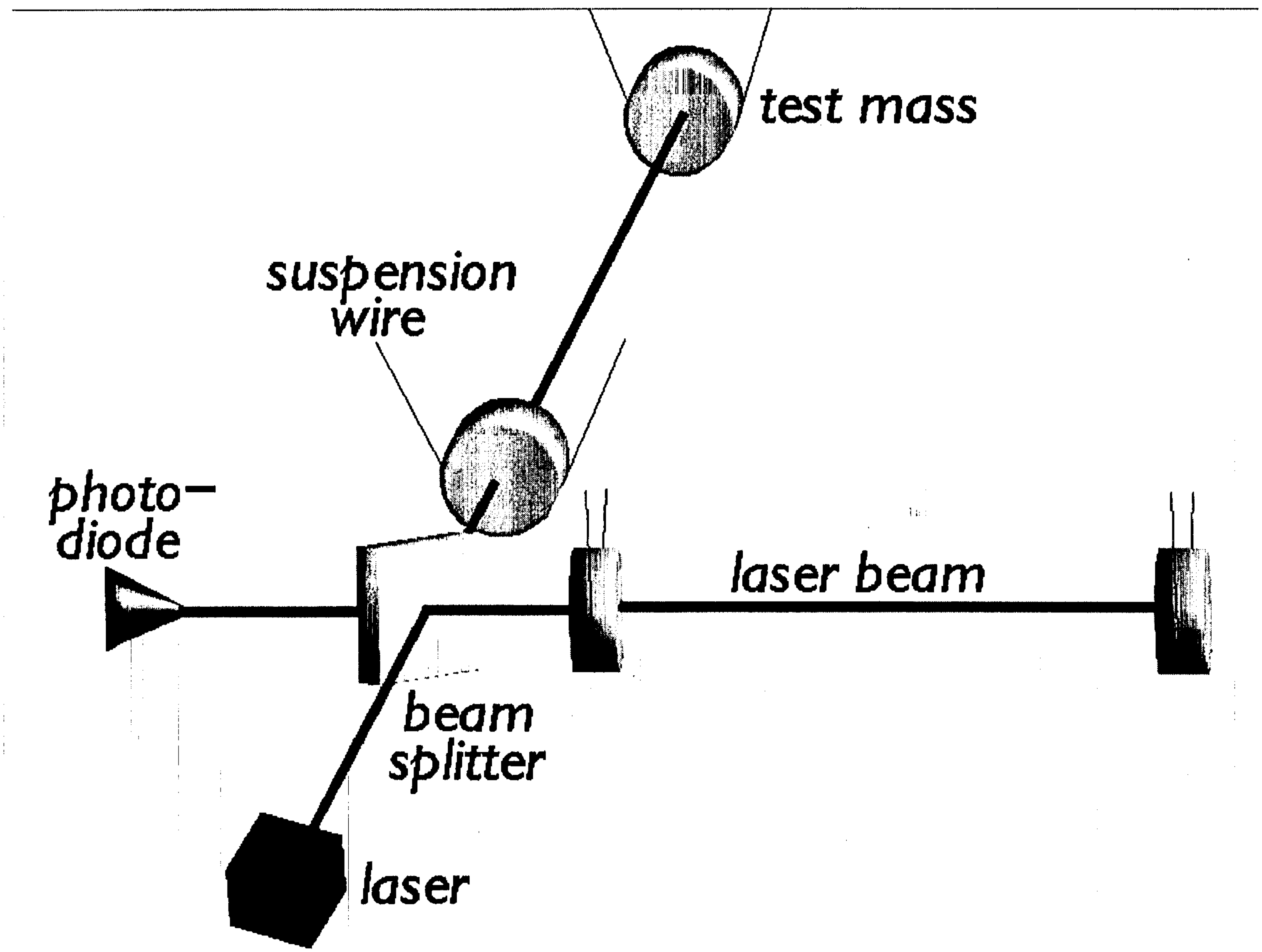
- Gravitational waves might unveil phenomena never considered before. Nature can surpass any ivory tower theorist trying to imagine or calculate what might be out there!

Gravitational Waves

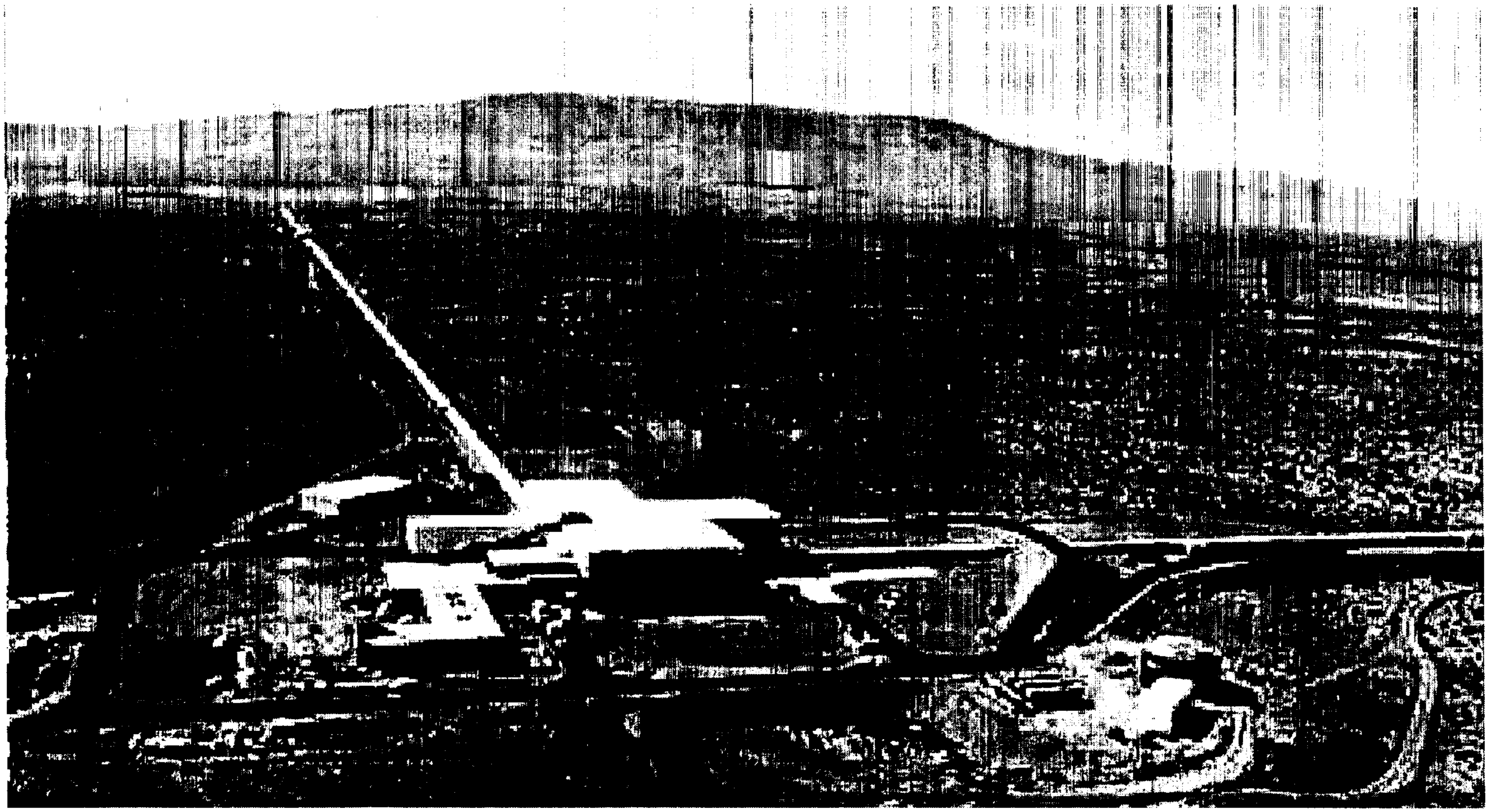
new window



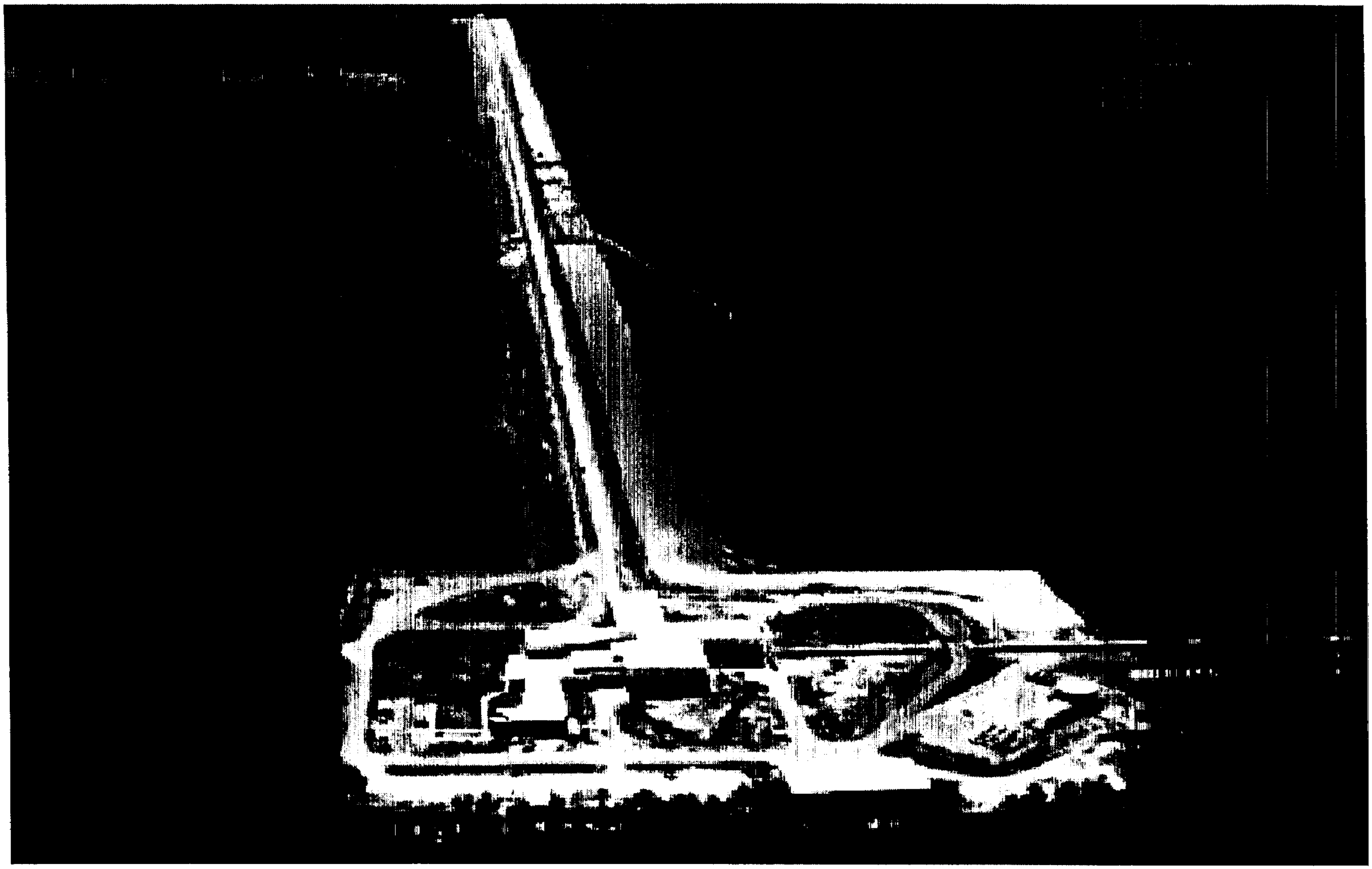
Test masses moving under the effect of a passing gravity wave.



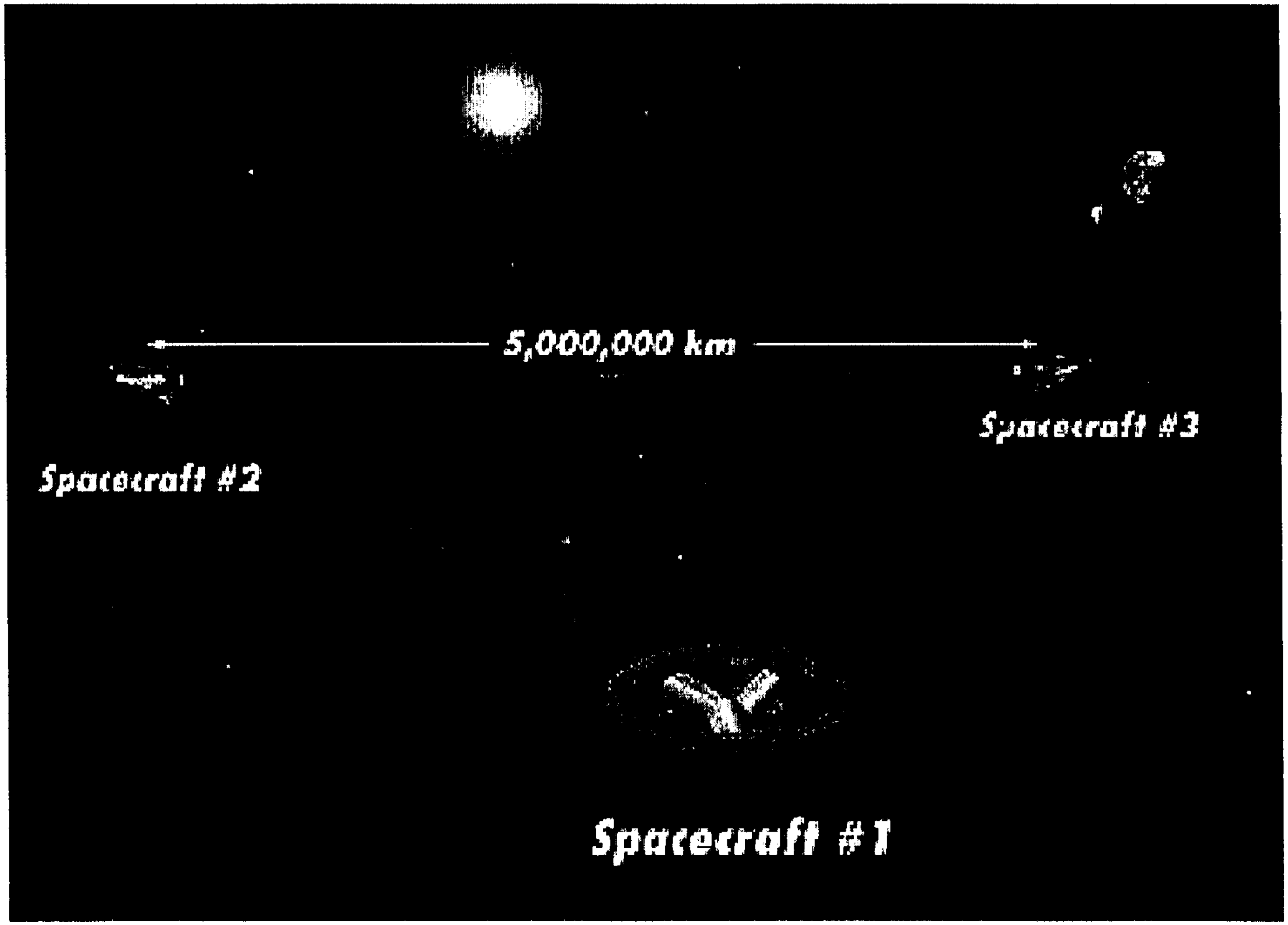
Schematic of a Laser Interferometer for Gravitational Wave detection. *(picture by Warren Anderson, UTB)*



LIGO Hanford (WA) Observatory



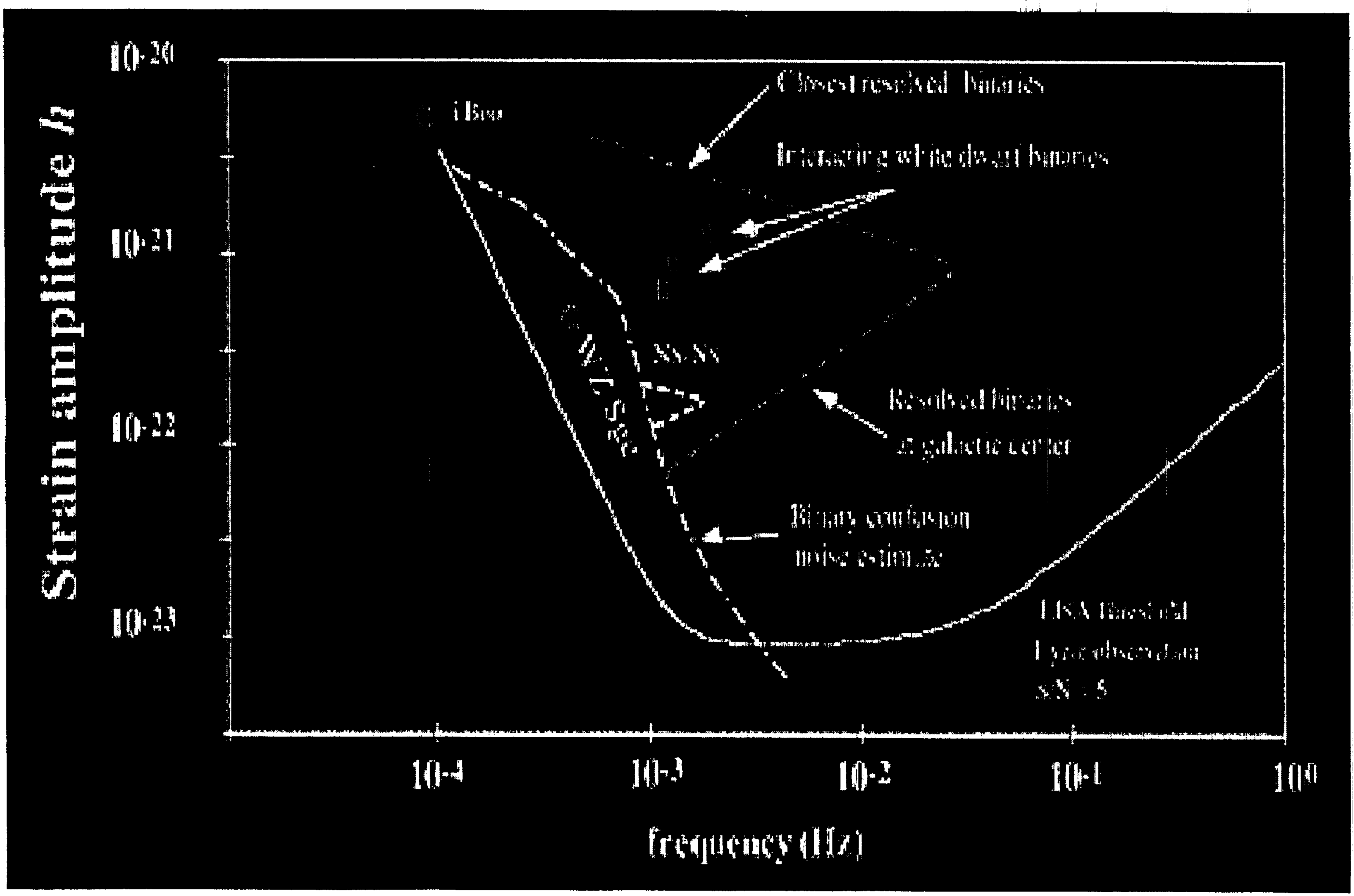
LIGO Livingston (LA) Observatory



LISA Laser Interferometer Space Antenna.

Coalescence of massive black holes during collisions between galaxies, perhaps in formation of massive black holes, probing the central engines powering quasars.	Black holes orbiting massive black holes, providing precision tests of gravitational theory in the high-field limit.	Hundreds of galactic binary star systems, many containing neutron stars or black holes, including several known binary systems.

LISA sources



The sensitivity curve for LISA

Calls for Participation

Mr. Dillard Menchan

NASA Goddard Space Flight Center
http://eeo.gsfc.nasa.gov

Linkages 2001

Dr. Mabel Phifer

International Telecommunciations Sercices

&

Ms. Kimberly Phifer-McGee

Florida A&M University

Linkages 2001

A Collaborative Partnership

Mabel P. Phifer, Ph.D.
International Telecommunication Services

Kimberly McGhee
Florida A&M University

Participating Institutions

TUSKEGEE UNIVERSITY

FAMU

Tallahassee, FL

The official web site of
Grambling State University

University of Louisiana System

Morgan State University

Norfolk State University

University of the District of Columbia 1851 1976 1996

Southern University and A&M College

Clark Atlanta University

223 James P. Brawley Drive, Atlanta GA 30314

PANTHERS

Bowie State University

Welcome to
Spelman College
Atlanta, Georgia

Goals

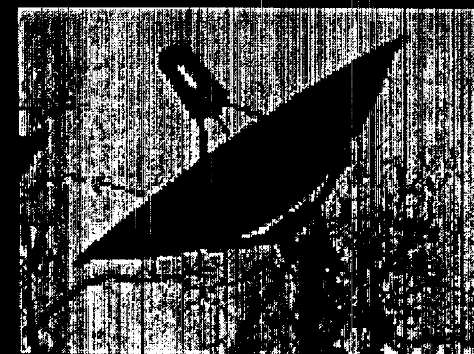
- Build collaborative linkages to maximize the utilization of existing technologies at HBCUs.
- Enhance the quality of both teaching and learning.
- Provide access to NASA scholars, researchers and lecturers for HBCU students and faculty.
- Create new revenue streams for the universities through the use of telecommunication technologies.

Services

- Interactive videoconferencing
  - multi-point bridging
- Webcasting
- Infrastructure design and development
- Distance learning courses
- Faculty training and development
  - instructional design
- Satellite broadcasting
  - uplinking
  - downlinking
- Video production

Fifth Annual MIE Conference

- NASA Millennium Symposium
- Spelman College
- Webcast
  - http://www.famu.edu/FamCast
- 8 remote sites participated via videoconferecing



Sample Distance Learning Activities

Linkages 2001 Institutions

WebCT.com
The e-Learning Hub

Bb
Blackboard
www.blackboard.com

Florida A&M University

- **Videoconferencing** (ISDN/384 Kbps)
  - Engineering Technology
  - Executive Doctor of Pharmacy (PharmD)
- **Web-based** (WebCT/Blackboard)
  - Master of Science in Mechanical Engineering
  - Science, Math & Engineering (12 courses - 2001)
- **Instructional Development Mini-Grant Program**
  - 13 recipients (courses will begin Jan. 2001)

Bowie State University

Web Initiative in Teaching

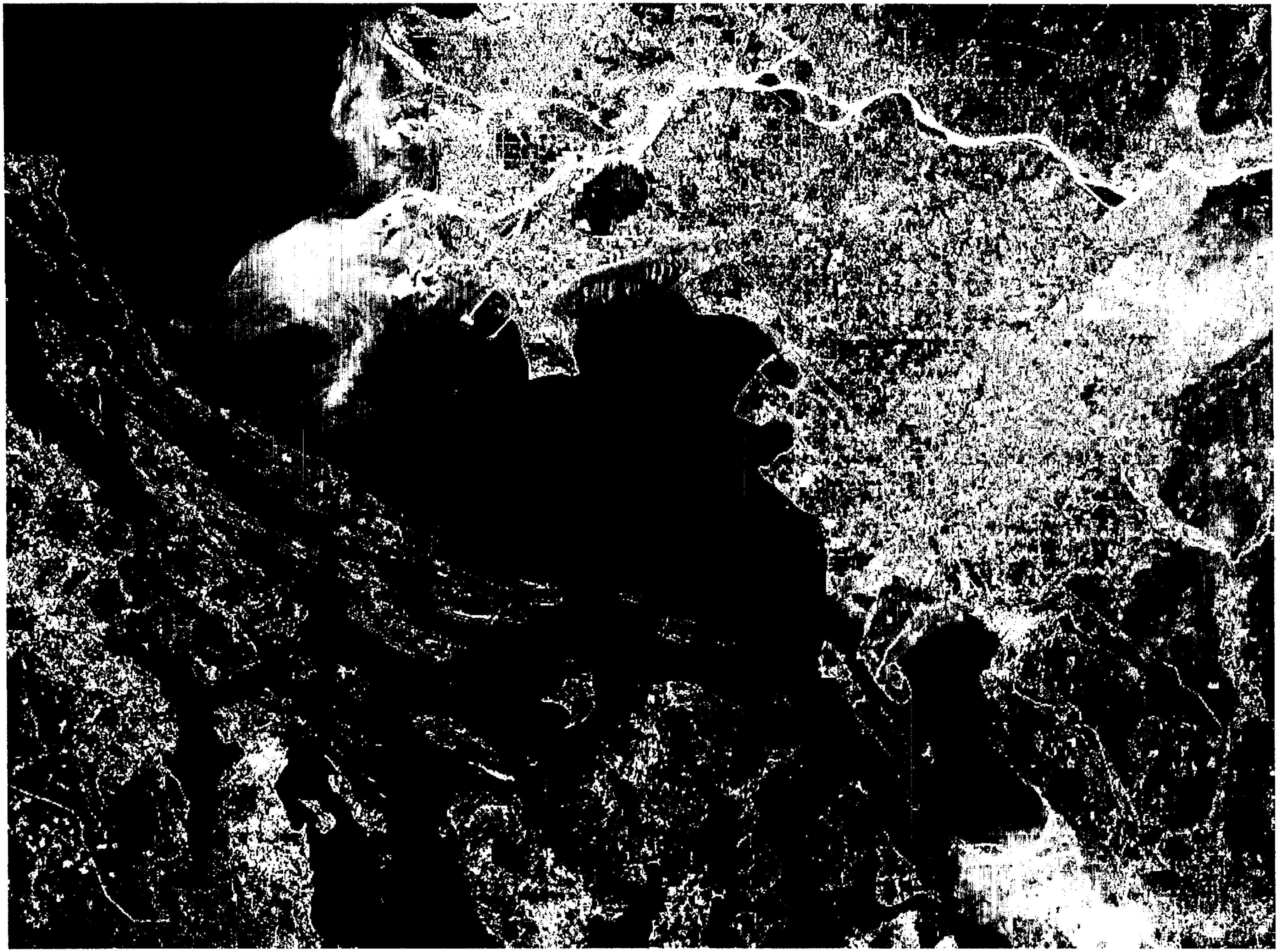
- **Developed software to implement online courses**
- **Web-Based Courses**
- **Web-Enhanced Courses**
  - use Internet technology and services to support distribution of class materials and student access to the resources on the Internet.
- **Web-Presence for Syllabi**
  - outlines, bibliographies, course requirements

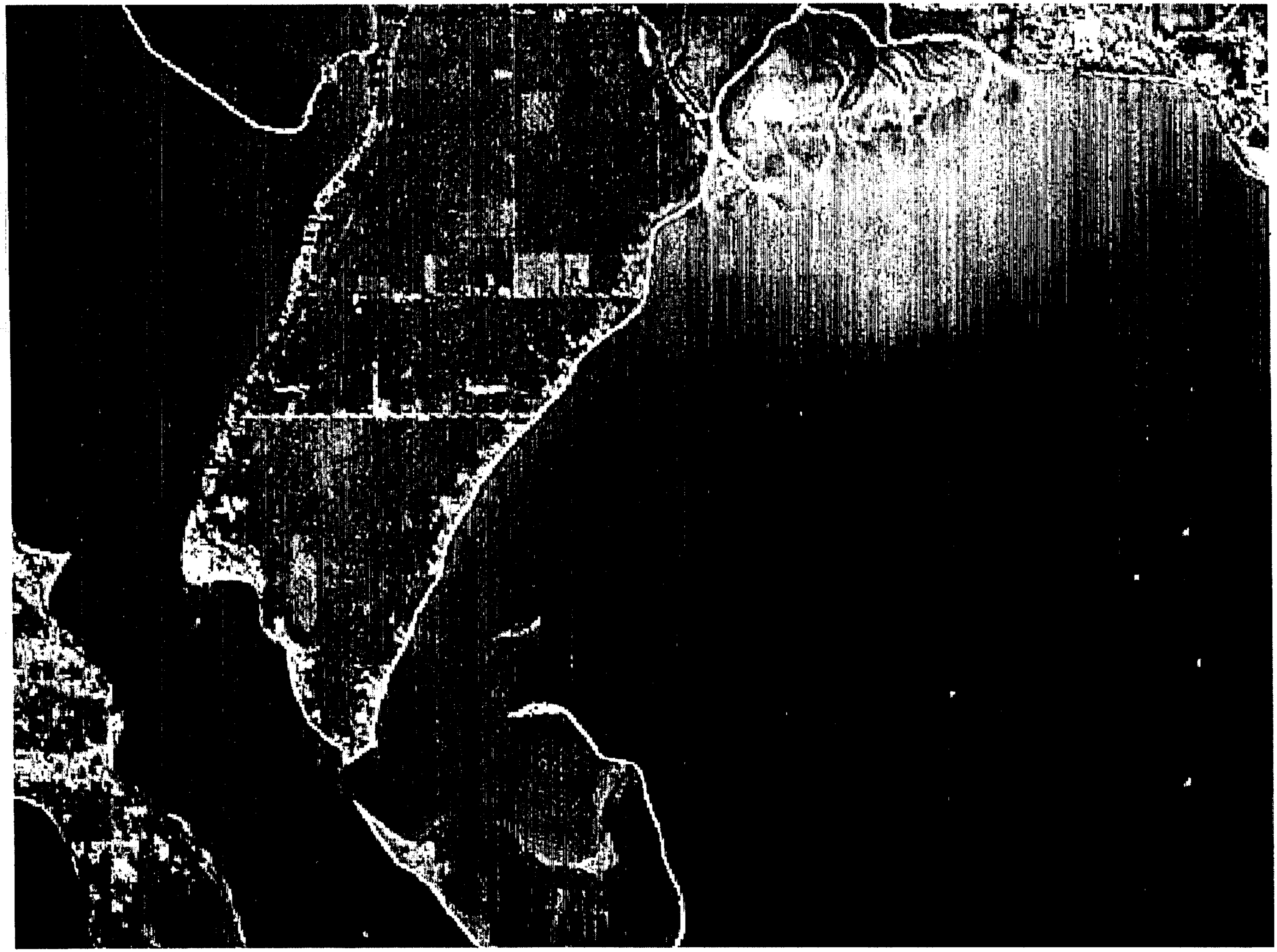
Distance Learning Activities

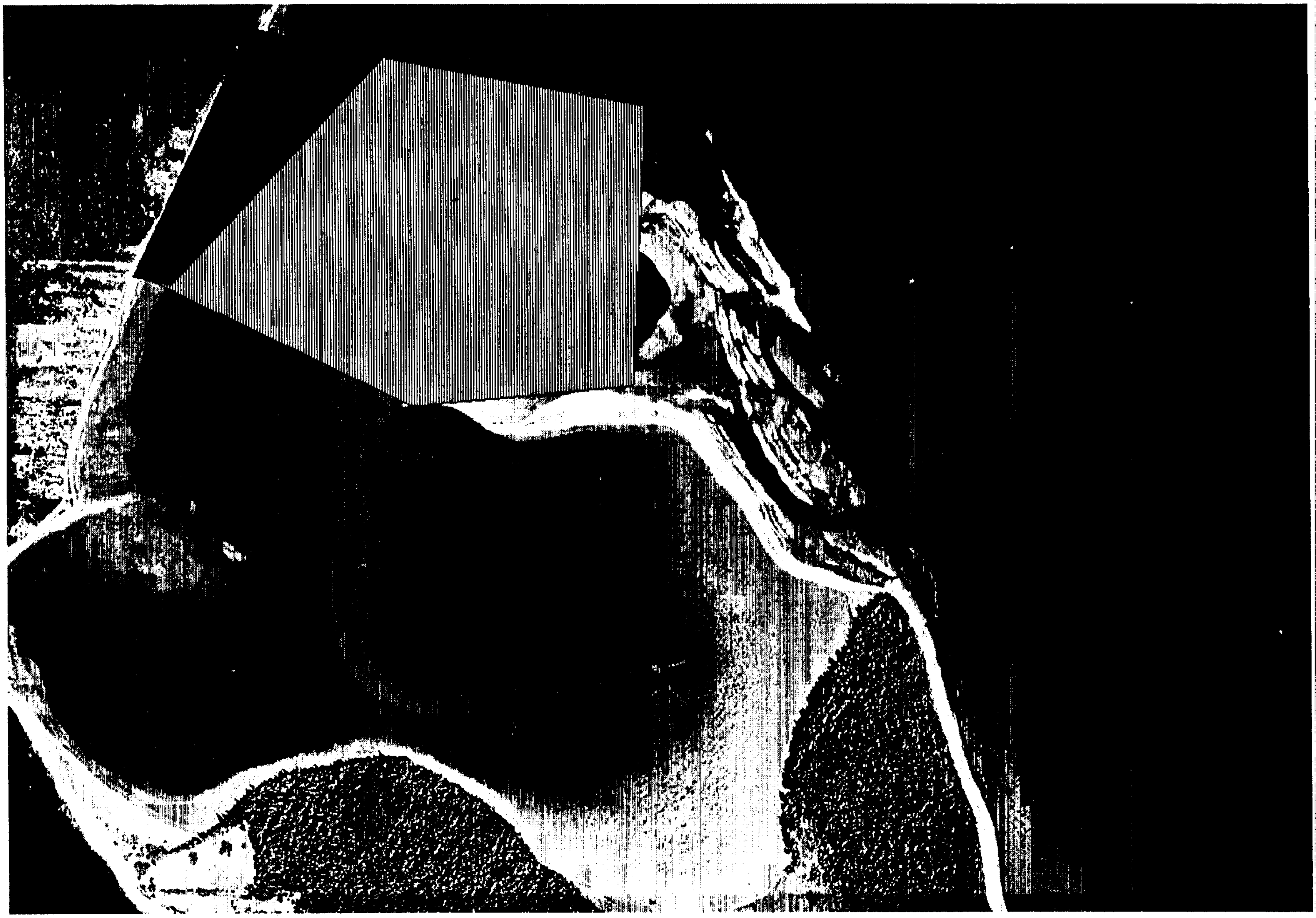
- Southern University Baton Rouge
  - **Web-based courses**
    - Chemistry
    - Engineering
    - Mathematics
- Norfolk State University
  - **Web-based courses**
    - Computer Science
- Grambling State University
  - **Videoconferencing**
  - **Undergraduate**
    - 7 courses
  - **Graduate**
    - Doctoral
    - Masters

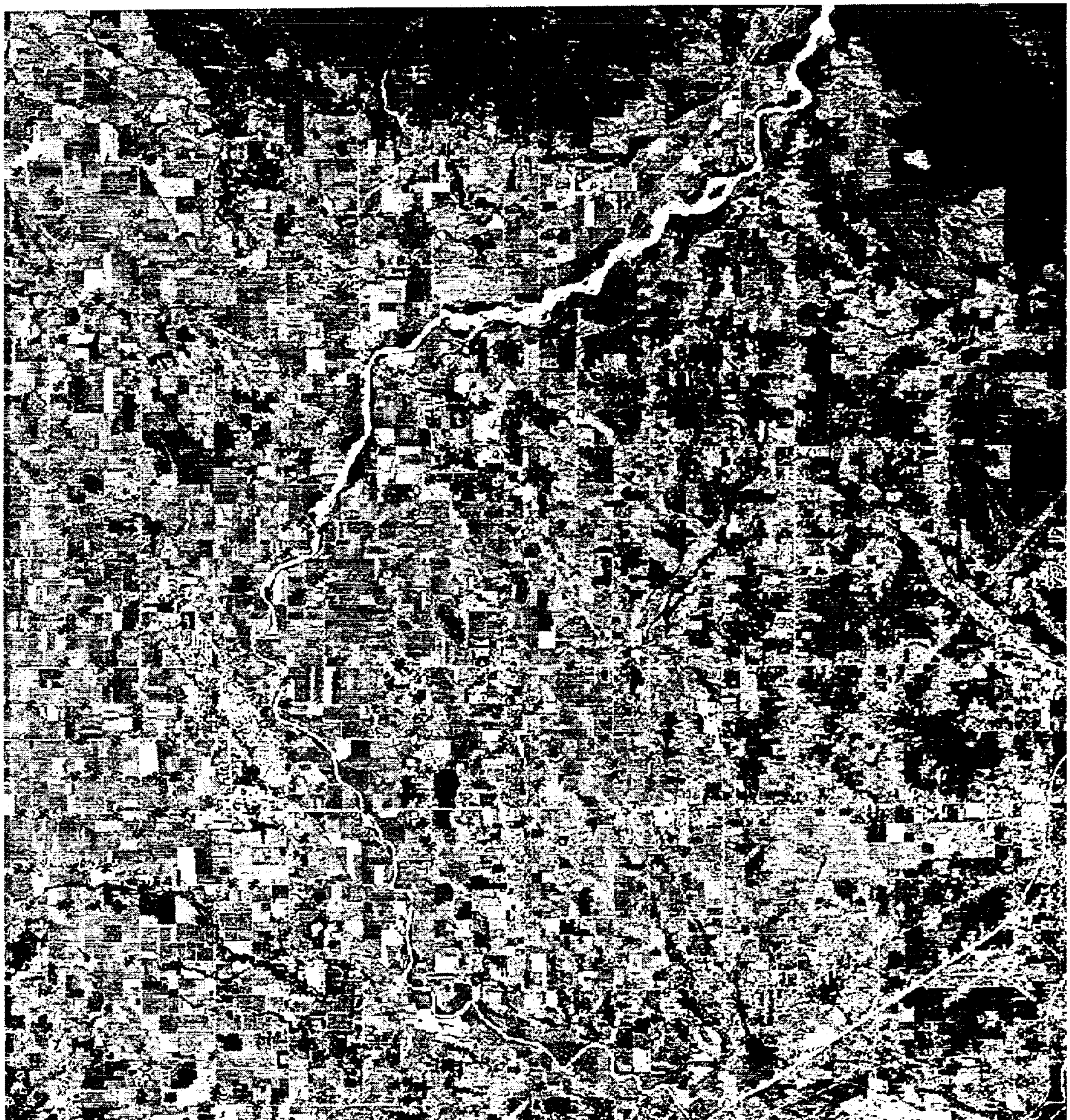
Assessing Agrucultural Land Conversion Impacts to Tribal Fisheries Using Satellite Multispectral Imagery

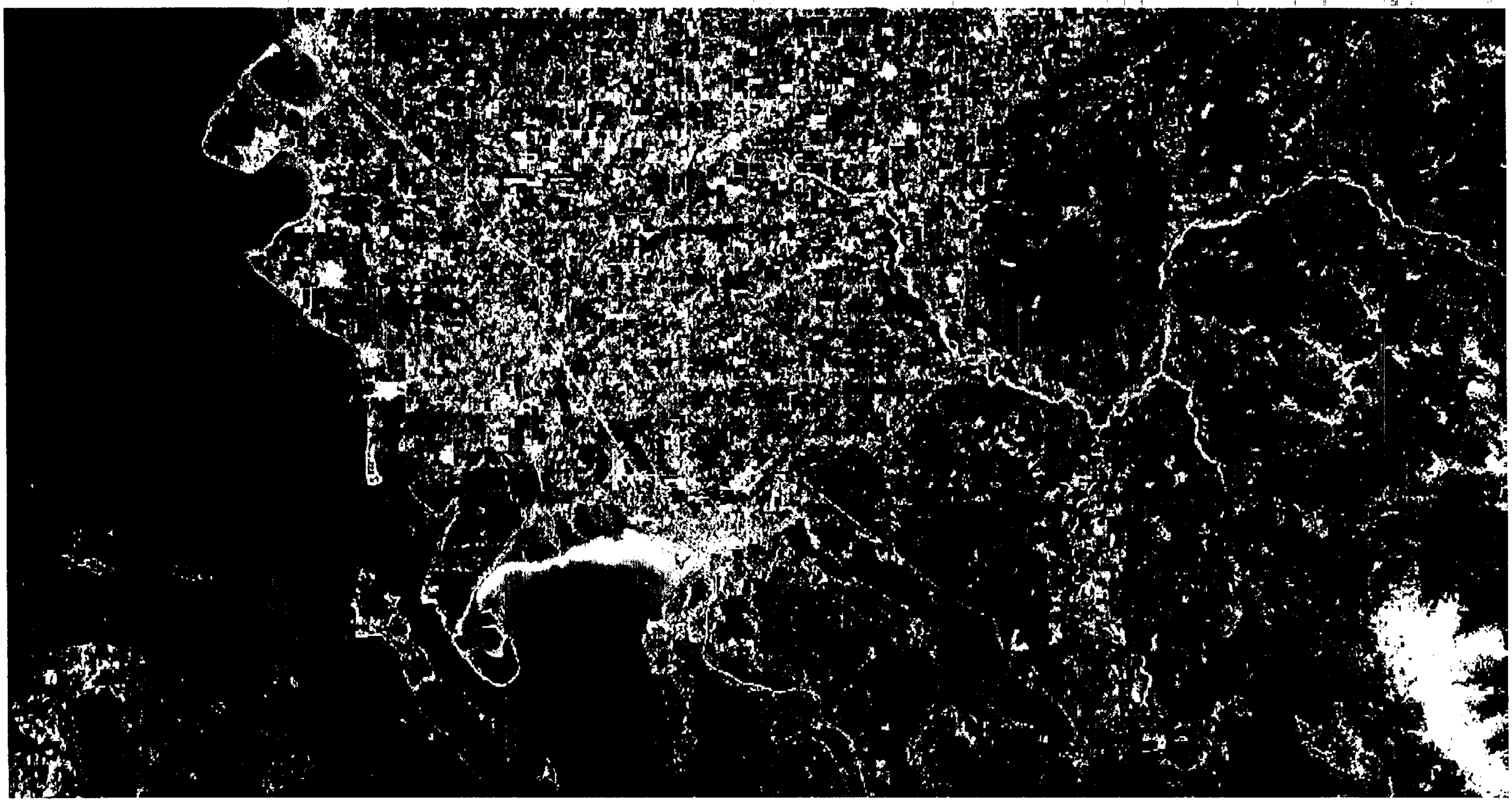
Mr. Michael Cochrane
Northwest Indian College

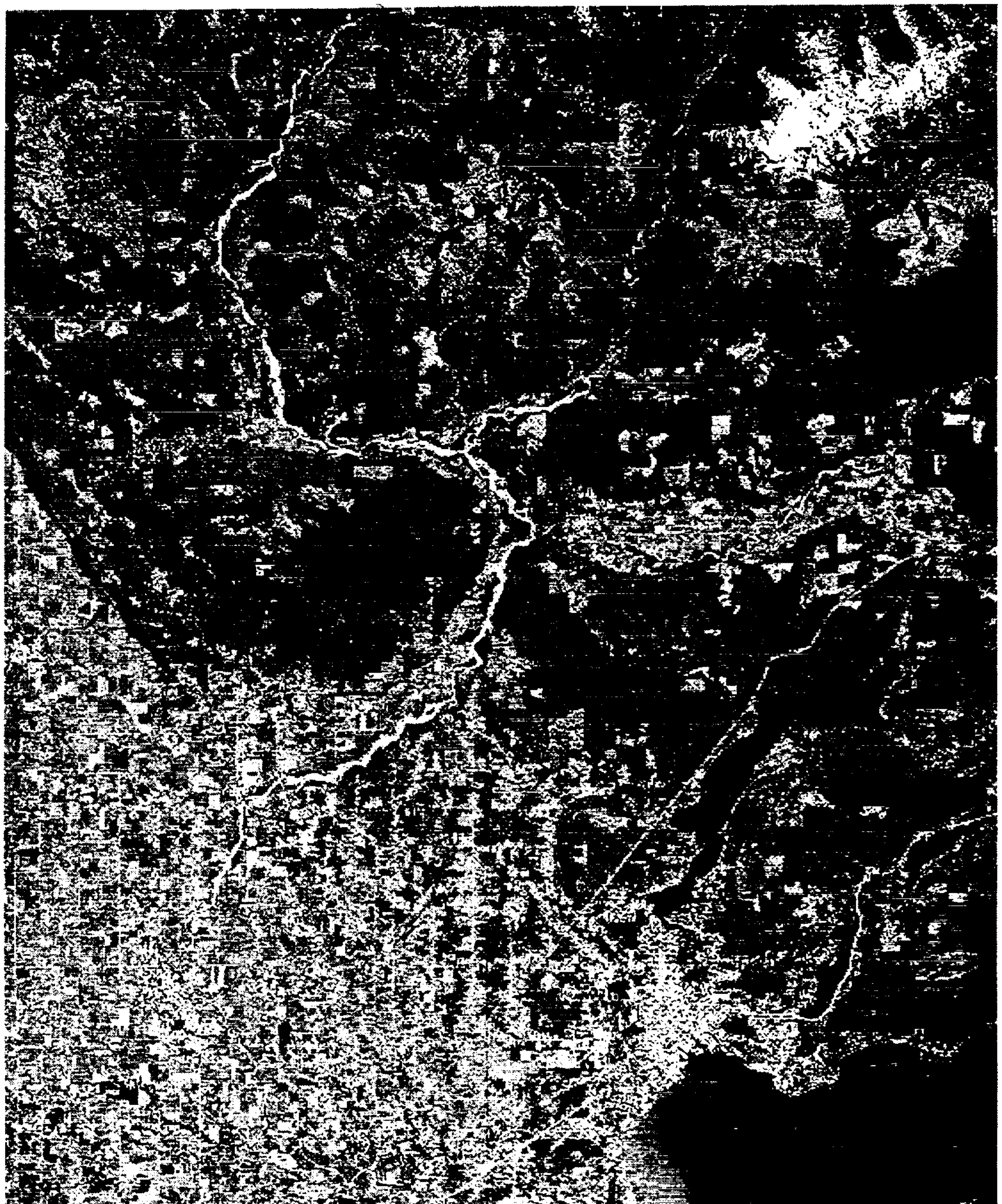


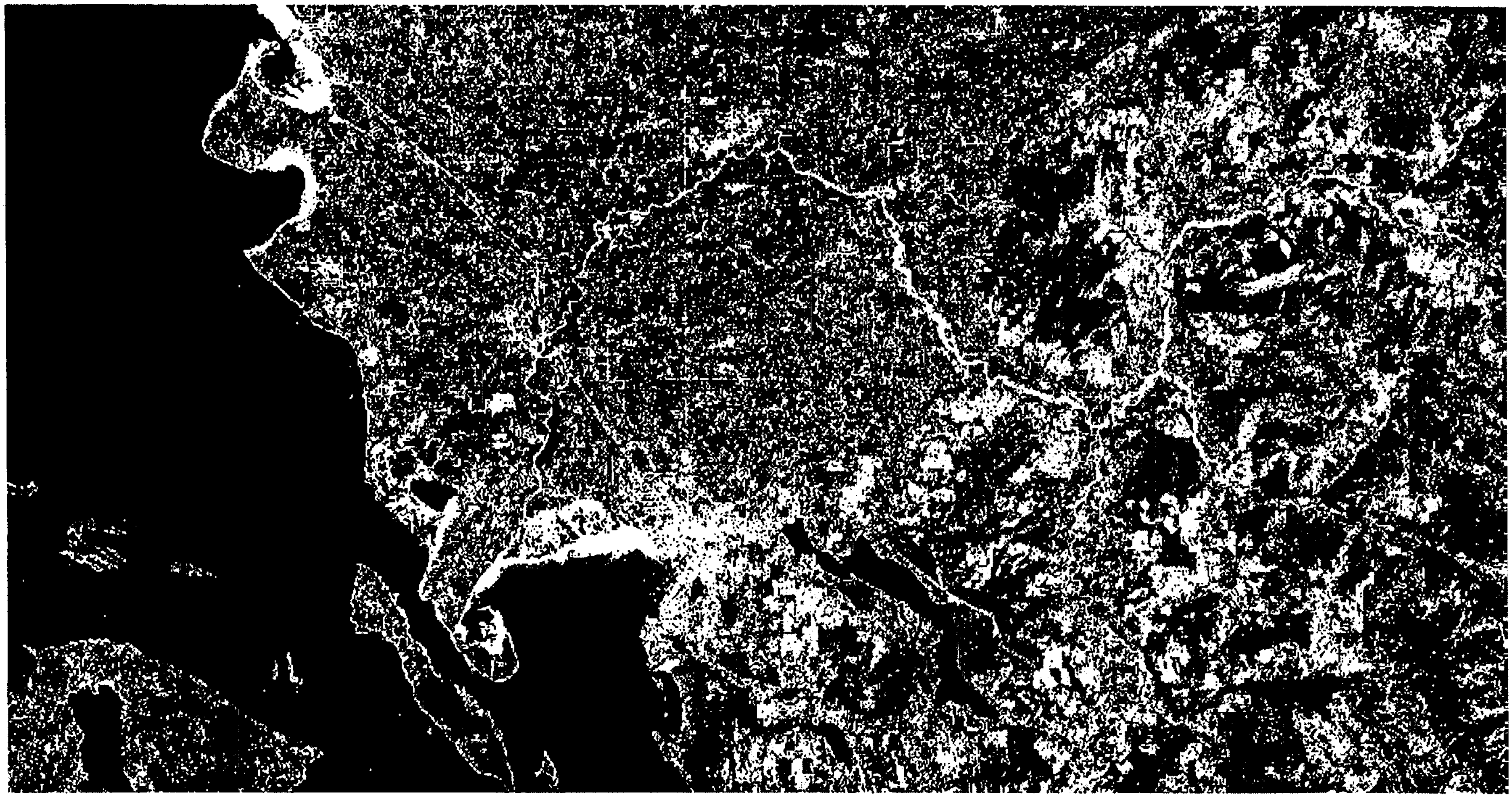


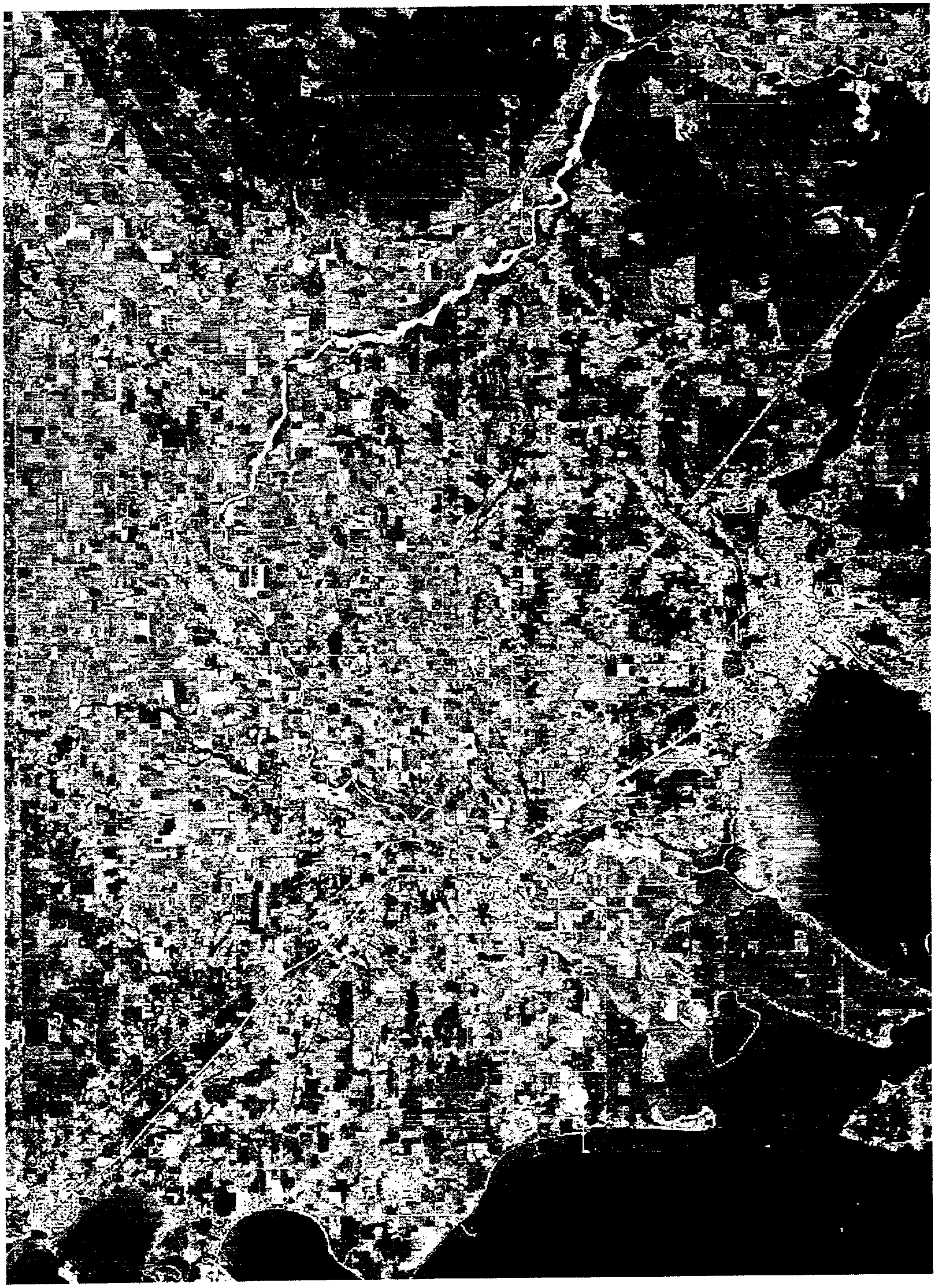


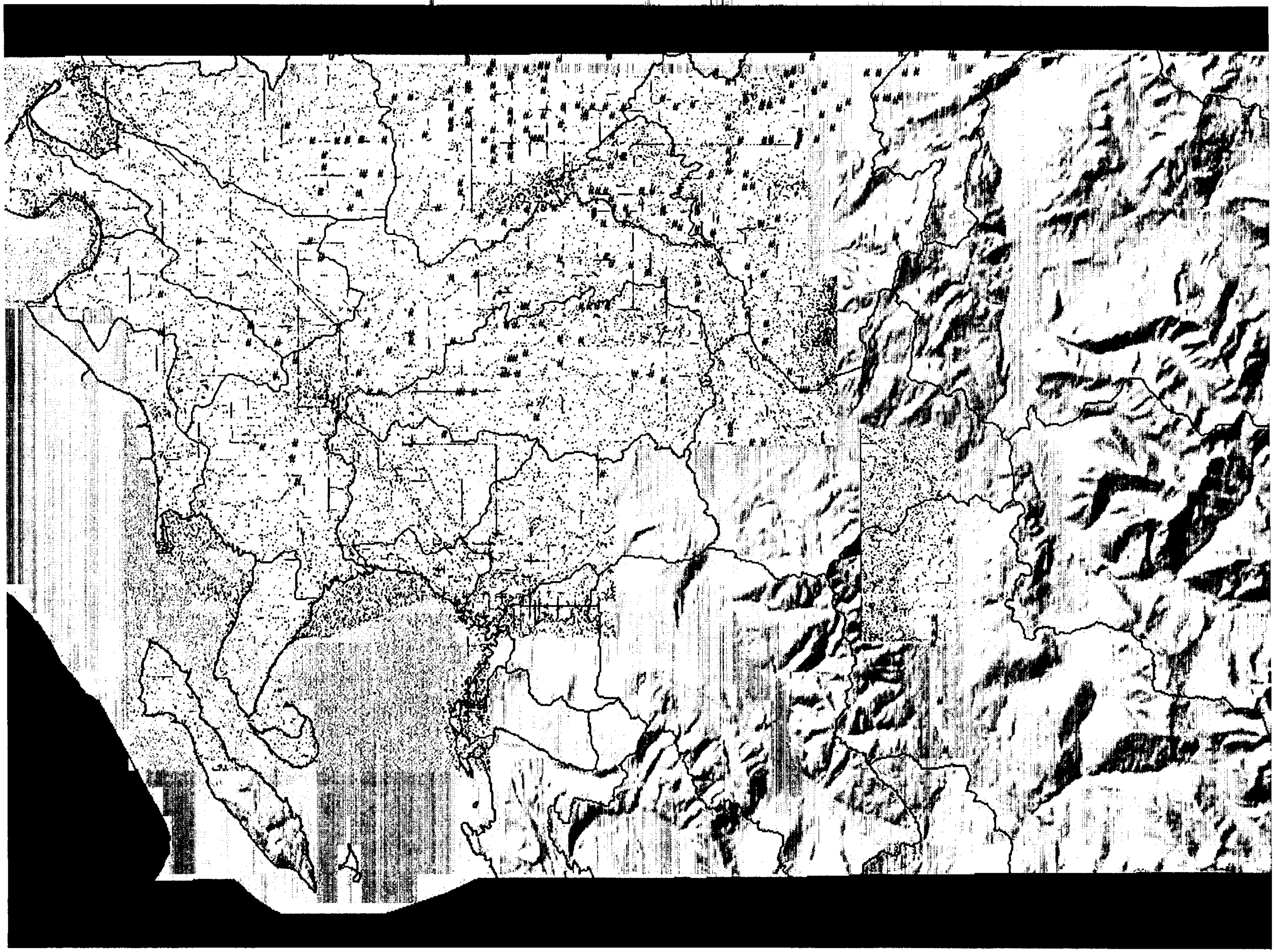


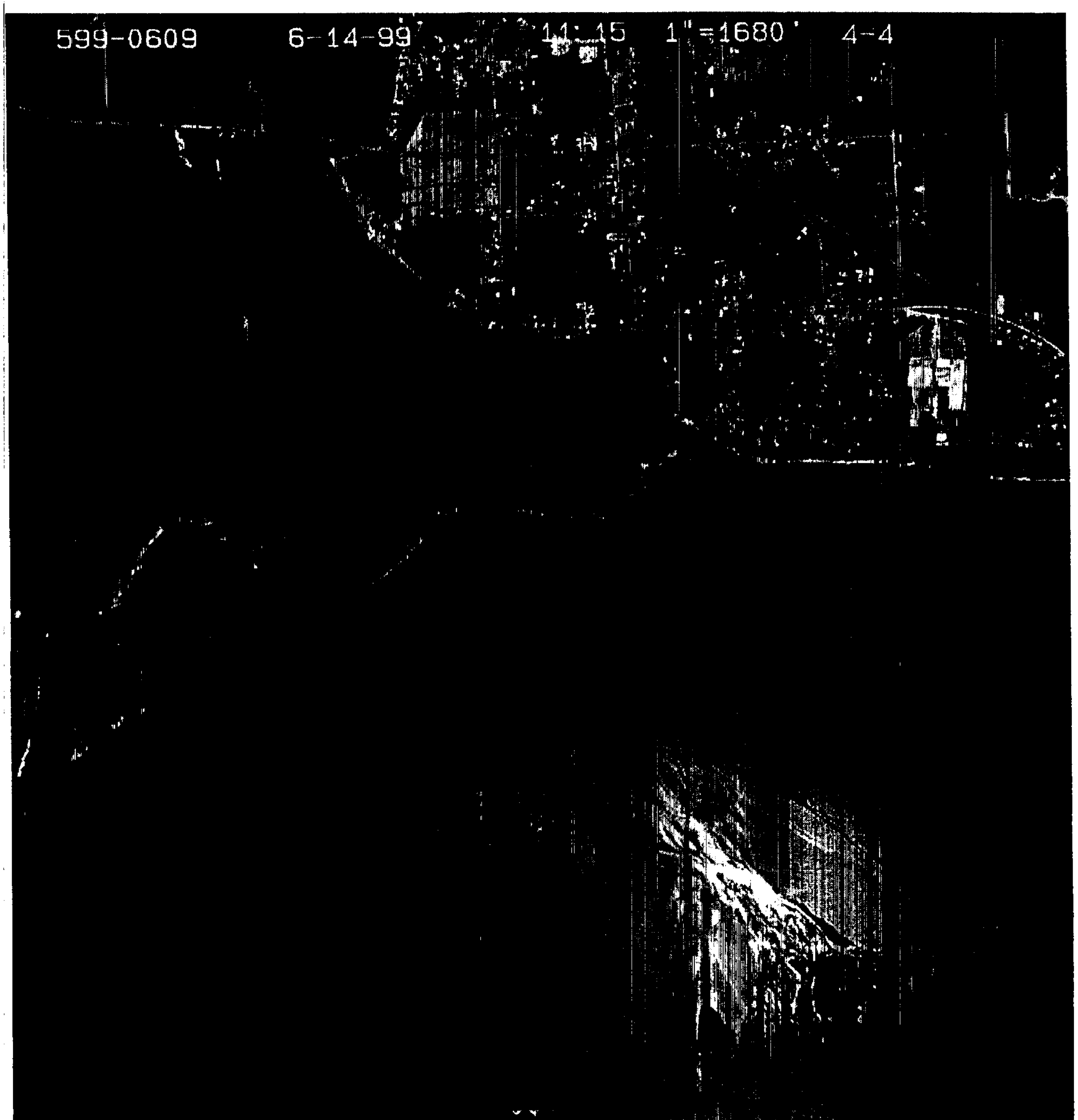








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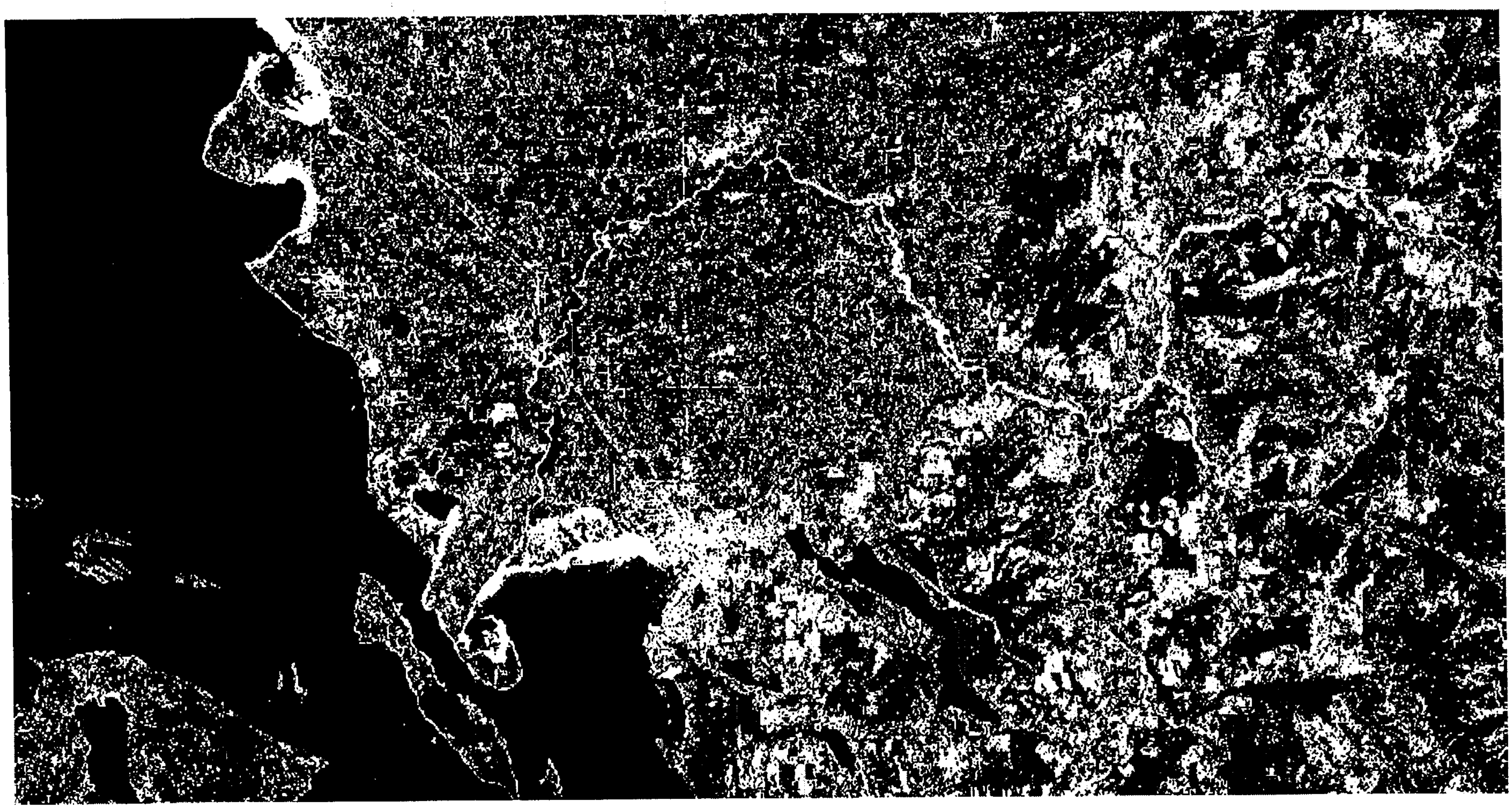
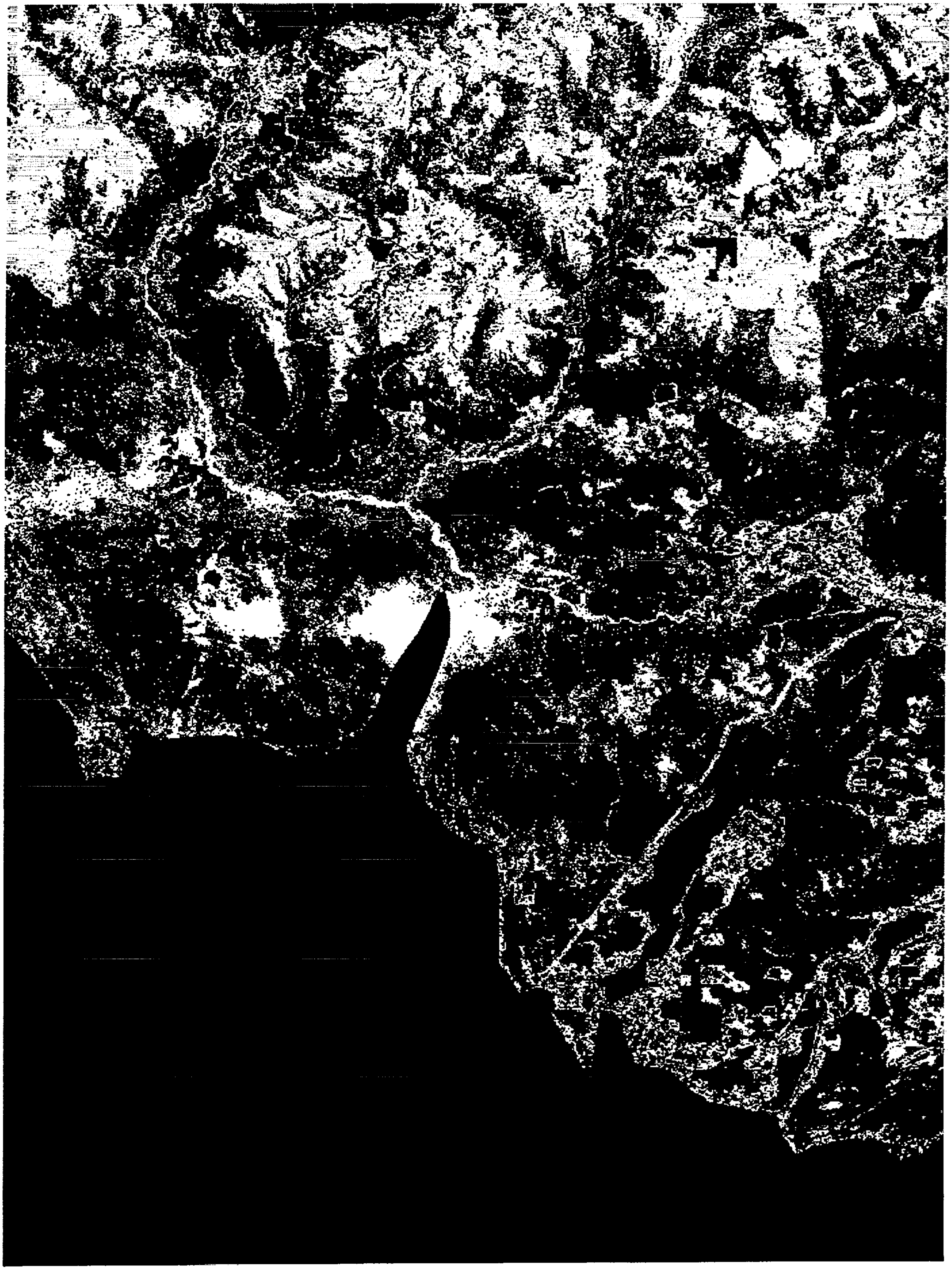
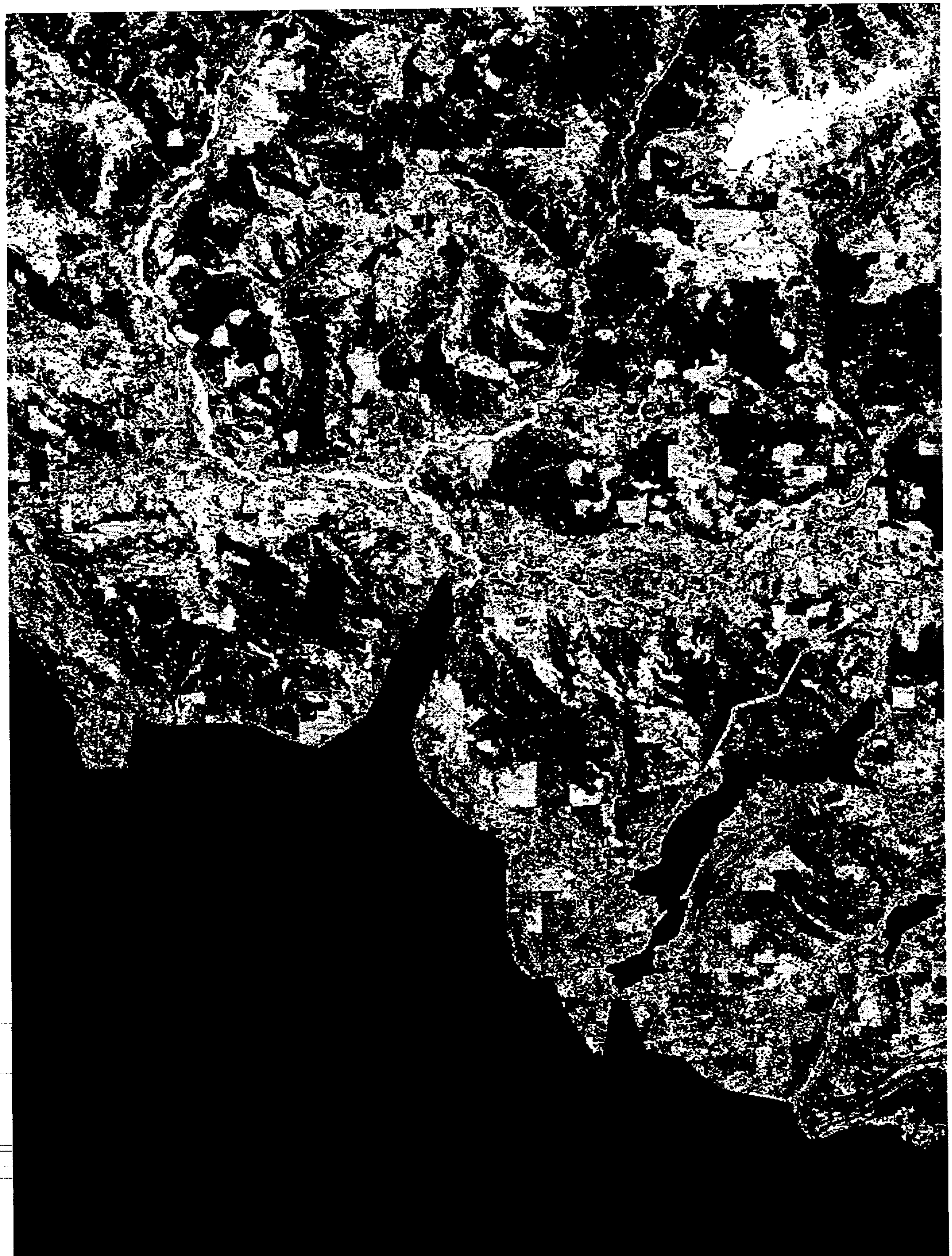
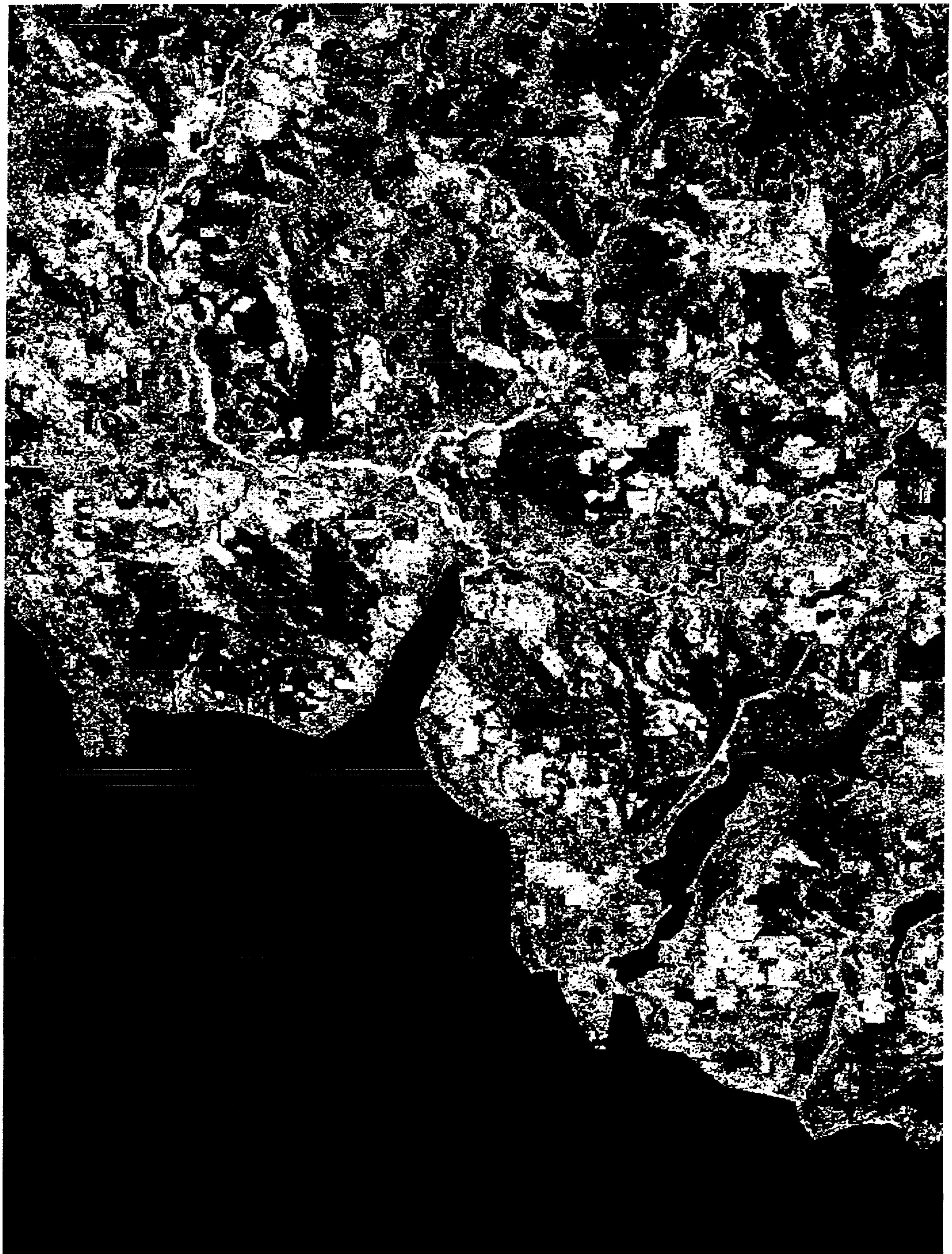
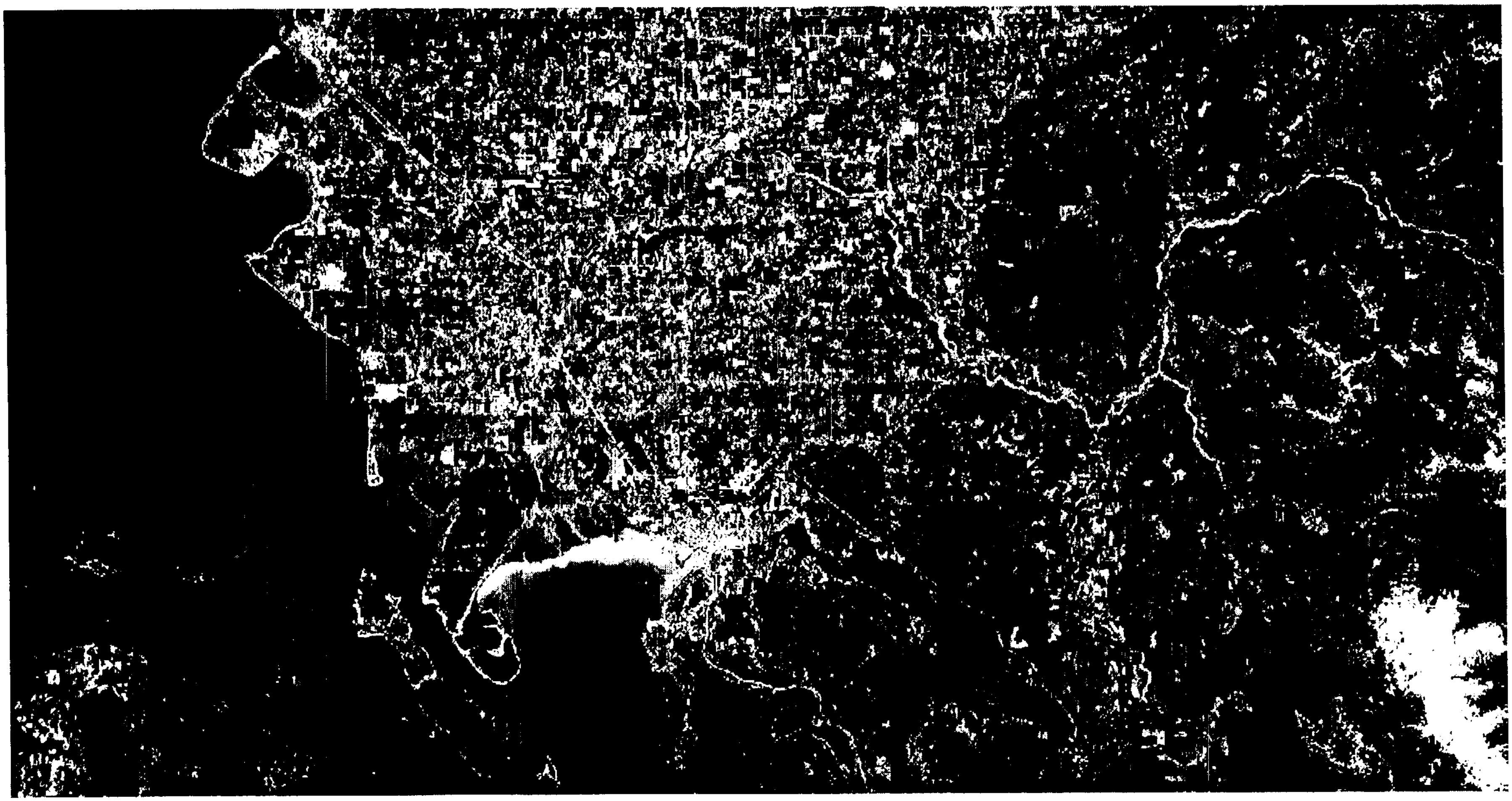










Consortium for Undergraduate Research Experience

Mr. Dean Arvidson
Los Angeles City College

CONSORTIUM FOR UNDERGRADUATE RESEARCH EXPERIENCES (CURE)

AND RELATED UNDERGRADUATE RESEARCH PROGRAMS OFFERED
BY
CALIFORNIA STATE UNIVERSITY AT LOS ANGELES, SEVERAL LOCAL COMMUNITY COLLEGES, AND THE JET PROPULSION LABORATORY

Dean Arvidson
Los Angeles City College CURE Coordinator
Acting Programs Director

OVERVIEW AND PURPOSE OF PROGRAMS

- Scientific research programs designed for undergraduate students
- Collaboration between Cal State Los Angeles, several local community colleges and the Jet Propulsion Laboratory
- Community based programs
- Year round programs
- Funded by grants from NASA (MURED), and NSF (REU)

PURPOSE OF PROGRAMS

- JPL and the Moon
  Connecting local ‘inner city’ students with JPL
- Recruit underrepresented minorities and female students to the fields of science and engineering
- Train underrepresented minorities and female students in some of the research techniques used in the fields of science and engineering
- Retain underrepresented minorities and female students in the fields of science and engineering
- Increase the number of underrepresented minorities and female students in the fields of science and engineering that transfer to four year institutions and who enroll in graduate programs

PAST AND PRESENT LIST OF PROGRAMS

- Physics Outreach Program (POP) 1995 – 1997
  NASA (MURED)
- Consortium for Undergraduate Research Experiences (CURE) 1998 – 2000
  NASA (MURED)
- Research Experiences for Undergraduates (REU) 1999 – 2000
  NSF (REU)
- Science Education through Extraterrestrial Research (SEER) 1999 – 2001
  NASA (MURED)

⇒ Consortium for Advanced Research Experiences (CARE) 2000 – 2002
NASA (OSS & MURED)

⇒ Astronomy Center for Undergraduate Research, Education and Teacher Training 2003 - ∞
NASA (OSS)

PARTICIPATING INSTITUTIONS and FACULTY

- Cal State Los Angeles — Dr. Milan Mijic
- Pasadena City College — John Sepikas
- Los Angeles City College — Dean Arvidson
- Los Angeles Southwest College — Walt Jordan
- East Los Angeles College — Jose Ramirez
- Los Angeles Valley College — David Falk
- Jet Propulsion Laboratory — Dr. Steve Gillam

FACILITIES AND EQUIPMENT

- Table Mountain Observatory (TMO); owned and operated by JPL
  - 1.2 m telescope (currently under repair)
  - 0.6 m telescope; fully operational
  - 1K LN2 CCD cameras
  - 4K LN2 CCD Astrometric camera
  - NEAT camera
  - Magneto Optic Filter camera
- Astronomical Computational Laboratory; CSLA
- Griffith Observatory South; LACC
- Classrooms and computer labs at participating schools
- Los Angeles Valley College Planetarium

STUDENT SELECTION PROCESS

- Selection done by the faculty at each school in coordination with program director

- Students are selected each quarter

- Students can (and often do) participate in program for up to two years

- Criteria
  - Scientific Interest
  - Academic Motivation
  - Work History
  - GPA
  - Essay and Interview

- ~ 4 – 6 students per school at any given time. Number of students per school determined by number of programs currently running, number of mentors in need of students.

PROGRAM ACTIVITIES

- Training Classes
- Observational research projects
- Data reduction projects
- Other related projects
- Report and paper writing
- Presentations

TRAINING CLASSES

- Special Topics Courses; CSLA (Dr. Milan Mijic and John Sepikas)
  - Planetary Astronomy 1995
  - Comets 1996
- Astronomical Data Reduction Course; CSLA (Dr. Steve Gillam) Wiinter1997
- UNIX Operating System; CSLA (Dr. David Gregorich) Spring 1997
- Basics of Observational Astronomy; LACC (Dean Arvidson) Summer 1997
- Advanced Data Reduction; CSLA (Dr. Steve Gillam) Winter 1998
- Telescope Operations; CSLA, TMO (Dr. Steve Gillam) Spring 1999, Summer 1999, Fall 1999, Winter 1999
- Remote Telescope Operations; CSLA (Dr. David Gregorich) Spring 2000
- Special Topics in Astronomy; CSLA (Dr. Milan Mijic, and Dr. Steve Gillam) Summer 2000

OBSERVATIONAL RESEARCH and DATA REDUCTION PROJECTS with MENTORS

- Dr. Steve Gillam; JPL
  - Observations of Comet Hale Bopp
  - Observations of Sojourner landing site (made prior to Pathfinder landing)
  - Age of Universe using Old Globular Clusters

- Ray Newburn; JPL
  Photometric observations of comet Wild 2

- Dr. Neil Murphy; JPL
  Jovian Seismological Investigations

- Dr. William Owen; JPL
  Astrometry of Guiding Asteroids for Deep Space One

- Dr. Bonnie Buratti; JPL
  Photometric evolution of Triton and Pluto

OBSERVATIONAL RESEARCH and DATA REDUCTION PROJECTS with MENTORS (CONTINUED)

- Dr. Bryan Penprase; Pomona College
  Polarimetric Studies of Circumstellar Disks

- Dr. Michael Hicks; JPL
  Astrometric Follow-up of Newly Discovered Near-Earth Asteroids

RELATED PROJECTS

- Installation of 'Astronomical Computational Laboratory' at CSLA
- Installation of 12" Meade LX 200 telescope at TMO
- Assistance in development of Astronomy Laboratory at LACC
- Assistance in building of observatory dome at LACC
- Remodeling of 1.2 m telescope control room at TMO

PRESENTATIONS, REPORTS AND PAPERS

- Southern California Conference on Undergraduate Research (SCCUR)
  - 1997 meeting; 2 poster presentations
  - 1998 meeting; 2 poster presentations
  - 1999 meeting; 2 poster presentations
  - 2000 meeting; 4 poster presentations (projected)

- American Astronomical Society (AAS)
  - Winter 2000 meeting (Atlanta); 2 poster presentations
  - Summer 2000 meeting (Rochester); 1 poster presentation

- MUSPIN/MURED JOINT CONFERENCE
  Fall 2000 meeting (Atlanta); 1 poster presentation

- More than 30 published reports and papers have been written by and contributed to by students in the programs

PROGRAM DIFFICULTIES AND PROBLEMS

- Location, Location, Location!!
  Transportation difficulties to and from TMO

- The moon again!!
  Scheduling observation nights that work for students, mentors, and the moon (as well as the weather)

- Under Repair!
  Equipment malfunction and breakdown

- Access Denied!
  Program and TMO access limitations to citizens and permanent residents

PROGRAM RESULTS
and some STUDENT STORIES

- More than 100 students have passed through the programs so far

- Over 95 % have transferred to a four year university or enrolled in graduate school

- At least 14 students have chosen Physics or Astronomy as their major

- Other popular choices of major fields of study:
  - Electrical Engineering
  - Computer Science
  - Biochemical Engineering
  - Mechanical Engineering
  - Biochemistry
  - Applied Mathematics
  - Pure Mathematics

- Personal Stories
  - Jomel Atienza-Rosel
  - Dale Enriquez
  - Daniel Moreno

http://tmo-web.jpl.nasa.gov/Science/Photometry/clusters.htm

Integration of Multidisciplinary Engineering Analysis Software for Teaching and Research

Dr. Chivey C. Wu
California State University at Los Angeles

MU-SPIN/MURED Conference

Integration of Multidisciplinary Engineering Analysis Software for Teaching & Research

Chivey Wu & Maj Mirmirani

Department of Mechanical Engineering

California State University, Los Angeles

Sept 14, 2000

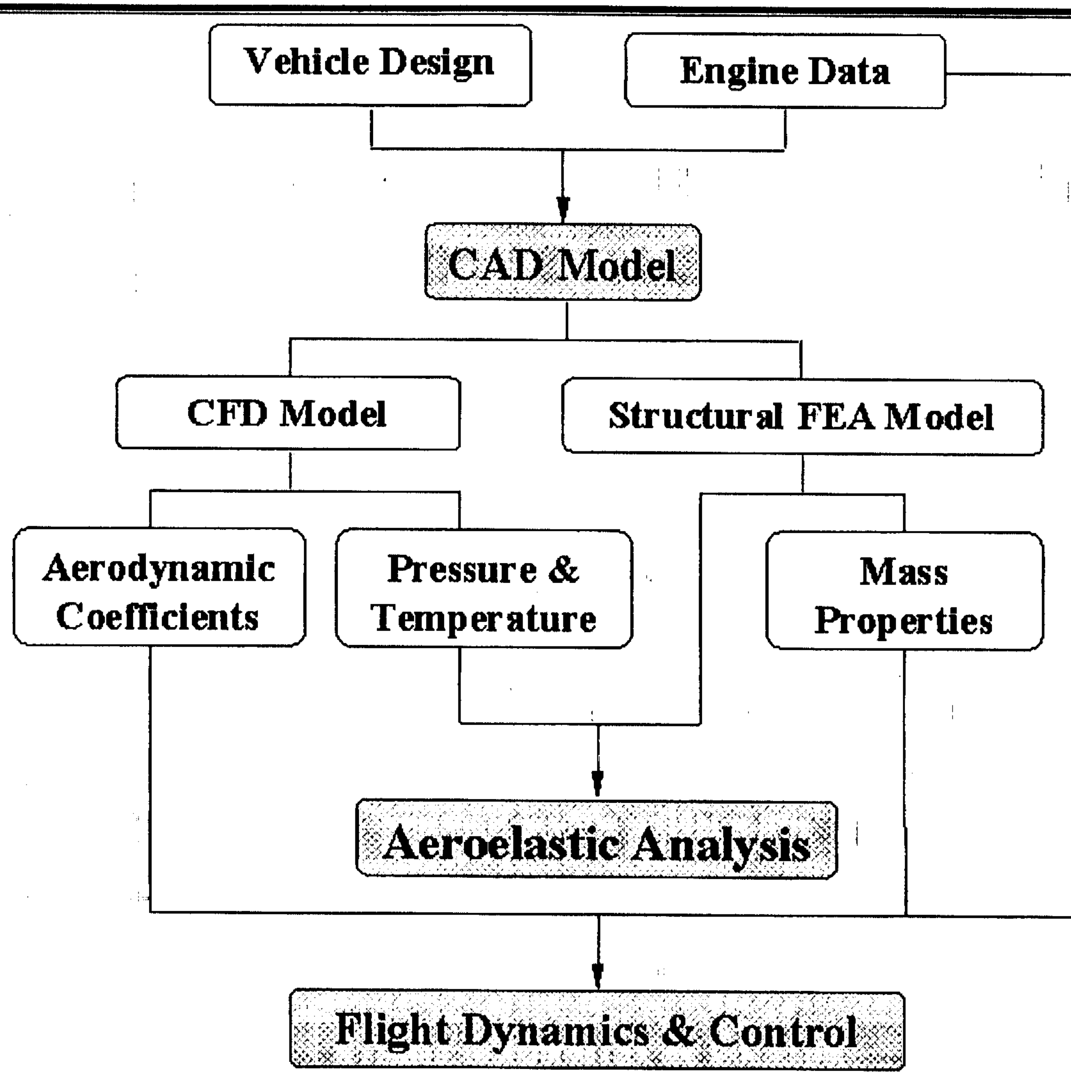
Goals

- Interface for Multidisciplinary CAD/FEA/CFD/Control Software
- Courses in Multidisciplinary CAD/CAE
- Application to Flight Vehicle Design, Analysis and Control Simulation

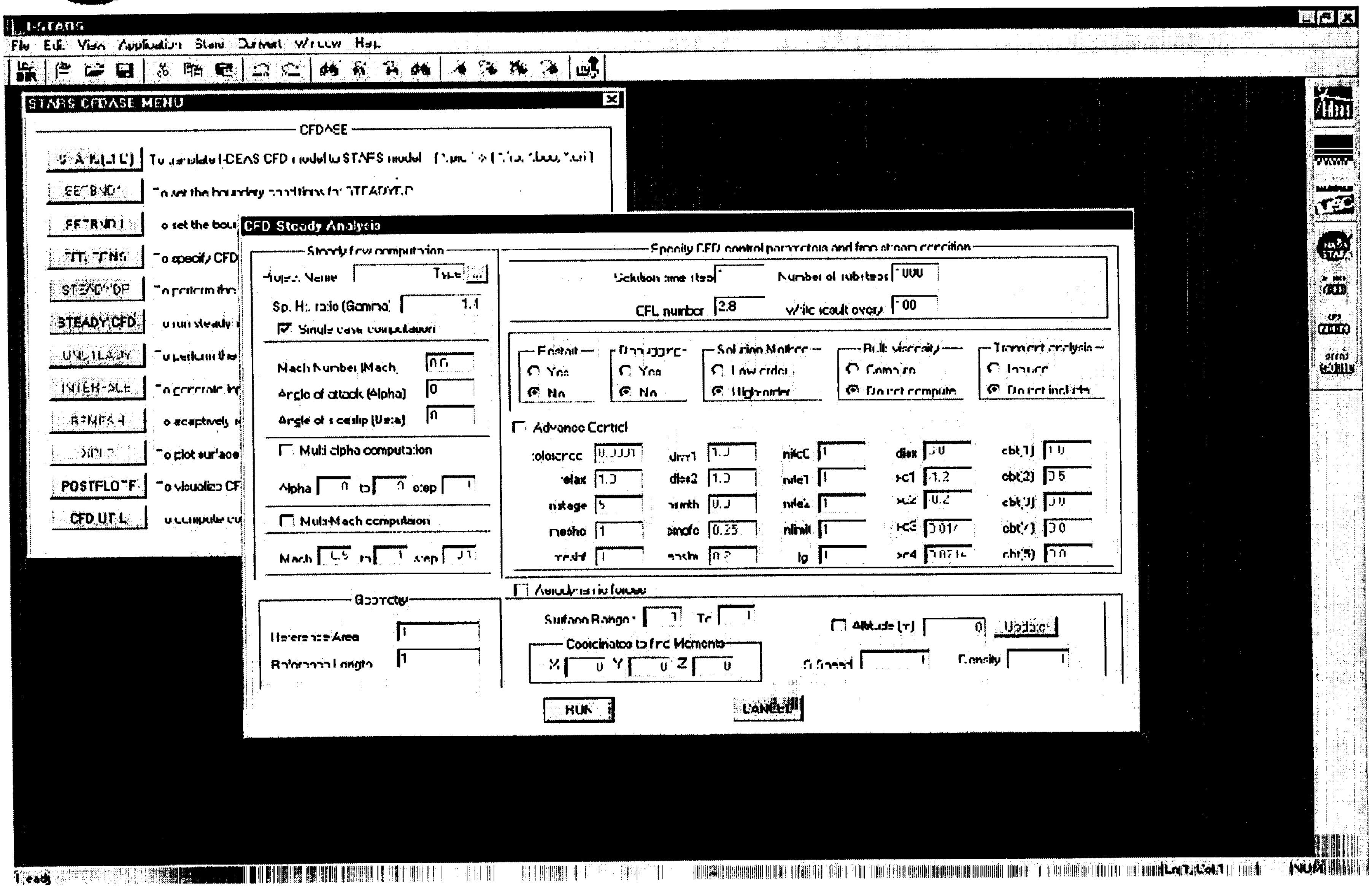
Software

- CAD/FEM : SDRC *IDEAS*
- FEA/CFD : NASA *STARS*
  CSULA *I-Newton*
- Flight Control : CSULA *I-CONT*
- Interface : CSULA *I-STARS*
  GUI, Data Translators

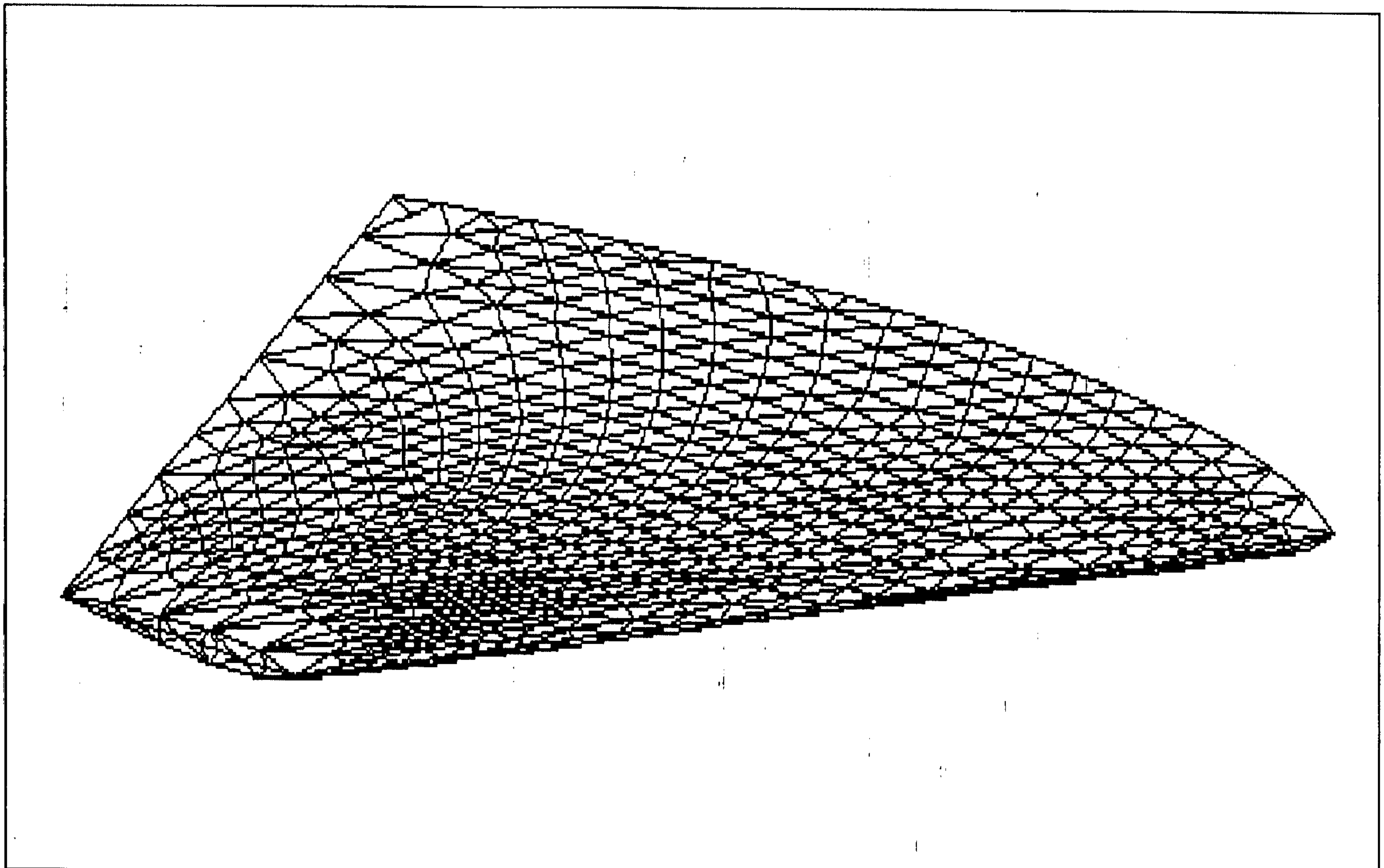
I-STARS Multidisciplinary CAE System



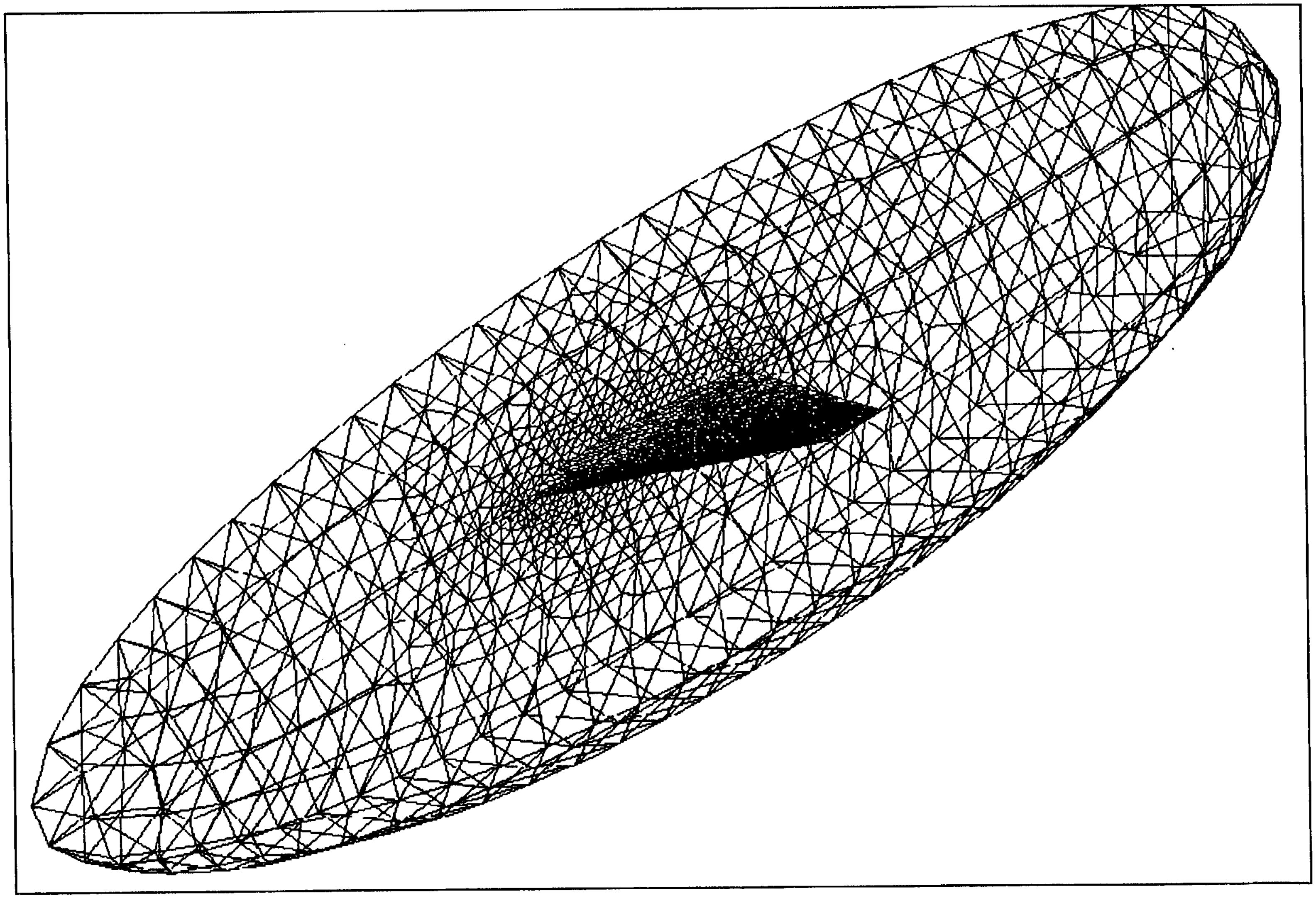
I-STARS Graphical User Interface



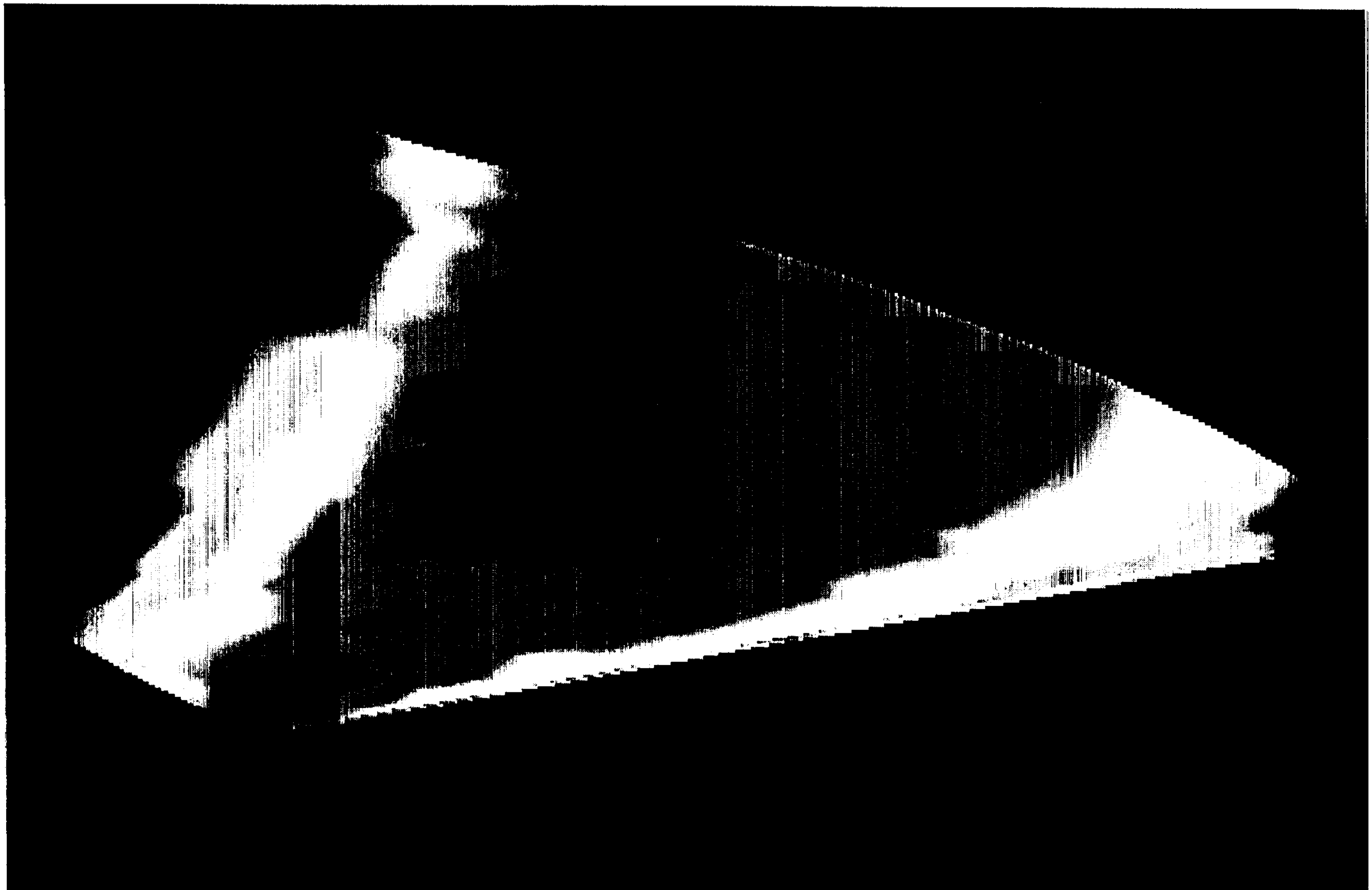
IDEAS FEM of a Wing



... and the corresponding CFD mesh

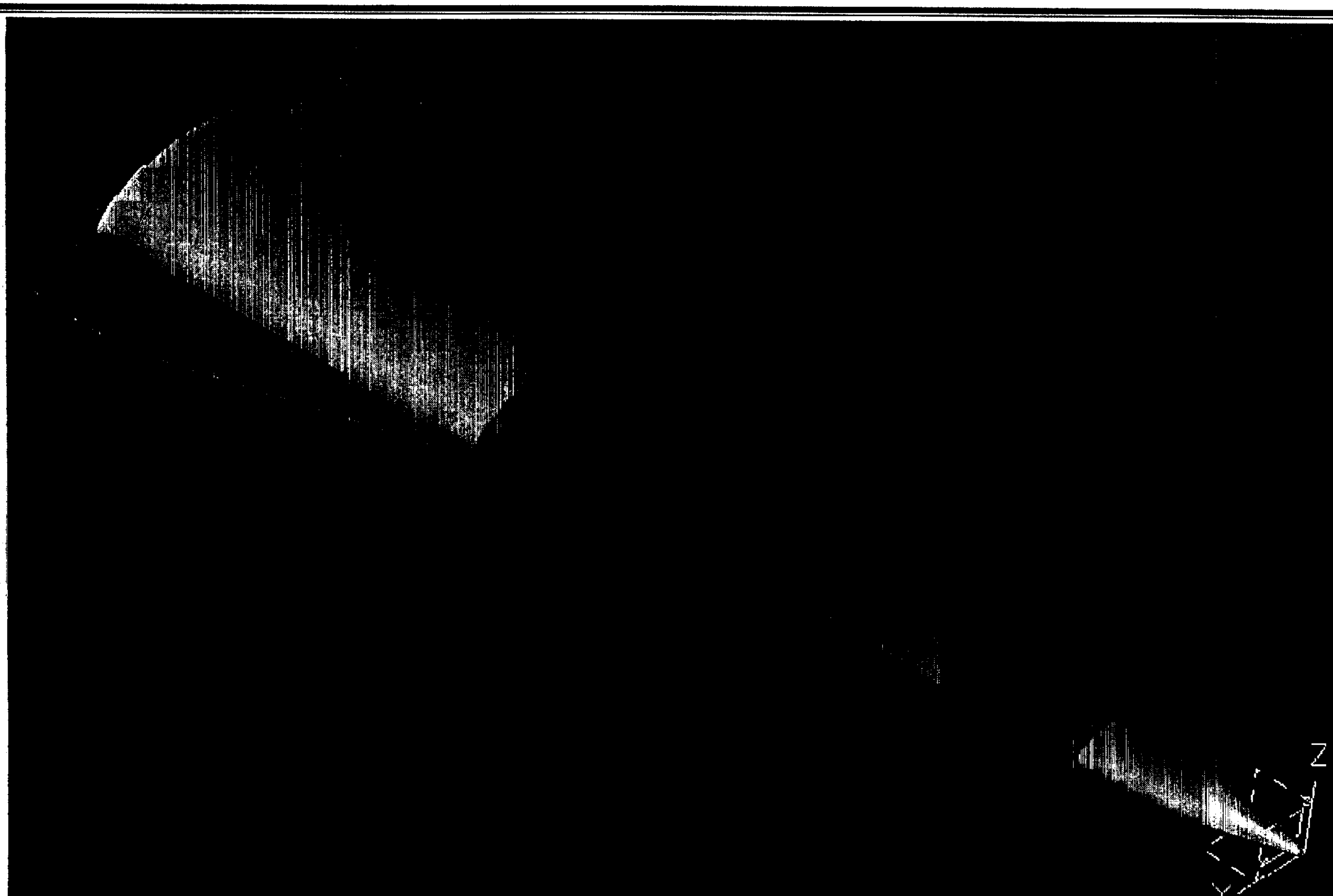


CFD Simulation: Mach Contours

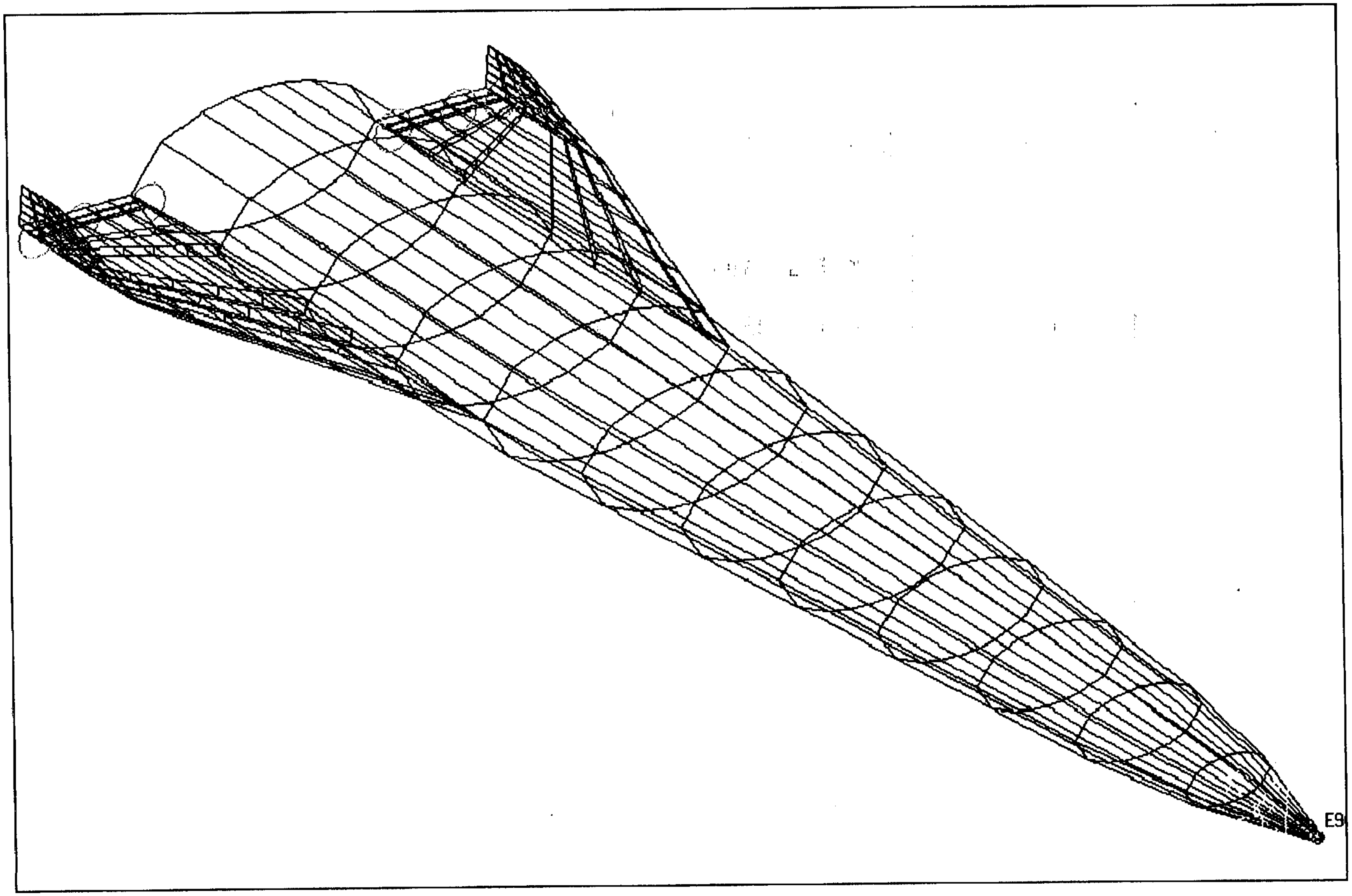


Aeroelastic analysis

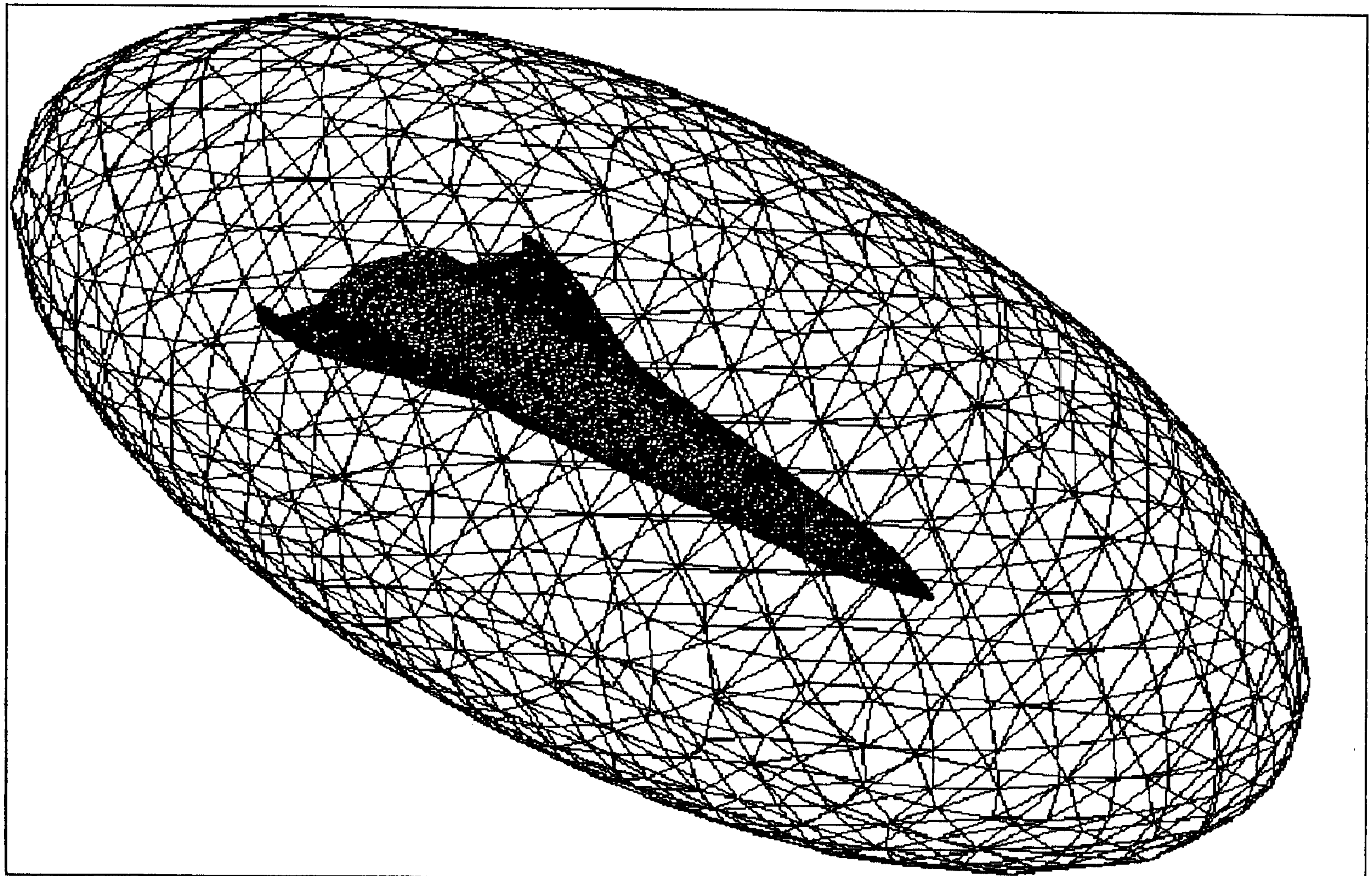
Generic Hypersonic Vehicle - CAD Model



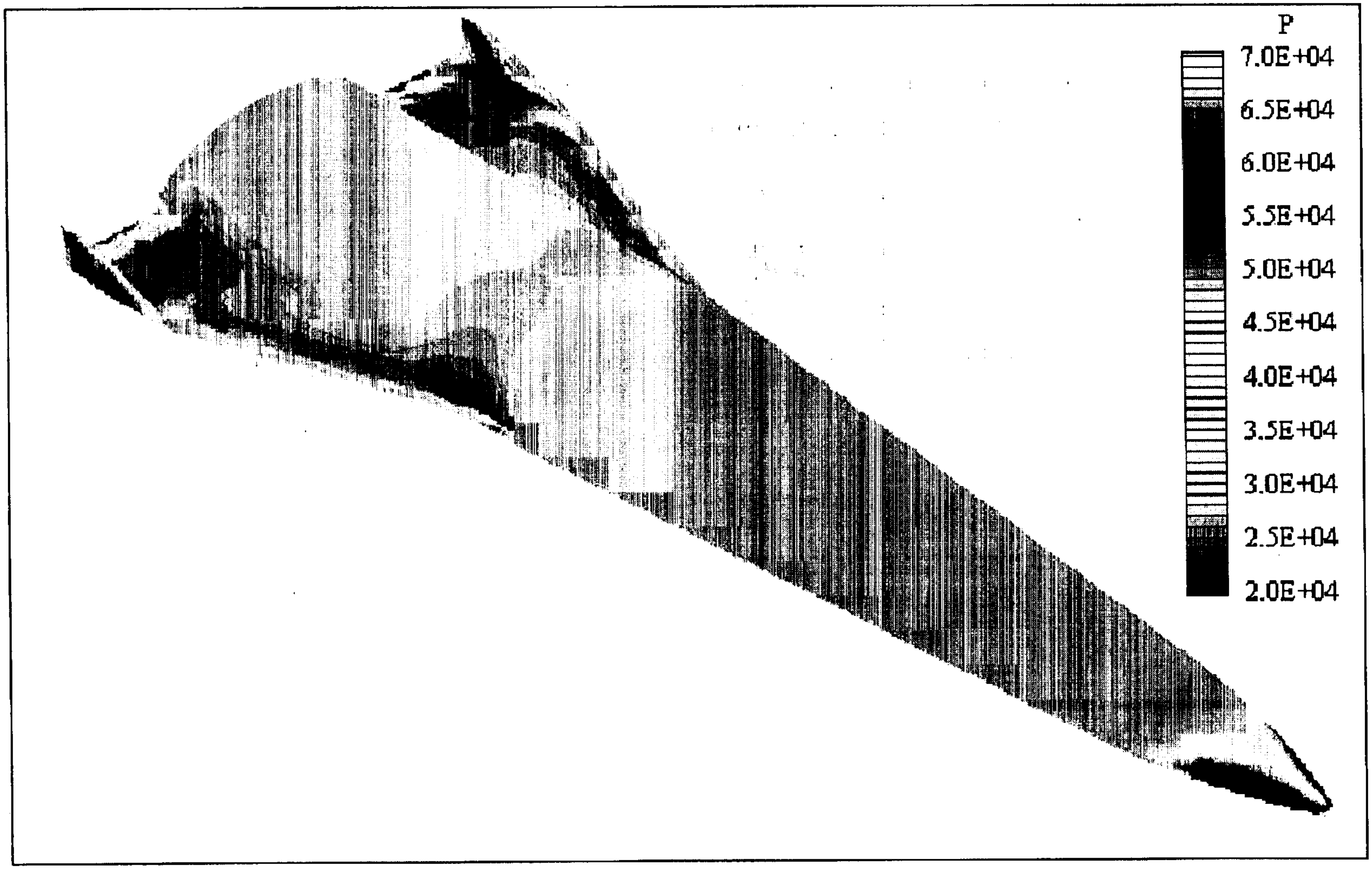
GHV Structure - *IDEAS* FEM



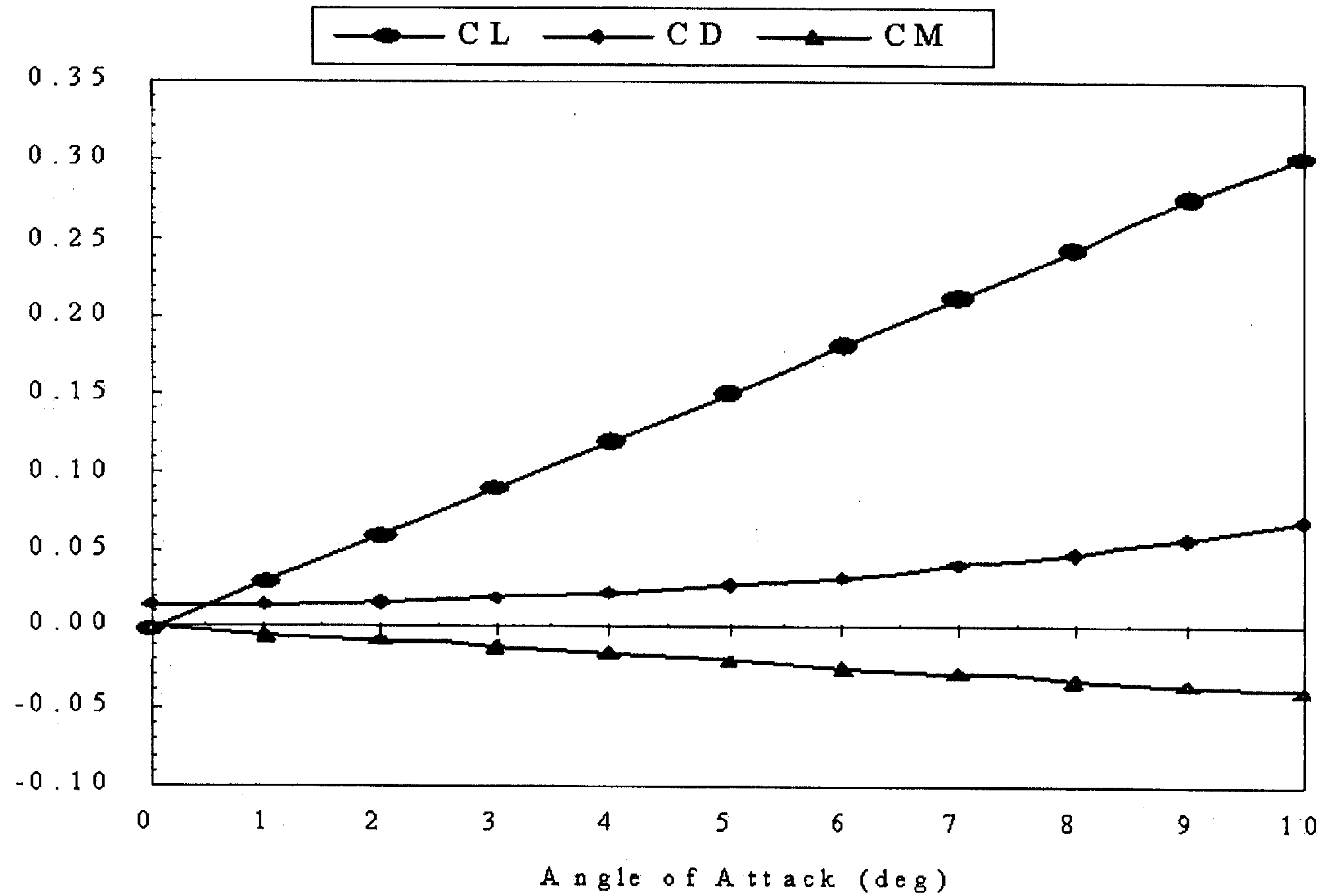
GHV - CFD Mesh



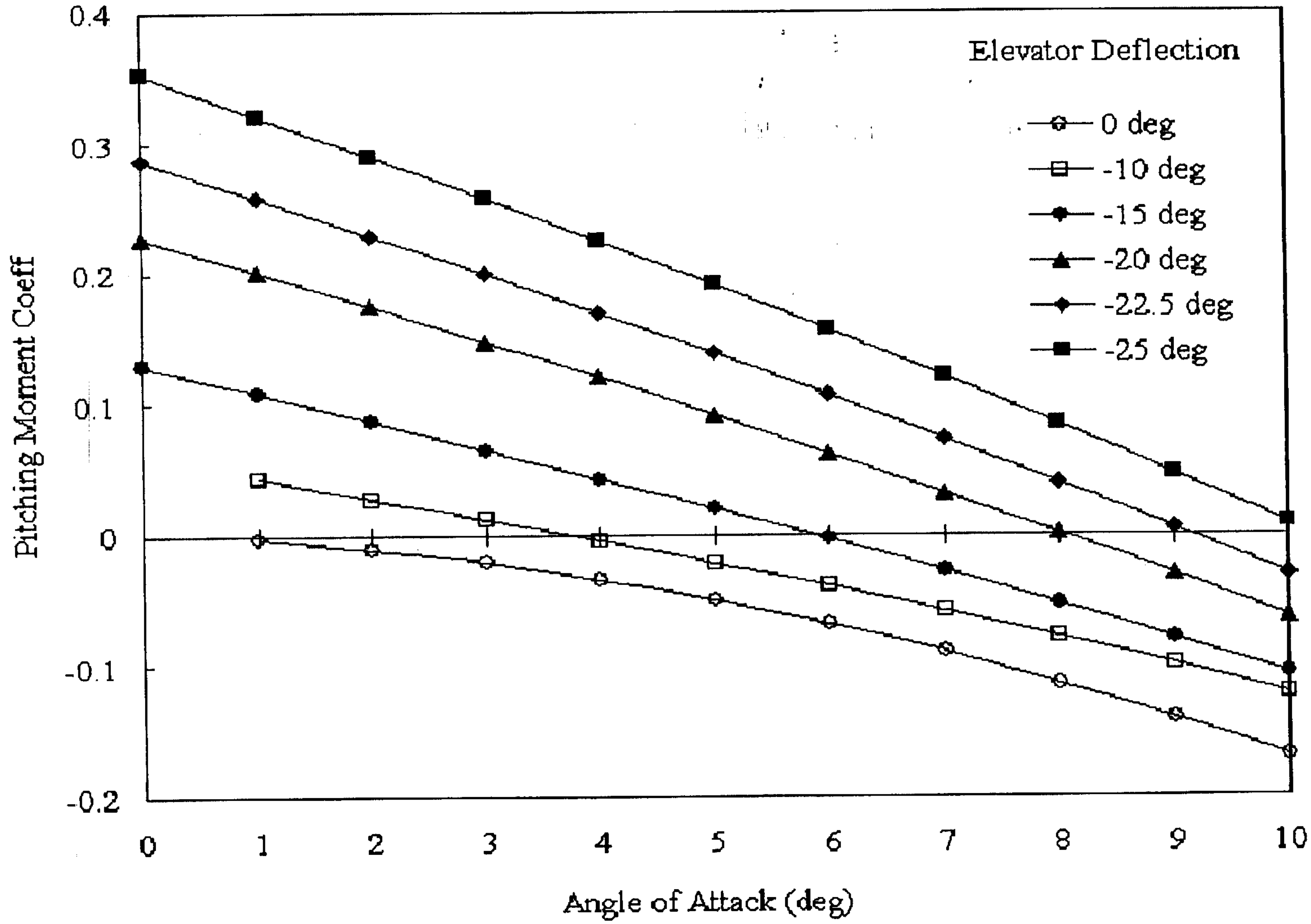
CFD Simulation - Surface Pressure



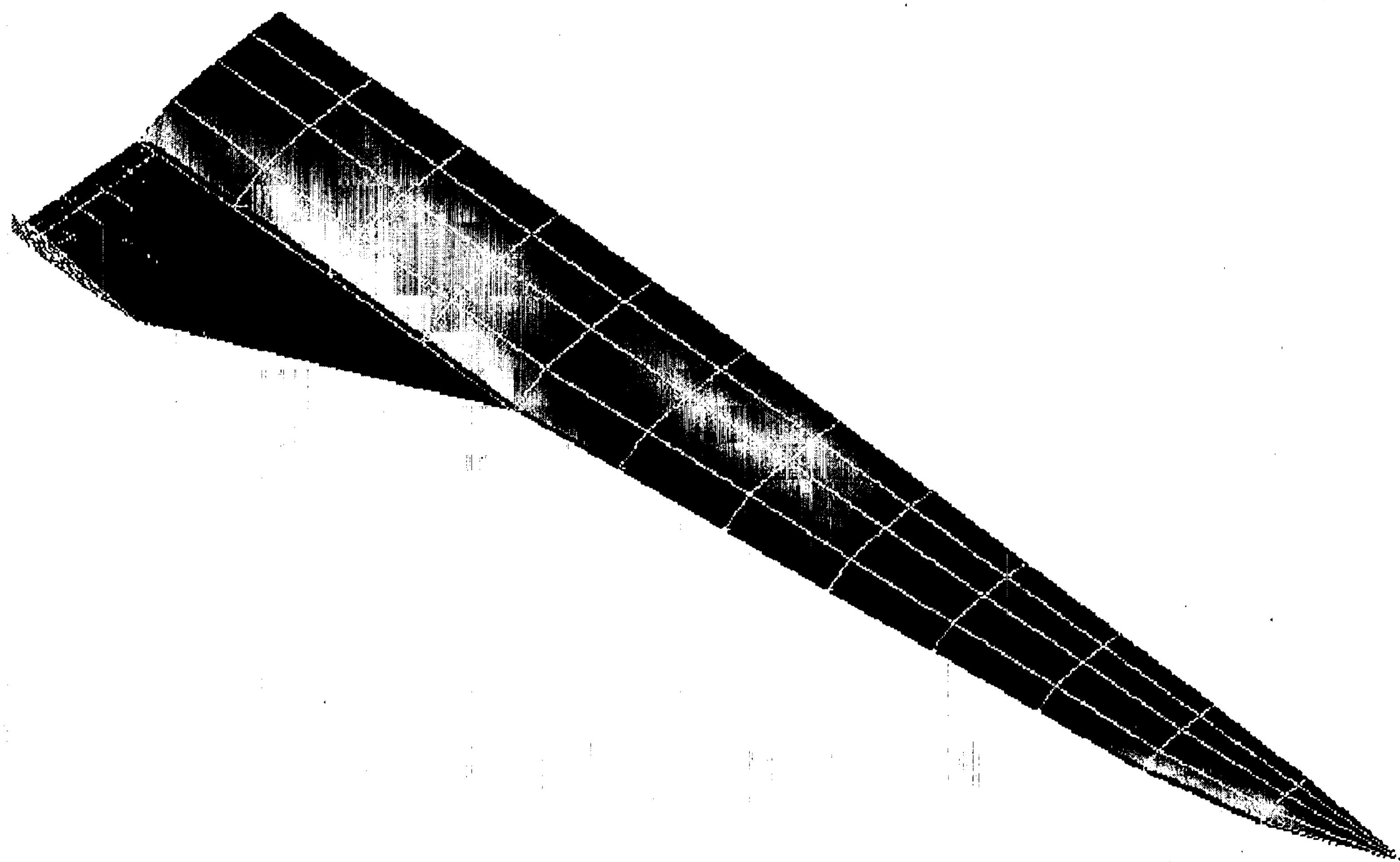
Aerodynamic Coefficients



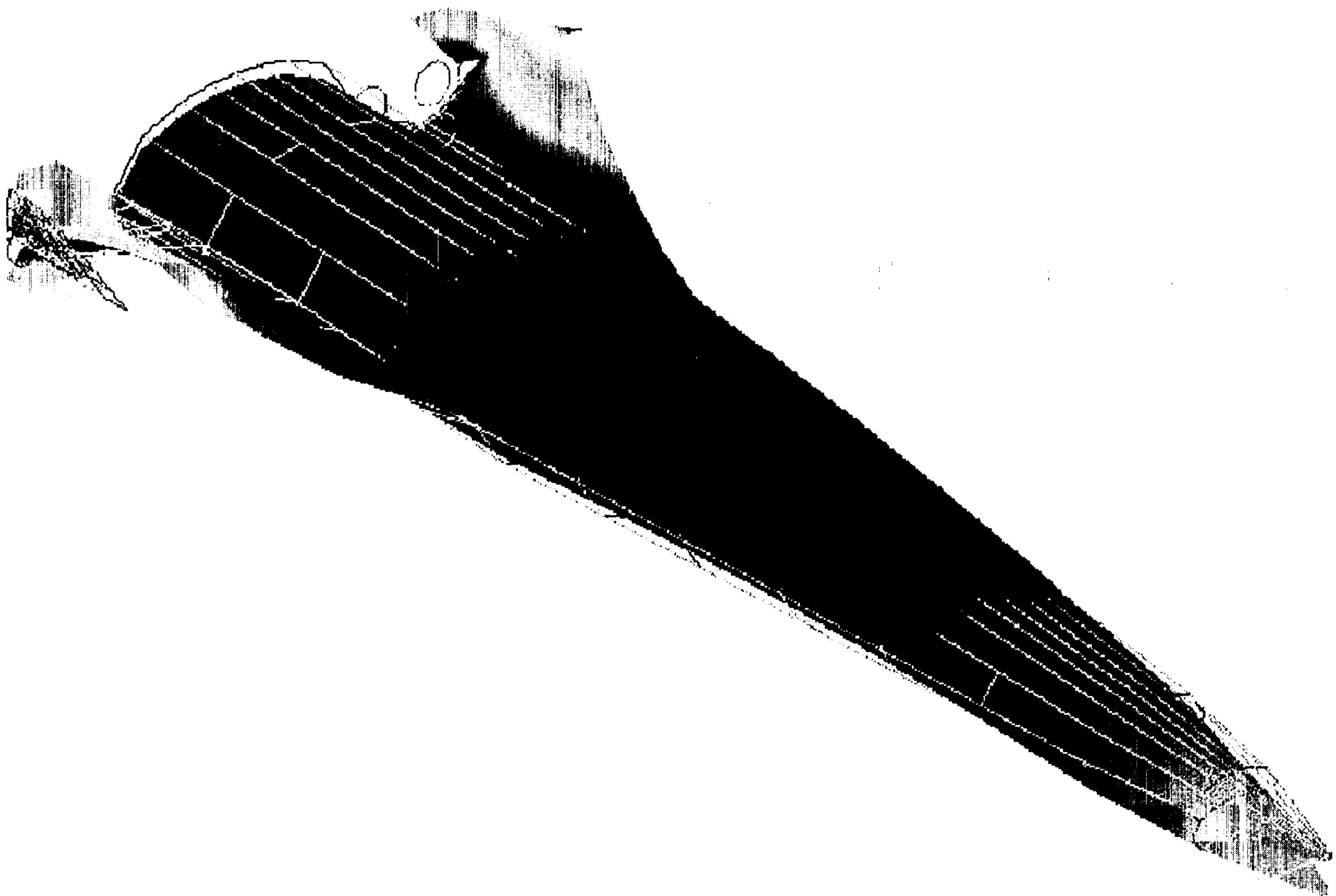
Effect of Elevator

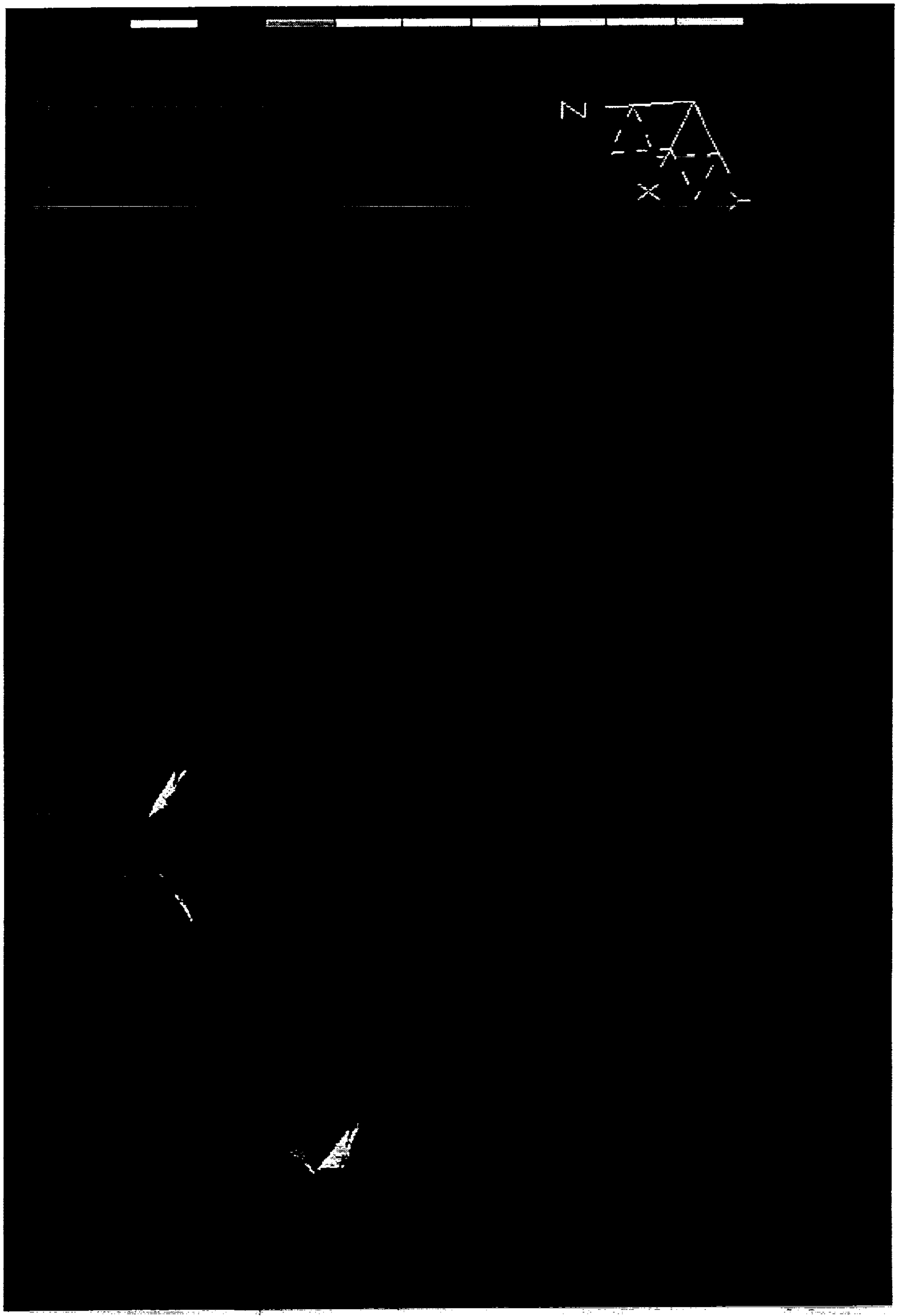


Static Stress Analysis



Vibration Analysis

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X
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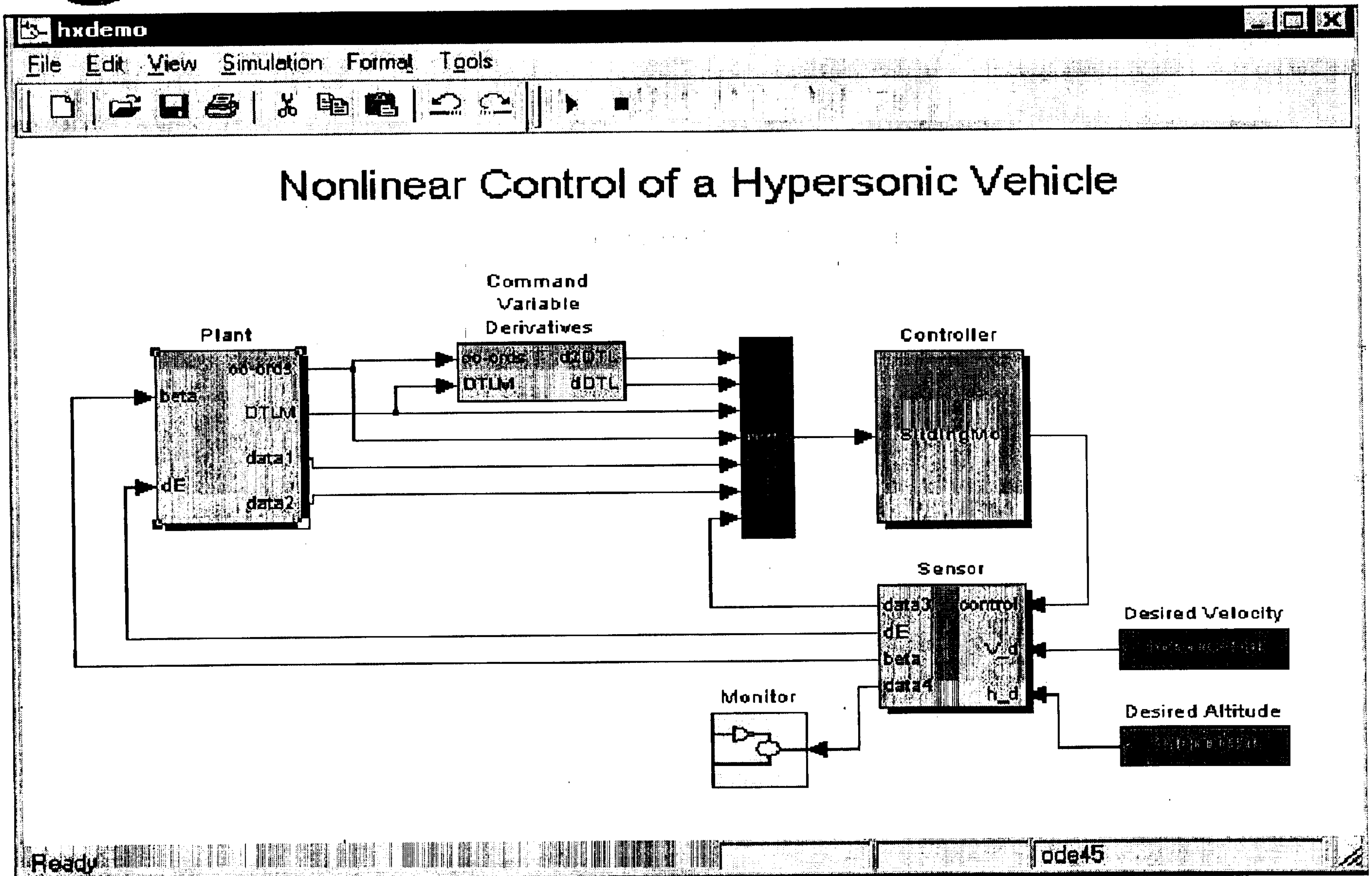
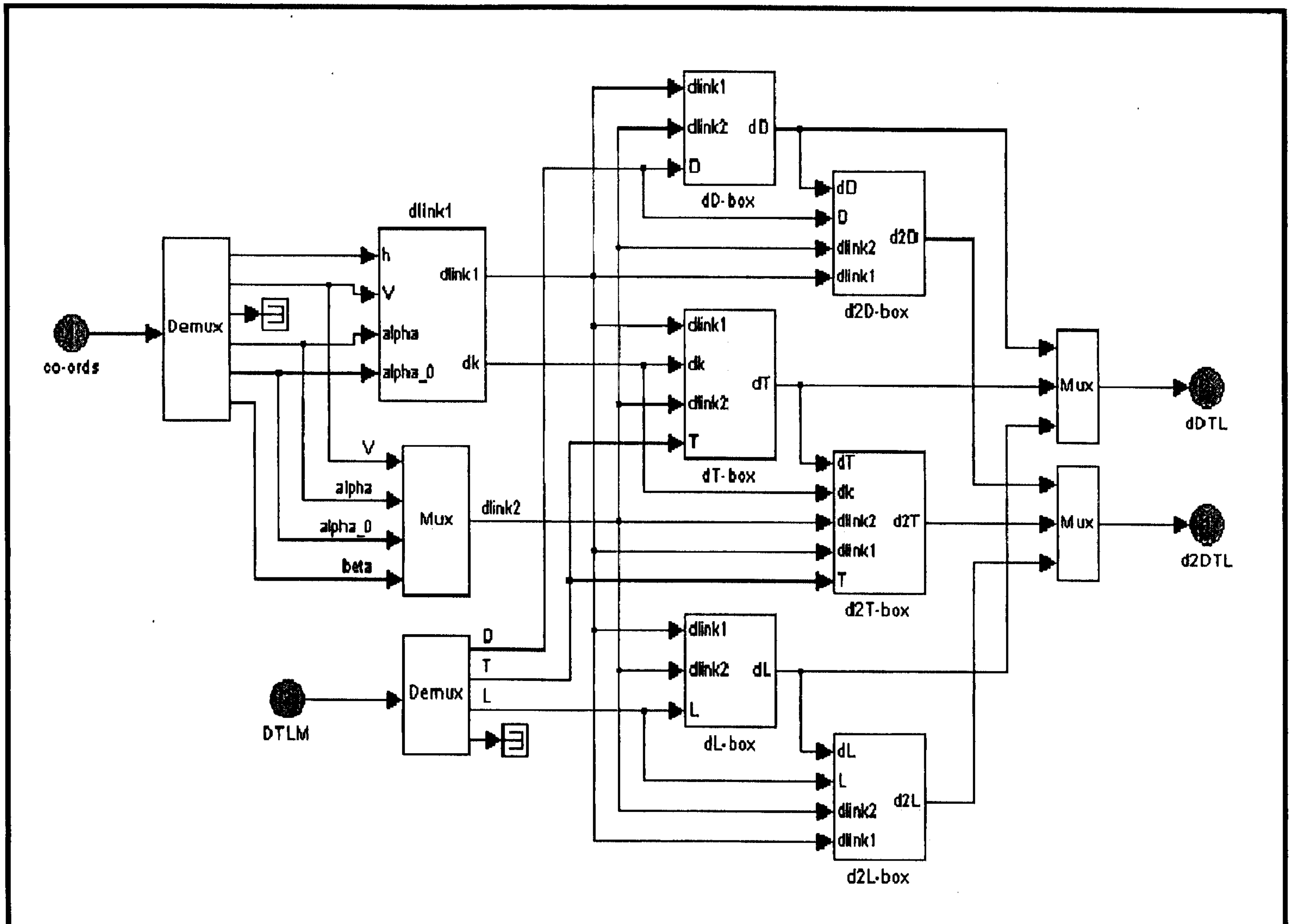
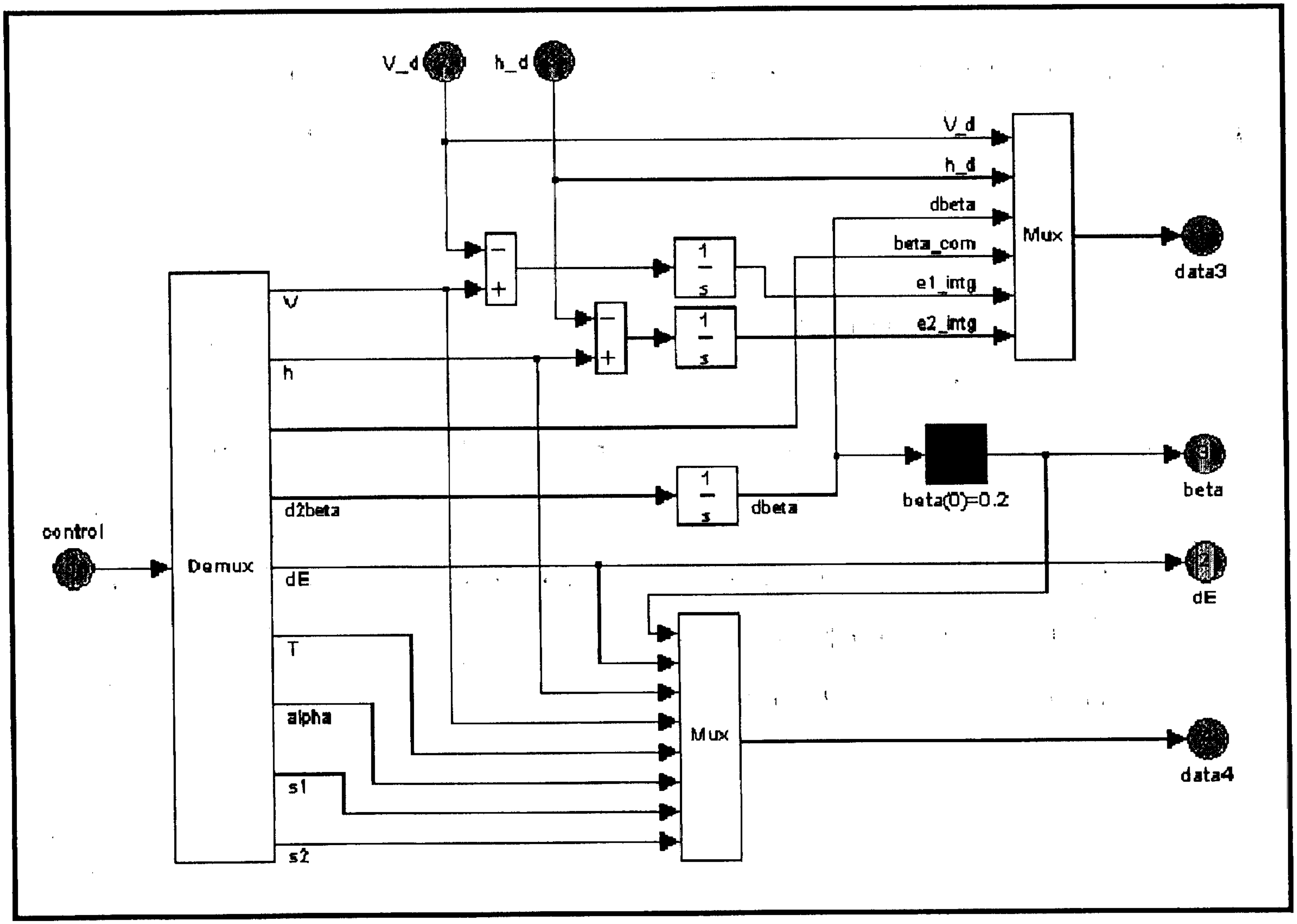
I-CONT Flight Control Simulator



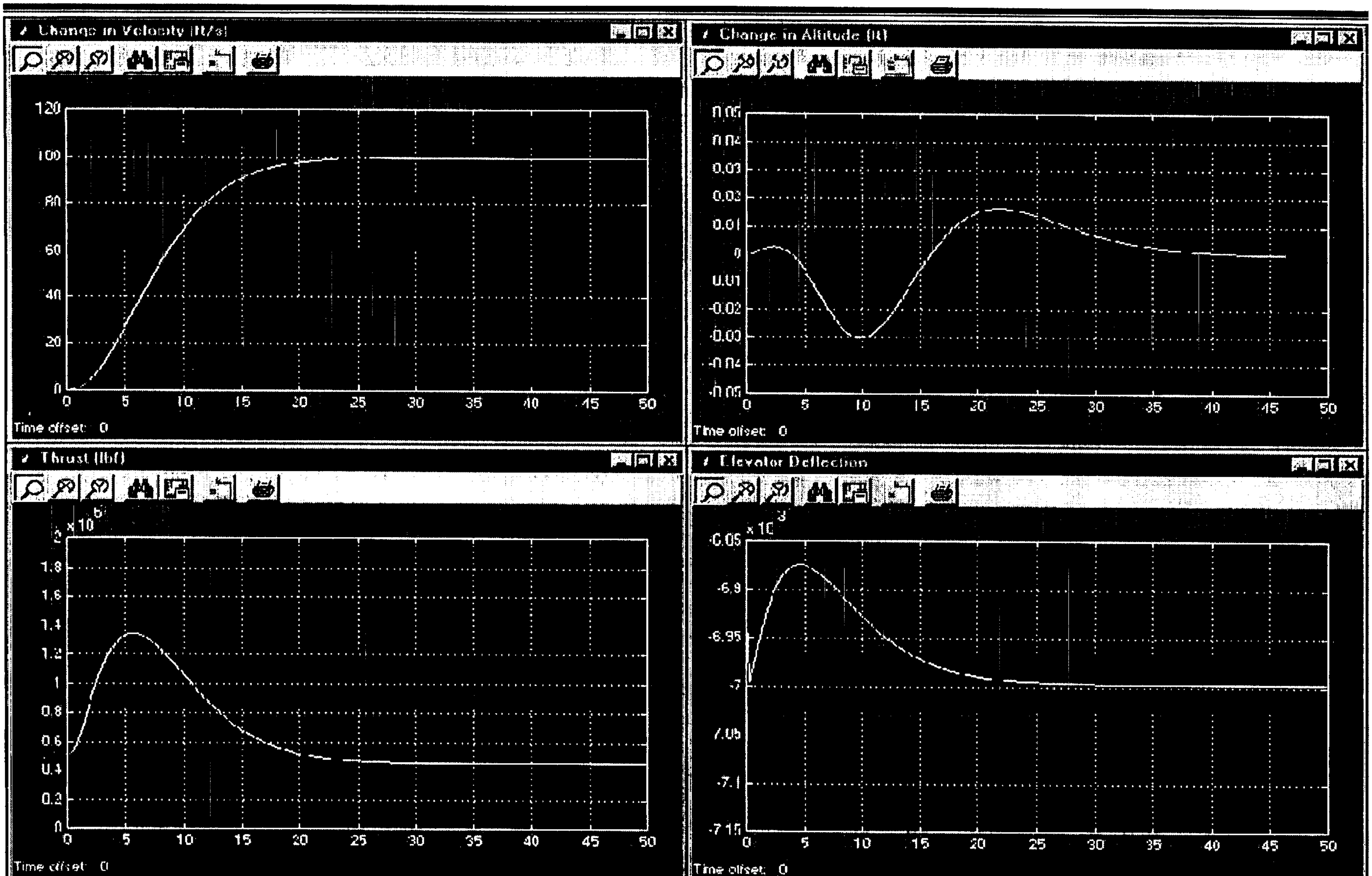
I-CONT Controller



I-CONT Sensor



Response to a Step Velocity Command



Courses

- ME318 Computer-Aided Mech Engr
- ME403 Aerodynamics
- ME409 Applied Multidisciplinary FEA
- ME454 Flight Dynamics Control
- ME508 Computational Fluid Dynamics

NASA-Sponsored Projects

- Integrated Aircraft Design & Analysis
  Dr. Chivey Wu
- Control of Hypersonic Vehicles
  Dr. Maj Mirmirani
- Applications of Inflatable Structures
  Dr. Lih-Min Hsia

Aerospace Technology Update

Mr. Roger Hathaway
NASA Langley Research Center

Detection of Objects Hidden in Highly Scattering Media Using Time-Gated Imaging Methods

Mr. Pierre A. Galland
City College of New York
Institute for Ultrafast Spectroscopy and Lasers

MU-SPIN Tenth Anniversary Users' Conference **and the** MURED Second Annual Education Conference

Detection of Objects Hidden in Highly Scattering Media Using Time-Gated Imaging Methods

P. A. Galland✉, L. Wang, X. Liang, P. P. Ho, and R. R. Alfano
Institute for Ultrafast Spectroscopy and Lasers; New York State Center for Advanced Technology at CUNY
Departments of Physics and Electrical Engineering
The City College the City University of New York, New York, NY 10031

✉ Correspondence: Email: pierre@sci.ccny.cuny.edu; Telephone: 212-650-5531; Fax: 212-650-5530

ABSTRACT

Non-intrusive and non-invasive optical imaging techniques has generated great interest among researchers for their potential applications to biological study, device characterization, surface defect detection, and jet fuel dynamics. Non-linear optical parametric amplification gate (NLOPG) has been used to detect back-scattered images of objects hidden in diluted Intralipid solutions. To directly detect objects hidden in highly scattering media, the diffusive component of light needs to be sorted out from early arrived ballistic and snake photons. In an optical imaging system, images are collected in transmission or back-scattered geometry. The early arrival photons in the transmission approach always carry the direct information of the hidden object embedded in the turbid medium. In the back-scattered approach, the result is not so forth coming. In the presence of a scattering host, the first arrival photons in back-scattered approach will be directly photons from the host material.

In the presentation, NLOPG was applied to acquire time resolved back-scattered images under the phase matching condition. A time-gated amplified signal was obtained through this NLOPG process. The system's gain was ~ 100 times. The time-gate was achieved through phase matching condition where only coherent photons retain their phase. As a result, the diffusive photons, which were the primary contributor to the background, were removed.

With a large dynamic range and high resolution, time-gated early light imaging has the potential for improving rocket/aircraft design by determining jets shape and particle sizes. Refinements to these techniques may enable drop size measurements in the highly scattering, optically dense region of multi-element rocket injectors. These types of measurements should greatly enhance the design of stable, and higher performing rocket engines.

Acknowledgment

The work is supported in part by the NASA/IRA program
K. Breidacher of *NASA Glenn Research Center at Lewis Field*
Picosecond Gated Optical imaging of Dense Fuel Sprays. – 44979

✍ Correspondence: Email: pierre@sci.ccny.cuny.edu; Telephone: 212-650-5531; Fax: 212-650-5530

Flight Programs Panel Break-out Session

Ms. Shari Asplund
Jet Propulsion Laboratory

Getting Involved with the Discovery Program

Presentation to MU-SPIN Conference
September 14, 2000

Shari Asplund
Discovery Program Outreach Manager

NASA's Discovery Program

- Represents the implementation of NASA Administrator Daniel Goldin's vision of "Faster, Better, Cheaper" planetary missions
- Encompasses a series of low-cost solar system exploration missions intended to accomplish high quality, focused planetary science investigations using innovative, streamlined, and efficient approaches to assure the highest science value for the cost
- Aims to enhance our understanding of the solar system by exploring the planets, their moons and other small bodies, either by traveling to them or remotely from the vicinity of Earth.

Asplund-2

Supporting Objectives of the Program

- Provide exciting and important scientific data to the global community
- Pursue new and innovative ways of doing business
- Encourage technologic development by designing and testing new technologies and transferring them to the private sector
- Increase public awareness of, and appreciation for, solar system exploration through exciting education and public outreach activities
- Support national education initiatives through mission-specific programs
- Ensure participation of small disadvantaged businesses, women-owned businesses, HBCUs and other minority educational institutions in procurements

Program Attributes

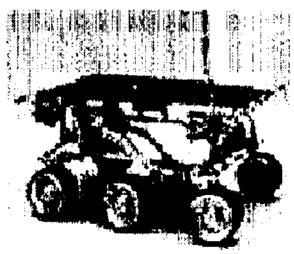
- Competitively selected through NASA AO process
- PI leads mission and is responsible for cost, schedule and performance
- Keep performance high and expenses low using new technologies and strict cost and schedule caps ($299M and 36 months development)
- Increase flight rates with a launch every 18 to 24 months
- Teaming arrangements are encouraged with
  - NASA Centers
  - Research Laboratories
  - Industrial Partners
  - Universities
- Education and Public Outreach program required

Asplund-4

Discovery Missions

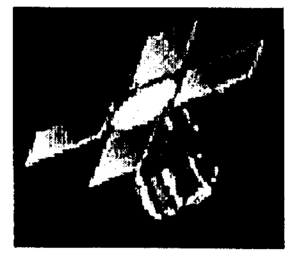
Accomplishments to date establish a firm, community-based foundation for solar system exploration and have exceeded all goals for technical performance, cost, and schedule

Mars evolution:
Mars Pathfinder



Lunar formation:
Lunar Prospector

NEO characteristics:
NEAR



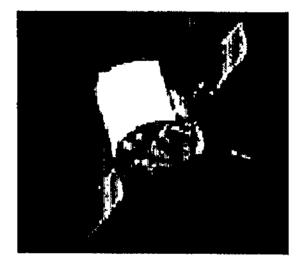
Nature of dust/coma:
Stardust

Missions now in development will set new standards for increased capability within costs and schedule constraints

Solar wind sampling:
Genesis

Comet diversity:
CONTOUR

Comet internal structure:
Deep Impact



Mercury environment:
MESSENGER

Asplund-5

How Can You Get Involved in the Technical Part?

- Enroll in science, math and engineering courses
- Work hard, study in groups, do hands-on research
- Demand excellence from yourself
- Get to know your professors and find a mentor, especially one who could be a potential PI
- Take advantage of programs offered by your schools, corporations, professional societies
- Join professional societies and attend conferences
- Stay informed about the latest developments in your field of interest by reading publications such as "Sky & Telescope" and "Scientific American"

Asplund-6

How Can You Get Involved in the Technical Part? (continued)

- Go to NASA's **Education Program--Resources for Students** web page (http://education.nasa.gov/students.html) to find "Research and Development Opportunities"
  - Cooperative Education Program
  - Graduate Student Researchers Program
  - National Space Grant College and Fellowship Program
- Get to know the Minority Affairs Officer at the NASA Center near you--they can help students get connected
- Find out about MURED programs; apply for grants and internships
- Follow mission web pages, learn how the science develops and evolves over time

Asplund-7

NASA/OSS E/PO Goals

- Use our missions and research programs and the talents of the space science community to contribute measurably to efforts to reform science, math and technology education and to elevate scientific and technical understanding throughout the country
- Cultivate the development of strong and lasting partnerships between the space science community and science/math/technology education community
- Contribute to the creation of a talented scientific and technical workforce
- Promote involvement of underserved/underutilized groups in space science
- Share the excitement of discoveries and knowledge generated by space science missions and research programs by communicating clearly with the public

Asplund-8

How Can You Get Involved in Education and Public Outreach?

- Make Connections!
- Best way is to get involved at the proposal stage
- Check the OSS Research Opportunities announcements
  - AOs, NRAs, IDEAS grants, Scientist-Teacher Partner Grants
  - Get your professors to help you make connections
- Utilize the expertise of the OSS E/PO Support Network
  - Contact the OSS Educational Forum Directors - four science themes; each Forum covers the entire country
  - Contact the OSS Broker/Facilitator in your region-each broker covers all four themes
    - Can help make connections, willing to review proposals
    - Maintain a directory of Prospective E/PO Partners (http://ssibroker.colorado.edu/broker/Partner_Directory/)

Asplund-9

How Can You Get Involved in E/PO? (continued)

- Find out what institutions are involved in education and outreach and connect with them
- At JPL, contact Anita Sohus, leader of Proposal Advisory Council (anita.m.sohus@jpl.nasa.gov)
- At APL, contact Nicola Fox (nicola.fox@jhuapl.edu)
- Read mission web pages; become familiar with each mission's unique approach to E/PO
- If you have something significant to offer, contact the mission E/PO lead to discuss your ideas; there may be opportunities for partnerships during the later phases

How Can You Get Involved in E/PO? (continued)

- MU-SPIN is a partner on the MESSENGER mission because of **connections**--someone knew someone who was involved in the proposal
- Many in the space science community work on multiple missions--get to know them and find out how you can play a role
- Contact me if you want help in connecting with a current Discovery mission (shari.e.asplund@jpl.nasa.gov)

Asplund-11

References

NASA Education Programs
NASA Resources for Students
http://education.nasa.gov/students.html
A Guide to NASA Education Programs
http://ehb2.gsfc.nasa.gov/edcats/2000/nep/programs/
NASA Research and Development Opportunities for Students
http://education.nasa.gov/sture.shtml
National Space Grant College and Fellowship Program
http://education.nasa.gov/spacegrant/index.html

Professional Associations
American Astronomical Society
http://www.aas.org
American Geological Institute
http://www.agiweb.org
American Geophysical Union
http://www.agu.org
American Indian Science and Engineering Society
http://www.aises.org
American Institute of Aeronautics and Astronautics
http://www.aiaa.org
Astronomical Society of the Pacific
http://www.aspsky.org
American Mathematical Society
http://www.ams.org

American Association for the Advancement of Science
http://www.aaas.org
Association for Women in Science
http://www.awis.org
Division for Planetary Sciences
(of the American Astronomical Society)
http://www.aas.org/dps2000/
Meteoritical Society
http://www.uark.edu/campus-resources/metsoc/index.htm
National Society of Black Engineers
http://www.nsbe.org
National Society of Black Physicists
http://www.nsbp.org
National Society of Hispanic Physicists
http://utopia.utb.edu/nshp
Planetary Society
http://planetary.org/
Society of Women Engineers
http://www.swe.org
Women in Technology International
http://www.witi.com/index-s.html

NASA Office of Space Science Education Forums
Astronomical Search for Origins and Planetary Systems
http://www.stsci.edu/stsci

Structure and Evolution of the Universe
http://cfa-www.harvard.edu/seuforum/
Solar System Exploration
http://sse.jpl.nasa.gov
Sun Earth Connection
http://sunearth.gsfc.nasa.gov

NASA OSS Regional Broker/Facilitators
Depaul University
Dr. Lynn Narasimhan
Cnarasim@condor.depaul.edu
http://condor.depaul.edu/
Lunar and Planetary Institute
Dr. Kathleen Johnson
johnson@lpi.usra.edu
http://cass.jsc.nasa.gov/education/education.html
Ohio Aerospace Institute
Dr. Larry Cooper
OSSBroker@oai.org
http://www.ossbroker.net/
SouthEast Regional Clearinghouse (SERCH)
Dr. Cassandra Combs
combsc@cofc.edu
http://serc.cofc.edu/serch/
Space Science Institute
Dr. Cherilynn Morrow
cmorrow@colorado.edu
http://www.spacescience.org/ Asplund-12

Dr. George Carruthers
Naval Research Laboratory

Space Science Research Programs at the Naval Research Laboratory

MU-SPIN / MURED Joint Conference

Atlanta, GA

September 11-16, 2000

George R. Carruthers

Senior Astrophysicist and

Head, Ultraviolet Measurements Group

Space Science Division

Naval Research Laboratory

Space Science Research Programs at the Naval Research Laboratory

- NRL began space science research, using captured German V-2 rockets, just after the end of World War II in 1946.
- The early research program focused on studies of the ultraviolet and X-ray emissions from the Sun, and upper atmospheric measurements.
- NRL also developed the Viking rocket, which replaced the V-2, for use in space science research, and lead the development of the *Vanguard* satellite launch vehicle.
- Following the creation of NASA in 1958, the NRL Space Science Division has continued its research programs, participating in space flight missions sponsored by both NASA and the Department of Defense.

Space Science Research Programs at the Naval Research Laboratory

- Short duration sounding rocket flights have continued to be useful as the first phase of new fields of space science investigations, and/or for testing new instrumentation planned for more extensive use in future satellite or deep-space missions.
- Sounding rockets have also continued to be useful for special-purpose, one-of-a-kind types of investigations not requiring long operating times above the atmosphere (such as far-UV studies of bright comets).

Space Science Research Programs at the Naval Research Laboratory

- Major NASA missions with NRL involvement include the *Apollo-16* and *Skylab* missions, the *Spacelab-2* Shuttle mission (which included an NRL Payload Specialist), and several subsequent Shuttle missions.
- These also include experiments on unmanned NASA (or NASA-cosponsored) satellites, including the *Compton Gamma Ray Observatory (CGRO)* (1991-2000), and the currently still-operating *Upper Atmospheric Research Satellite (UARS)* and *Solar and Heliospheric Observatory (SOHO)*.

Space Science Research Programs at the Naval Research Laboratory

- NRL Space Science Division has also had experiments flown on several Department of Defense-sponsored (or DoD-NASA co-sponsored) space missions. These include the following:
  - STS-39 (April-May, 1991)- Far Ultraviolet Cameras and UVLIM experiments
  - STS-63 (February, 1995)- Spartan 204/ Far Ultraviolet Imaging Spectrograph (FUVIS)
  - Advanced Research and Global Observation Satellite (ARGOS)- Delta II launch, February 1999 (still operating)
- Five of the nine experiments on *ARGOS* were provided by NRL (three of these were provided by the Space Science Division).

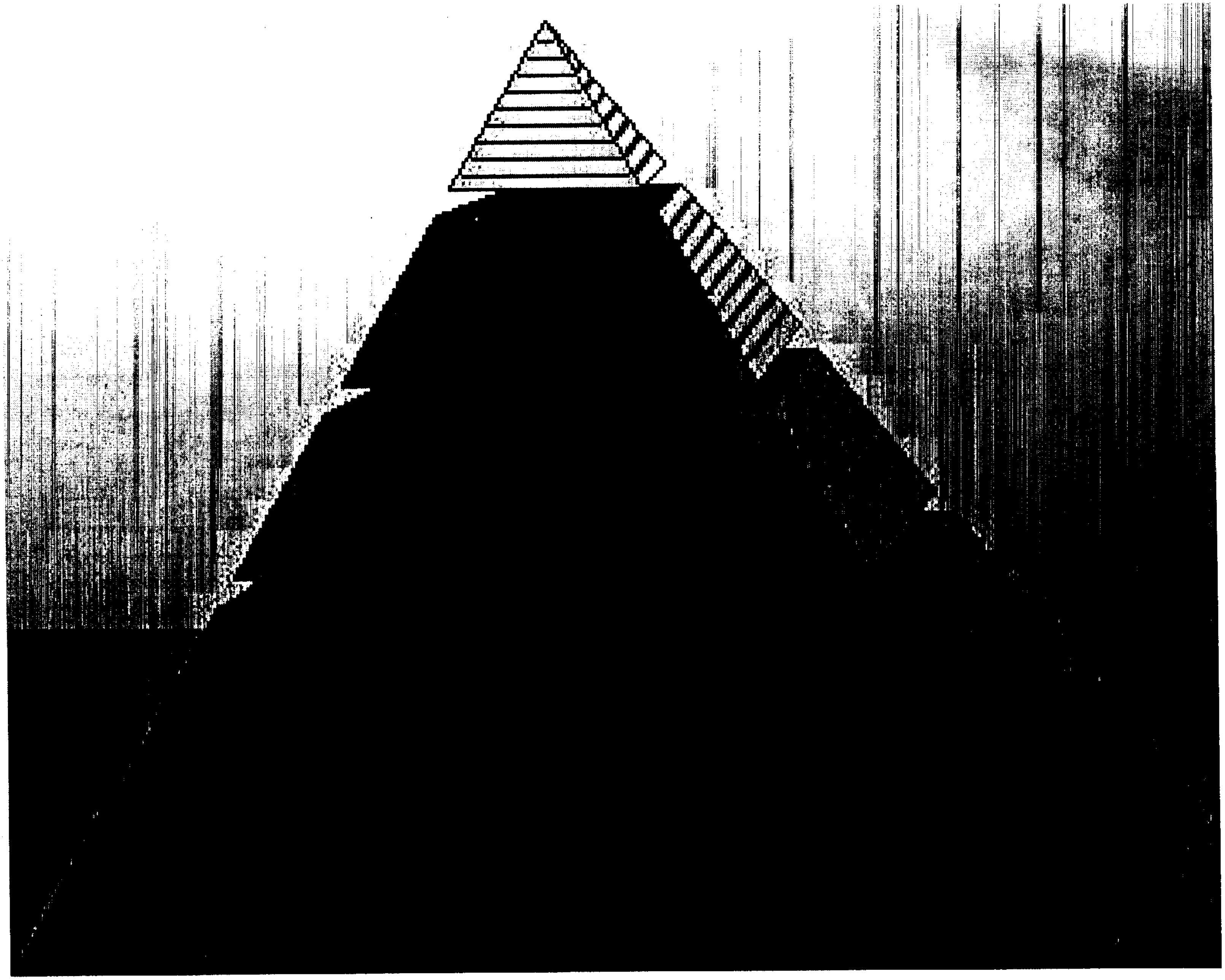
What is Required to Design, Build, and Operate a Space Flight Experiment?

- **Four Major Areas of Engineering Design and Analysis:**
  - Mechanical and Structural
  - Electrical and Electronic
  - Thermal
  - Software (for Operation, Control, and Data Reduction)
- Detailed Analysis is required BEFORE Building the Hardware!
- Testing is required at all levels of assembly of the individual experiments, and of the spacecraft with instruments installed:
  - Functional Testing and Calibrations
  - Vibration, Shock, and Acoustic Testing
  - Thermal Vacuum Testing
- In Flight: Detailed Mission Planning (well in advance of operations) and Data Acquisition, Processing, and Analysis

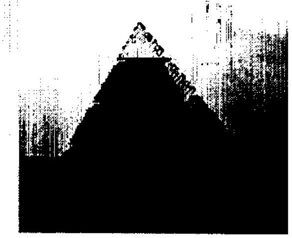
Some Suggestions for Planning and Proposing a Space Flight Experiment

- Remember to consider, and to include in planning and in proposals, the special requirements of Space Flight experiments vs. similar ground-based experiments.
- Read carefully, the Announcement of Opportunity (and any referenced documents) before writing the proposal, and be sure that all required items are fully addressed or provided.
- The demonstrated merit of the proposed scientific or technical objectives is the PRIMARY criterion by which proposals are prioritized.
  - Note, "cheaper" cannot substitute for "better" as long as cost guidelines are not exceeded!
- The planning (and cost estimates) must include all necessary analyses and testing, as well as design and fabrication, of the flight hardware.
- Be sure that all necessary areas of expertise are included in the proposing team.

Dr. Nicola J. Fox
Johns Hopkins University



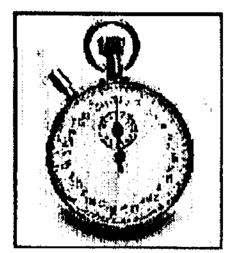
Introduction-Preparation



1) Foundation Building Benefits
   a) Increased Research Opportunities
   b) Reputation
   c) Higher Graduate Retention

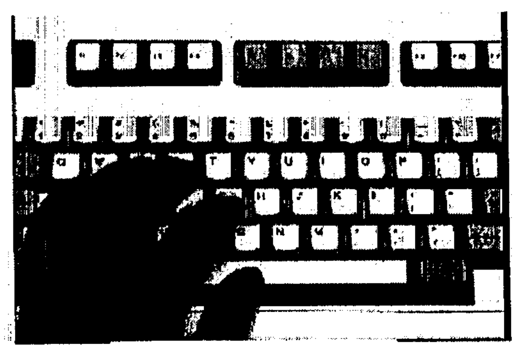
2) Minority Institution's Research Roles
   a) Source
      i) Principle Investigator
      ii) Co-Investigator
   b) Target
      i) Tertiary Role
   c) Supporter
      i) Proposal Evaluation

3) Timing
   a) Resource Availability
      i) Students
      ii) Faculty
      iii) Administration

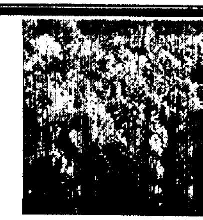


4th Fiscal Quarter Activities

4) Develop Goals for a Two Year Plan
   a) Mainly junior and senior participation
      i) Requisite knowledge
      ii) Graduate capture
   b) Fits within most funding forecast periods
      i) Availability of decision-makers
      ii) Availability of phased research opportunities
   c) Adequate time for revision



1st Fiscal Quarter Activities

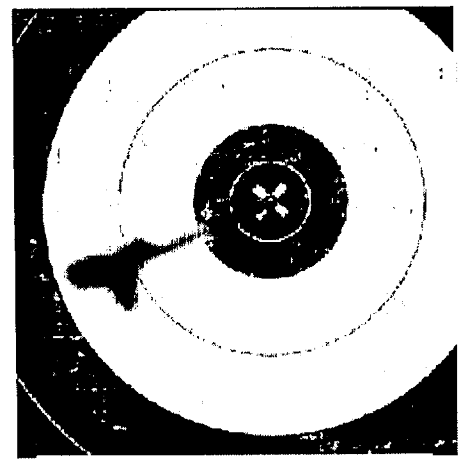


5) Grow University Support
   a) Students
   b) Faculty
   c) Department
   d) College
   e) University Administration

6) Advertise University Endorsed Goals
   a) Keep Goals Separate from Mission and Vision Statements
   b) Use Existing Communication
      i) University Websites
      ii) University Brochures
      iii) Alumni Newsletters

7) Make Your Presence Known
   a) Increased Membership in Professional Societies
      i) Faculty
      ii) Students
   b) Attending Sponsored Functions
      i) Conferences
      ii) Seminars
      iii) Colloquiums

2nd Fiscal Quarter Activities



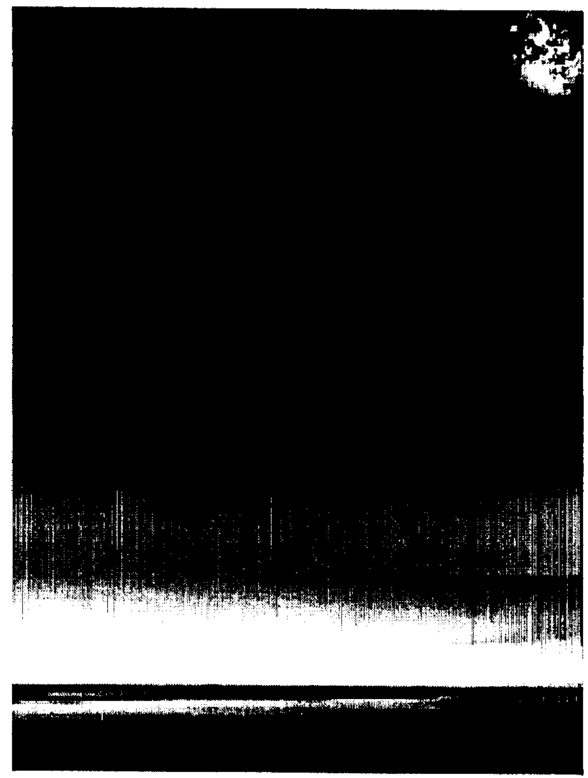
8) Determine Potential Funding Sources
   a) Government Agencies
   b) Non-Profit Agencies
   c) Private Sector

9) Determine Research Goals of Sources
   a) Scientific
   b) Commercial
   c) Educational/Outreach

10) Develop a Plan for Reaching Goals
   a) Realistic – Within University's Capabilities
   b) Flexible – Can Withstand Shifts in Paradigms (Internal/External)
   c) Scalable – Program Intensity Varies with Funding
   d) Traceable
      i) Metrics
      ii) Reporting

3rd Fiscal Quarter

11) Present University Endorsed Plan
   a) Use Existing Communication
      i) University Websites
      ii) University Brochures
      iii) Alumni Newsletters
   b) Professional Societies
      i) Presentations
      ii) Posters/Brochures



Closing Remarks

- Do it right the first time
- Stay Vigilant
- Seek Help
- Acknowledge Support
- Be aware of real limits
  - University framework
  - Opportunities
  - Scalability
  - Flexibility

Mr. David G. Naves
SGT, Inc.

MU-SPIN Tenth Anniversary Users' Conference and the MURED Second Annual Education Conference September 11- 16, 2000

By
David Naves

Abstract

NASA has made tremendous strides to develop science mission programs that can be supported by Historically Black Colleges and Universities (HBCUs) and Other Minority Universities (OMUs), including Hispanic Serving Institutions and Tribal Colleges and Universities. The University Explorer (UNEX) and University Earth System Science (UnESS) programs are designed for that specific purpose. However, participation in these programs by HBCU institutions at the Principal Investigator/Co-Investigator level has been sparse, at best. There is a tremendous science and engineering capability that exits among HBCU member institutions. This is evident in the successful implementation of the MURED research grants program and the MU-SPIN university information systems and technology infrastructure assistance program. HBCU, OMU, and TCU administrators will need decide if their institutions will strategically pursue NASA Announcements of Opportunity mission solicitations as Principal and/or Co-investigators. Through requisite training, coaching, and partnering, HBCUs can develop responsive proposals to manage and implement a major NASA science mission.

MURED and MU-SPIN

NASA's Office of Equal Opportunity Programs (Code E) established the Minority University Research and Education Division (MURED) in 1990 to increase the Agency's responsiveness to Federal mandates related to Historically Black Colleges and Universities (HBCUs) and Other Minority Universities (OMUs), including Hispanic Serving Institutions and Tribal Colleges and Universities. MURED is responsible for formulating and executing the Agency's Minority University Research and Education Program (MUREP) budget of which a $60 million investment in research grants were awarded to HBCU's representing a 14.4 percent increase over the Agency's expected FY 1999 investment. Forty-five HBCUs received 209 awards that reached more than 36,000 faculty, administrators, and students.

The Minority University Space Interdisciplinary Network (MU-SPIN) primary focus is on the transfer of advanced computer networking technologies to HBCUs, TCUs, and OMUs and their use for supporting multi-disciplinary research. By leveraging the success of these programs, HBCU institutions can began to access their ability to pursue NASA earth and space science missions.

Research Sponsoring Organizations

There exists several primary NASA research sponsoring organizations. They include:

- Minority University Research and Education Division
- NASA Institute for Advanced Concepts
- Office of Earth Science
- Office of Life and Microgravity Sciences
- Office of Space Science
- Small Business, University, and non-profit Research Institution
- Technology Innovation and Research Programs (SBIR/STTR)

Each of the above research sponsoring organizations has in its strategic goals to direct opportunities to HBCU, OMU, and TCU institutions. NASA has made tremendous strides to accomplish that goal.

University Explorer Missions

The NASA GSFC University Class Projects Office, Code 850, Explorer Program, Space physics and astronomy missions, is intended to examine the Earth space environment and to observe the universe beyond Earth. Additional information concerning the Explorer Program can be found on the web at http://www.hq.nasa.gov/office/oss/. The primary focus for the Explorer Program is:

- Astronomical Search for Origins and Planetary Systems;
- The Sun-Earth Connection; and
- Structure and Evolution of the Universe

The Explorer program consist of four classes of missions that include:

- University Explorer (UNEX) - not to exceed $13 million
- Small Explorer (SMEX) - not to exceed $71 million
- Mid-Explorer (MIDEX) - not to exceed $140 million
- Missions of Opportunity - participate in a non-NASA space mission of any size, but having a NASA cost under $21 million

The UNEX is specifically designed for university managed missions. It is intended to provide frequent flight opportunities for highly focused and relatively inexpensive science missions. UNEX investigations must be either a complete mission or a secondary payload on a spacecraft. The total cost to NASA is limited to $13 million (FY98) and is managed by GSFC for Office of Space Science.

The Office of Equal Opportunity Programs will consider providing capital investment funding to enhance the capacity of HBCU's and OMU's on successful proposing teams to carry out their mission responsibilities. This investment will provide infrastructure germane to the proposed University-class Explorer mission and will have long-term benefit to the HBCU/OMU.

The GSFC University Class Projects Office, Code 850, University Earth System Science Project (UnESS), is designed to provide for significant and meaningful "hands-on" student involvement. These investigations are capped at $15M in NASA Earth Science Enterprise funding. Participation of HBCU and OMU including Hispanic serving institutions or Tribal colleges and universities is being strongly encouraged. Thew UnESS web site can be found at http://www.wff.nasa.gov/~code850/pages/uness.html

A Mission Perspective

Principal Investigators (PIs) are solicited through a continuing NASA Announcement of Opportunity (AO) process in which the PI proposals constitute the first cycle of formulation. The PI is responsible to NASA for the scientific integrity of the mission, as well as the management of the complete mission including the:

- Instrument
- Spacecraft
- Launch Vehicle
- Ground System
- Data Collection and Distribution

The PI has responsibility and authority for the entire life cycle of the mission as well as the mission's program cost, schedule, and technical performance and the management of system requirements. The PI should be knowledgeable in all these areas and call on experts to assist or as a team member. The phases of the mission life cycle include:

Phase 1: Mission Concept Studies
Phase 2: Mission Definition and Preliminary Design
Phase 3: Mission Detailed Design
Phase 4: Mission Development and Launch
Phase 5: Mission Operations and Data Analysis, Archival, and Dissemination

[redacted]

Space Mission AO	NASA Research Announcement
• The PI is responsible to scientific integrity of the mission, the management of the • Generally solicits end-to-end which begins with concept includes spaceflight hardware and ends with delivery of the data the scientific • Typically capped at $15 million $13 million • Once selected for flight, failure reasonable progress on an schedule or failure to operate constraints outlined in the AO for termination by • Proposals go through a Selected proposers will studies, culminating in the Report, which will be used as the Downselect	• The PI is responsible for work and participates in the research regardless of compensated under the award. targeted solicitations exceed a designated funding determined period • NASA does not have formats for responses to • Up to $250K. MURED PI awards $100K for three • MURED solicitations targeting OMU, and TU

NASA uses the AO process to solicit earth and space science mission proposals from the science community. The goal of the AO Process is somewhat different than that of the NASA Research Announcement (NRA). These differences are reflected in the table below.

NASA will evaluate how well the proposal satisfies the requirements of the AO, even for those aspects of the mission contributed by mission partners other than NASA. The proposals must be compliant and compelling, demonstrate the ability to do what you say you can do, and demonstrate real scientific "value" in the approach.

Building a Capability

Each HBCU institution must decide if it has in its strategic plan the pursuit of NASA missions. This must be something the institution desires to do and has the passion to pursue. The institution has to be willing to make the "long term" investment. This capability may take several years to develop. An approach would be to leverage the success of MURED/MU-SPIN programs and successful implementations of research grants from other sources. The institution must develop teaming/ collaborations (Co-Investigator) to leverage technical and/or scientific strengths of partners.

Setting Goals

To begin building a capability, the institution must determine if pursuing earth and space science missions is a goal of the institution. If it is a goal, the following should be addressed:

- Assess your technical, scientific, engineering, and management strengths and weaknesses
- Identify individuals you believe have the ability and passion to pursue a NASA mission.
- Develop a plan to attract capable scientist and engineers to the institution (if athletic departments can do it, why can't the sciences and engineering)
- Attend scientific colloquiums and conferences where earth and space science issues are being discussed. This is an excellent opportunity to network
- Make it known to majority institutions that you are interested in forming collaborations. Begin to develop partnerships/consortiums with these institutions

Industry Participation

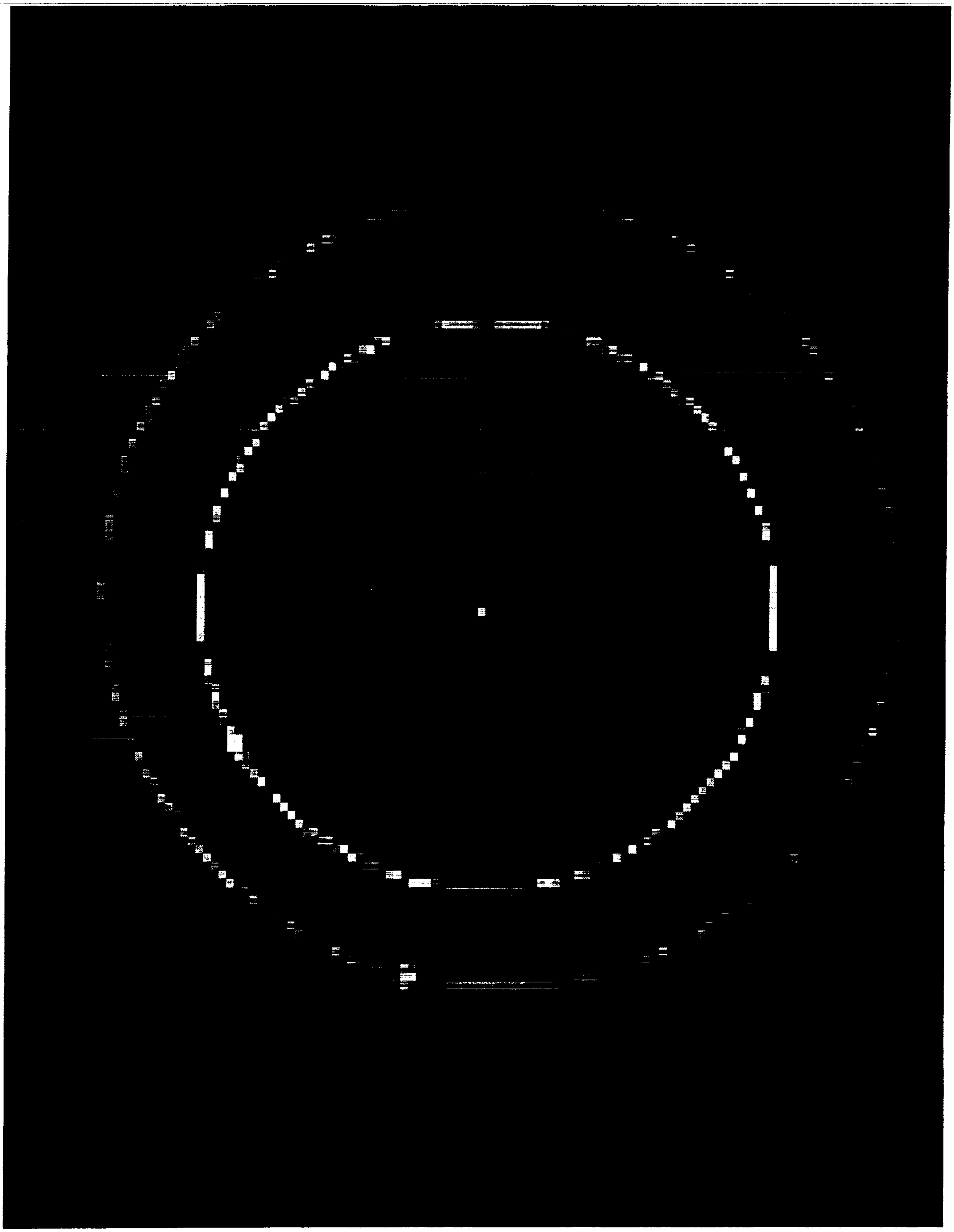
NASA should consider using an experienced systems and mission engineering industry partner to provide the necessary support to assist in developing PIs at HBCUs. The goal of the industry partner would be to coordinate and bring to bear existing NASA resources to implement the necessary training. The training would involve classroom instruction, GSFC mission design review observations, and case studies of successful earth and space science AOs and NRAs. PI candidates would be required to devote a predetermined number of hours in each area. Each member institution would be required to provide some amount funding for the participation of their representative(s) in this initiative. The industry partner would provide instruction on developing compliant and compelling proposals. The training initiative would be promoted through an aggressive outreach and awareness program leveraging existing programs and possible resources (MURED, MU-SPIN, University Grants, etc.).

Dave Naves
dnaves@sgt-inc.com
301-614-8600x316

Mr. Naves is currently Director-Technical Services, SGT, Inc.. He brings more than 27 years of experience progressing from providing discipline engineering, systems engineering, systems integration, and systems development through executive-level strategic planning and business development. Mr. Naves has had numerous national and international assignments in both the private and public sector. He has obtained three patents for mechanical system designs and holds a B.S. degree from Northern Illinois University. Services provided have included program and project management, risk management, information systems design, development, and implementation, contract administration, contract financial management, and NASA enterprise mission engineering, operations engineering, discipline engineering, and technology transfer.

Ms. Stephanie Stockman
NASA Goddard Space Flight Center

Presentation Available on line
http://nasa.utep.edu/muspin/sstockman



Dr. Gilbert Yanow
Jet Propulsion Laboratory

Anthology Of Two NASA Discovery Projects

Their Missions And Character

GENESIS
SEARCH FOR ORIGINS

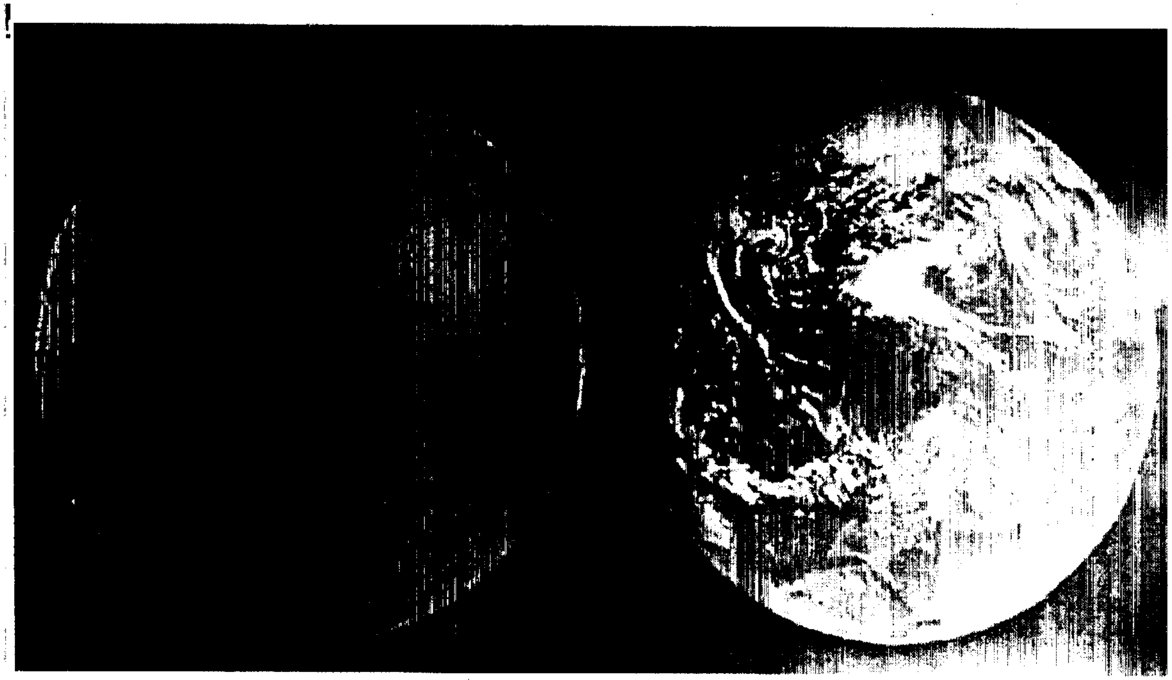
DR. GILBERT YANOW
Genesis Outreach Coordinator
Special Consultant, Deep Impact
gilbert.yanow@jpl.nasa.gov
(818) 354 8060

FOR TODAY

- Examine The Science And Technology Of The Missions
- Identify Common Areas That Most All Space Missions Have
- Emphasis (In Speakers Opinion) Of Some Key Things That New Comers To This Field Should Realize, Especially Students
- Discuss How You May Be Able To Become Involved With These Projects
  - "Build Up Your Resume" To Make You A Better Choice Of Partner On A Future Proposal
- Some "Food For Thoughts" We Can Discuss Later In The Session

WHY A GENESIS MISSION?

We See The Planets As They Are Today, Venus, Mars, Earth. All Are Very Different, But If The Planets And Sun Were All Formed At The Same Time, They Must Have All Been The Same When Our Solar System Began--The Question Is How Were They Then And Can We Tell How And Why They Changed!!



Venus-Nobody Can Live There Now **Earth- We All Live Here**

WHAT ARE SOME OF THE “BIG” QUESTIONS?

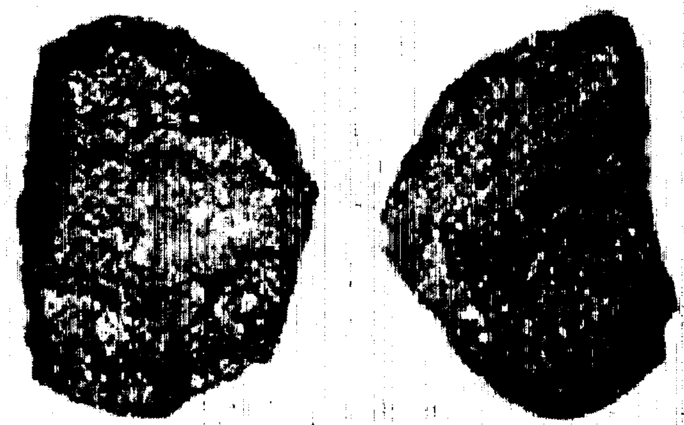
(1) How Can We Explain the Great Diversity of Planetary Objects?

(2) What Made Earth Different From Its Planetary Neighbors?

(3) The Planets All Started From The Same Planetary Nebula And Then Changed Over Time--But What Was That Starting Composition?

WHERE CAN WE SEEK ANSWERS?

- What Comes To Us From Space



This Is A Picture Of A Piece Of The Allende Meteorite That Fell To Earth At Chihuahua Mexico, Feb. 9, 1969

It Is Believed To Be The Order of 4.6 Billion Years Old, Dating It With The Formation Of Our Solar System. It Is The Oldest Material Identified To Date

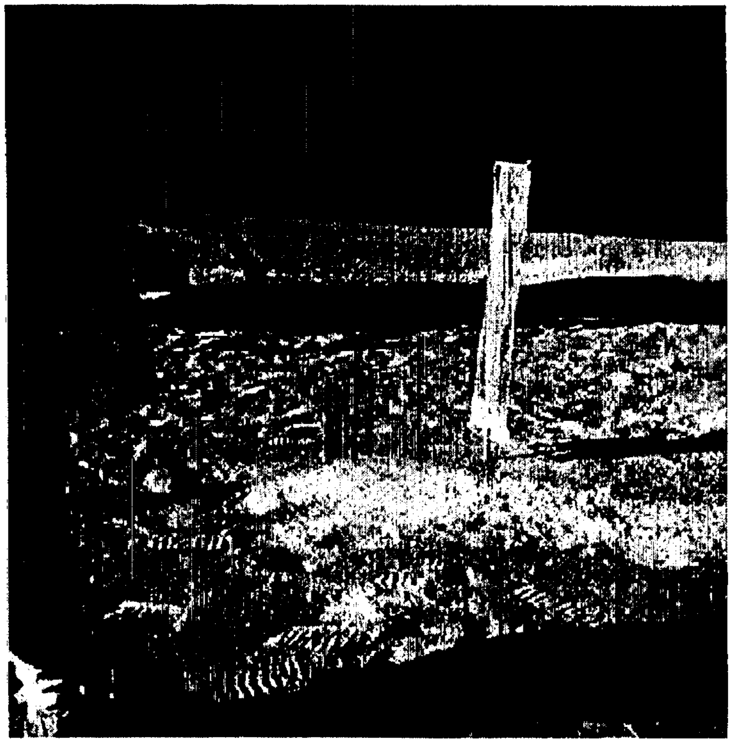
What Has Happened To It Over Those Many Many Years?

What Do We Need To Really Do ?

We Need To Some How Get Pieces Of The Sun From Outside The Cloak Of The Earth's Magnetic Field

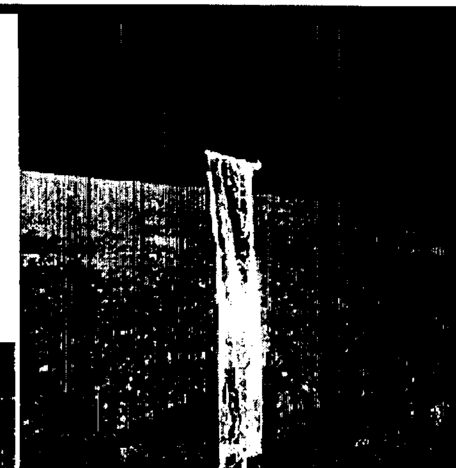
We Then Need To Analysis This Material For Many Isotopic Ratios Better Than We Have Done In The Past

HOW DO WE HAVE SOLAR COMPOSITION?
(The Moon Adventures Lead The Way)



The Apollo 11 "Foil" Experiment

Apollo 12 Foil



Apollo 16 Experiment

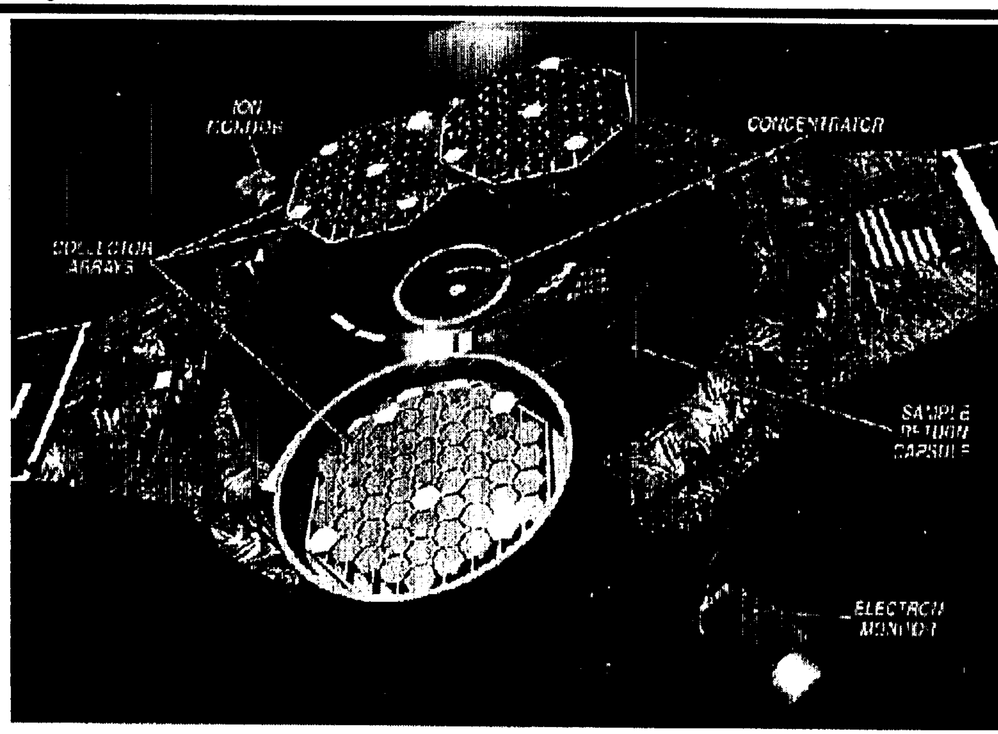
WHAT APOLLO SOUGHT TO UNDERSTAND

The Apollo Solar Wind Experiments Trapped Solar Particles On Aluminum Foil. These Foils Were Brought Back To Earth. Using The Best Methods Of Analysis At The Time, The Amounts Of Some Elements And Isotopes (Different Varieties Of The Same Element) Were Determined

An Example Of What Was Discovered

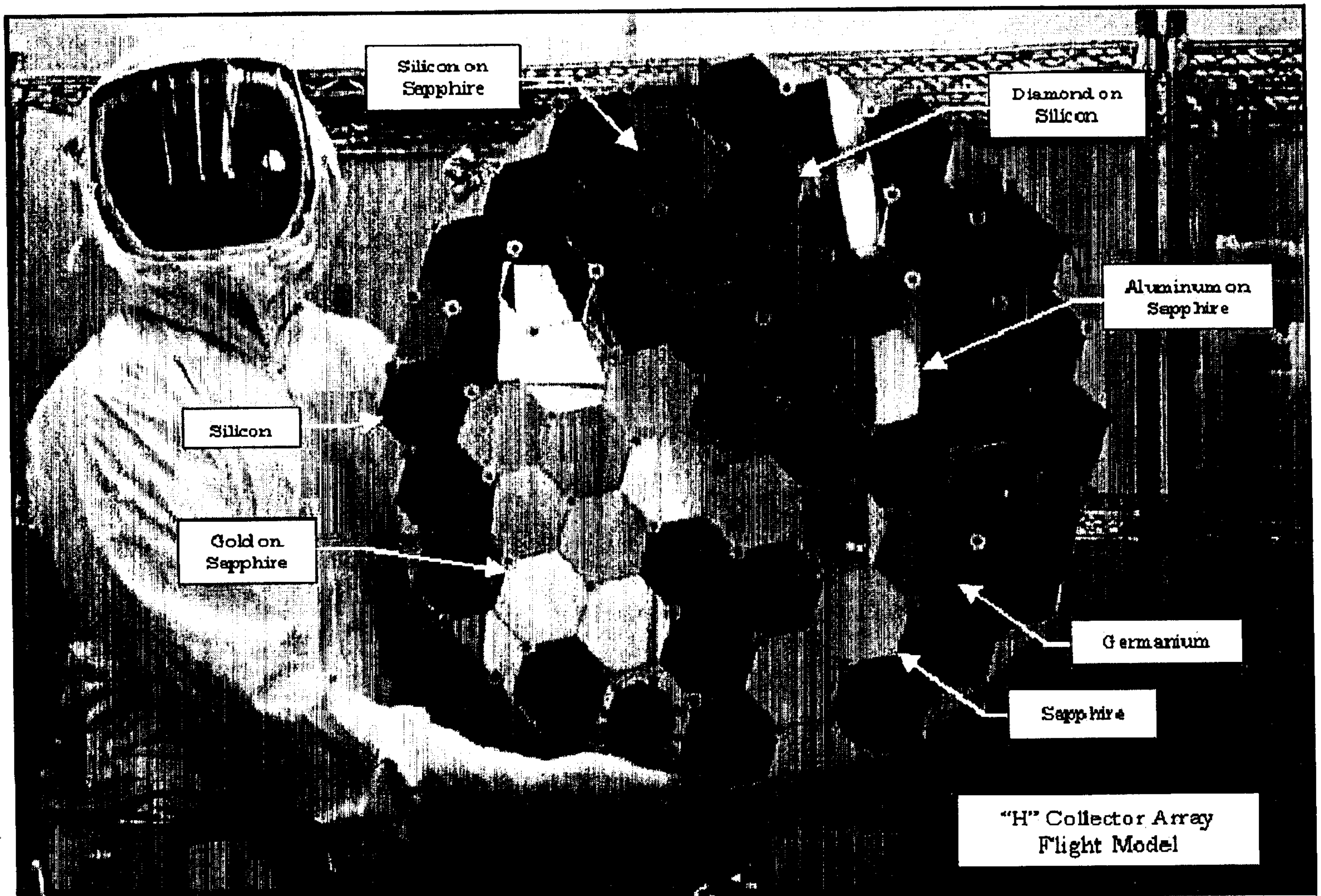
On Earth There Is 9.80 Times More Neon(20) Than Neon(22) Analysis Of The Apollo Foils Said The Sun Value Is About 13.7

ENTER THE GENESIS MISSION
(Our Adventure Begins)

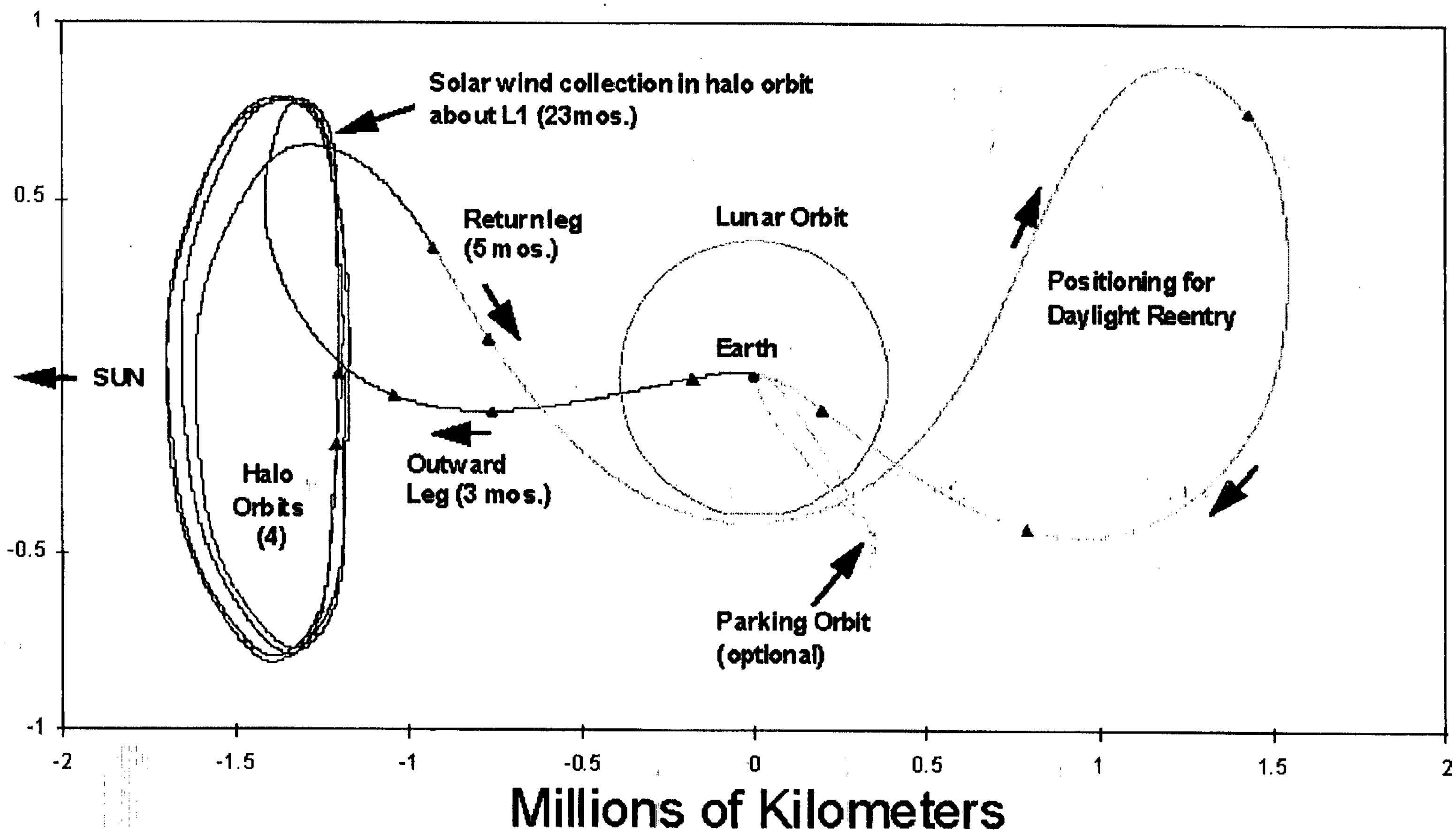


Genesis Is A Small Spacecraft That Will Remain In Space (A Million Miles From Earth) Collecting Bits Of Solar Wind, For About Two Years, Bring Them Back To New Earth Laboratories For The Most Detailed Analysis Ever Done To Determine The Building Blocks Of Our Solar System

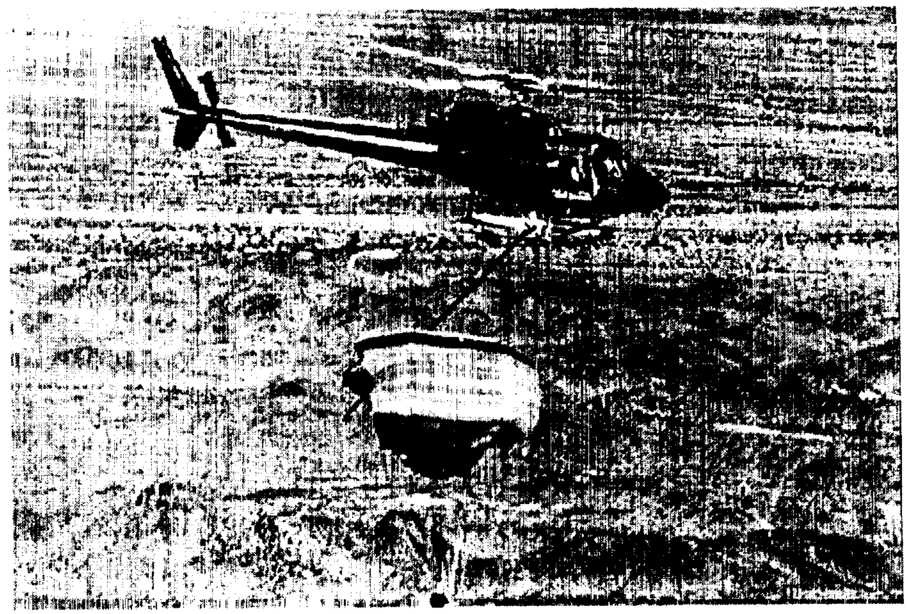
A FINISHED ARRAY



HOW DO YOU STAY A MILLION MILES FROM EARTH FOR TWO YEARS?

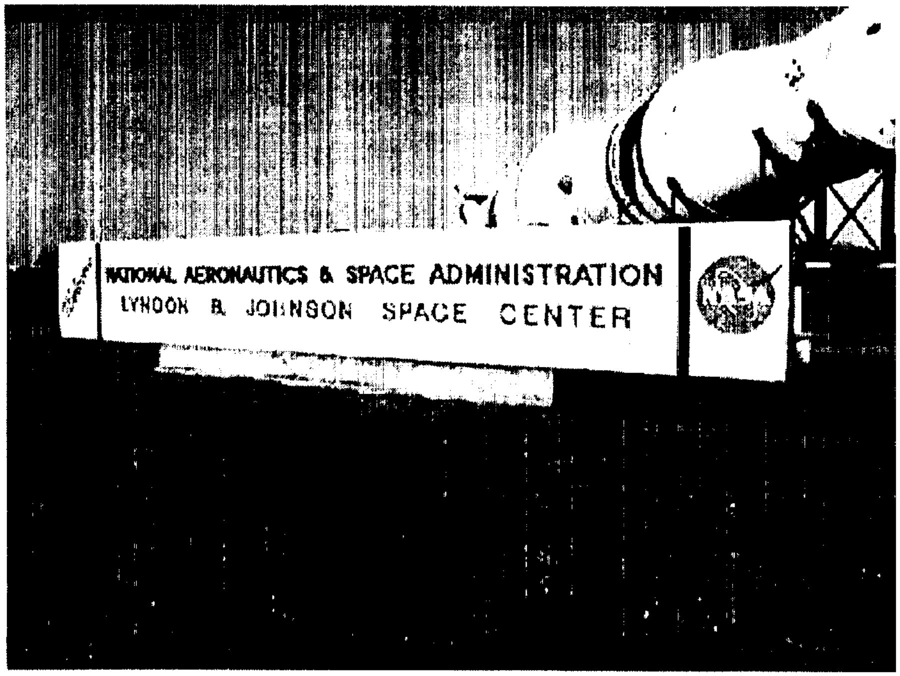


THE WELCOME HOME
(The End Of Phase One Of The Adventure)



A "Chopper" Will Catch The Re-entered Capsule At An Air Speed Of About 35 mph.

GENESIS WILL INVITE SCIENTISTS FROM ALL OVER THE WORLD TO JOIN THE QUEST
(We Want To Share The Adventure)



The Returned Wafers, Full Of Sun Particles, Will Be Stored In A Special New Area At JSC, Near Where The Moon Rocks Are Archived.

For The Next Century Genesis Materials Will Be Made Available to Scientists All Over The World Who Wish To Conduct Investigations.

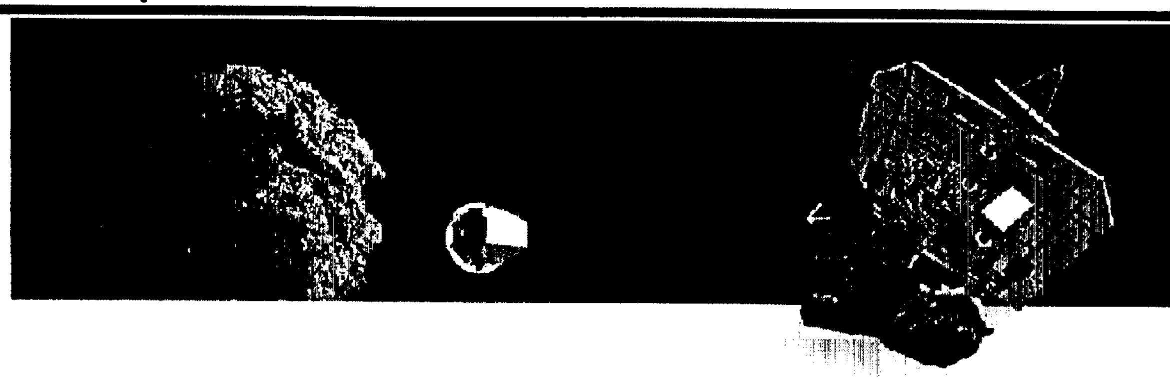
Take A Look At Our Educators Web Page

Http://genesismission.jpl.nasa.gov

JUST A WORK MORE ABOUT OUTREACH

- McREL (Mid -Continent Research in Education And Learning) Is Our Partner (And Sub-Contractor) In Denver, CO, For EPO
  - One Of The National Dept. Of Ed. (DOD) Labs
  - Has National Lead Rule For DOD In Standards And Learning
- Because Of This Genesis Not Only Has Good Science, But Also Speaks "Education"
  - Our Web Page Has Won Many Awards Because Of It Education
  - Our Products Are All Driven By The National Standards (I.e. Skills)
- It Has Taken Us Some Time To Understand Each Other's Worlds
  - Scientists And Engineers At JPL And Its Partners Just Look At Life Differently Than The Educational Community

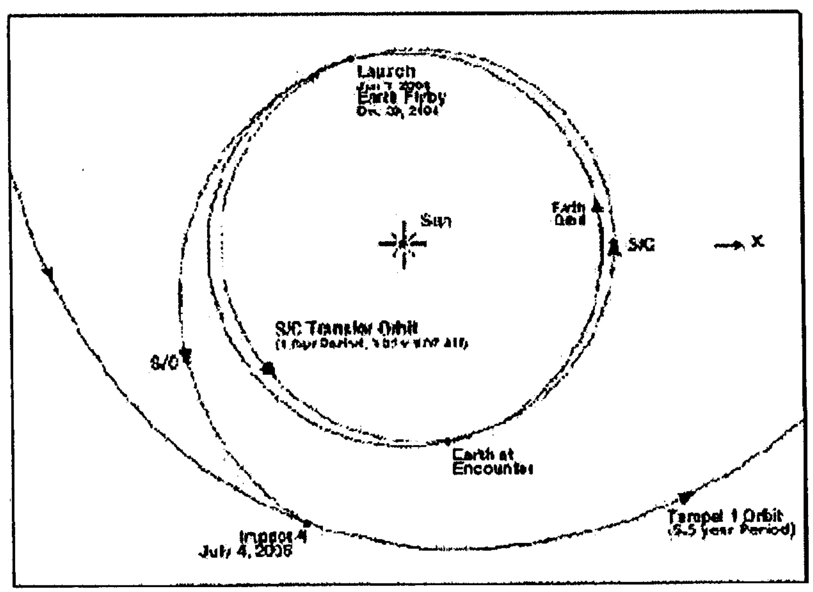
DEEP IMPACT "SHOOTING A COMET"



- **Deep Impact Is A New Mission That Also Seeks To Find Out More About Our Origins**
- **Deep Impact Will Find Out More About What Is Inside A Comet**
  - Many Feel Comets Contributed To The Development Of The Earth, Say In Providing One Source Of Water
- **How Do You Do That?—Shoot It!!**
  - Well Not Exactly

DEEP IMPACT

- We Will Put An Instrumented Spacecraft In The Orbit Path Of Tempel 1
- Our Spacecraft Will Send An Instrumented Probe (about 450 kg, Made Mostly Of Copper) Toward The On Coming Comet And Get Out Of The Way
- The Impact Will Produce A Crater 10-20 meters Deep (I.e. Deep Impact)
- The Spacecraft And Earth Bound Observers (Using Large And Small Telescopes) Will Analyze The Ejected Materials



G.Y. Page 16 4/12/99

WHAT ARE COMMON THREADS OF THESE PROJECTS

- There Is A Team For System Engineering--The People Who Will Design And Make The Spacecraft
- There Is A Team To Get It Launched, Get It Operational And Then Control The Spacecraft And Operate The Mission
- There Is A Team Of Scientists Who Work With The Other Teams To Make Sure The Spacecraft Will Get The Required Data And Then They Use It

Realize

- Almost Every Spacecraft Is Different Because Usually The Missions Are Different
- Each Mission Brings With It New "Insurmountable Problems"
- You Must Start Every Mission Knowing You May Have To Change or Modify Your Initial Ideas and Designs
- Remember, Your Mission Was Funded Because The Knowledge It Will Bring Is Important
  - You Have Been Funded To Find Out How To And Then Do The Mission
  - If You (Or Anyone Else) Already Knew Exactly How To Do It, Your Project Would Not Have Been Undertaken!!

HOW DO I PREPARE MYSELF FOR THESE JOBS

- Make Sure You Learn Your Basic Concepts And Fundamentals
  - No Matter What The Problems, The Laws Of Physics And Basic Analysis Techniques Still Seem To Hold
- The Main Skills To Bring With You To This Environment Are Knowing How To Learn And Attempt To Understand:
  - (1) New Concepts
  - (2) New (And Some Times Weird) Ideas
    - Be Able To Come Up With New Ideas And Innovative Approaches To Solve Problems (I.e. Make Up Your Own Weird Ideas)
  - (3) Be Willing To Learn New Ways To Do Things
- (*In My View*) If You Are Really A Good Student, You Will Realize How Much You DO NOT Know, But You Will Have The Self Confidence To Take On New And Challenging Jobs That Will Require You To Learn New Things And Do Things In Different Ways

INTERACTIONS WITH MINORITY INSTITUTIONS

- Now
  - M.O.U. With Cal. State Northridge To Allow Students (All Levels) To Work With Our Projects
  - The NSF Chautuaqua Program (JPL Is Cal Field Center, Dr. Yanow Director)
    - Provide Intensive 3 And 4 Days Courses On Areas Of Content And Teaching Methods (Several Courses Highlighting NASA Projects Or Programs)

INTERACTIONS WITH MINORITY INSTITUTIONS (Cont'd)

- The Future
  - Chautuaqua
    - Not Only Attend Courses, Act As Venue And Also Give Them At Their Institutions
      - Help Your Local Family And Build Up A National Reputation At The Same Time
  - Genesis
    - Our Principal Investigator Would Welcome MI's To Work With The Science (If Appropriate Task)
      - Surface and Materials Chemistry and Science
  - Deep Impact
    - Again MI Scientists And Students Would Be Welcomed To Work On The Science
      - Astronomy

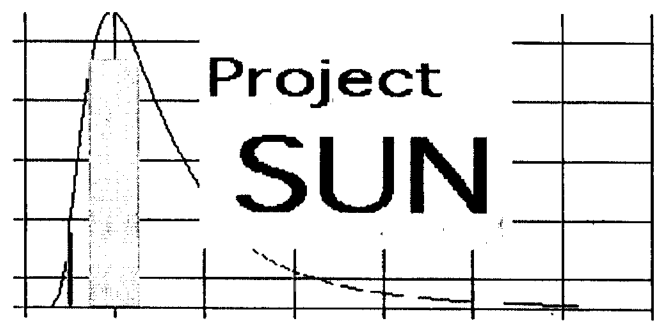
GETTING TO KNOW YOU BETTER

- How Can We Get To Know Each Other Better?
  - When A Task Or Idea Comes Up At JPL, I Would Like To Have, Because I Know YOU, Your Name Pop Up In My Mind And Give You A Call
  - When New Thoughts Or Needs Come Into Your Mind, I would Like To Have, Because You Know Me, My Name Pop Up In Your Mind To Give A Call
- I Feel In The End, Partnerships Are Really Based On Personal Relationships

GENESIS
SEARCH FOR ORIGINS

SPECIAL JPL STUDENT PROJECTS

JPL
Jet Propulsion Laboratory



Students Understanding Nature

Dr. Gilbert Yanow
NASA/Jet Propulsion Laboratory
4800 Oak Grove Dr., Pasadena CA 91109
(818) 354 8060
gilbert.yanow@jpl.nasa.gov

(MORE Details http://sunshine.jpl.nasa.gov)

Multidisciplinary, Multicultural, Urban Watershed Protection and Environmental Education Project

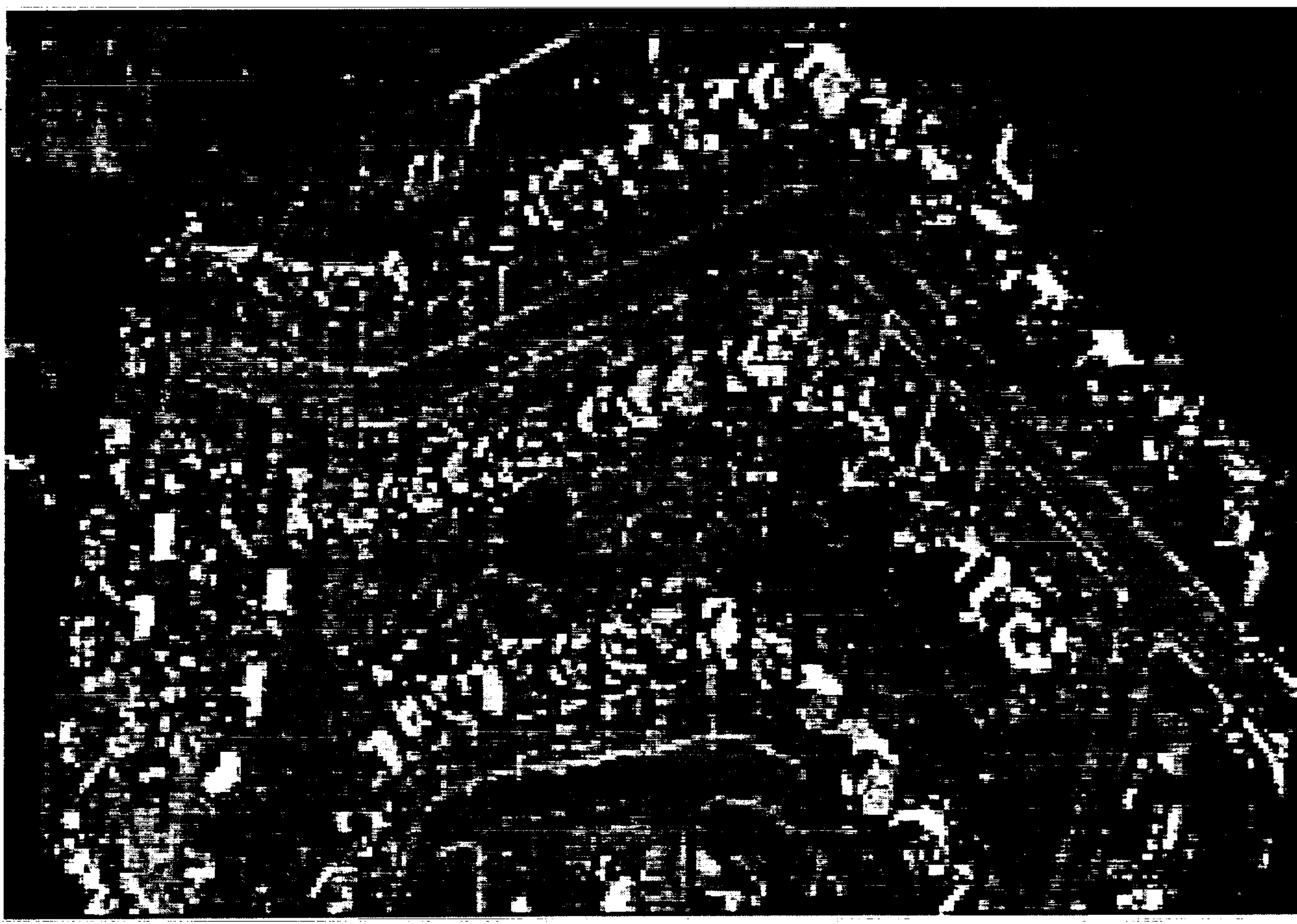
Dr. David Padgett
Tennessee State University

Multidisciplinary, Multicultural, Urban Watershed Protection and Environmental Education Project

David A. Padgett

Tennessee State University

Nashville, Tennessee



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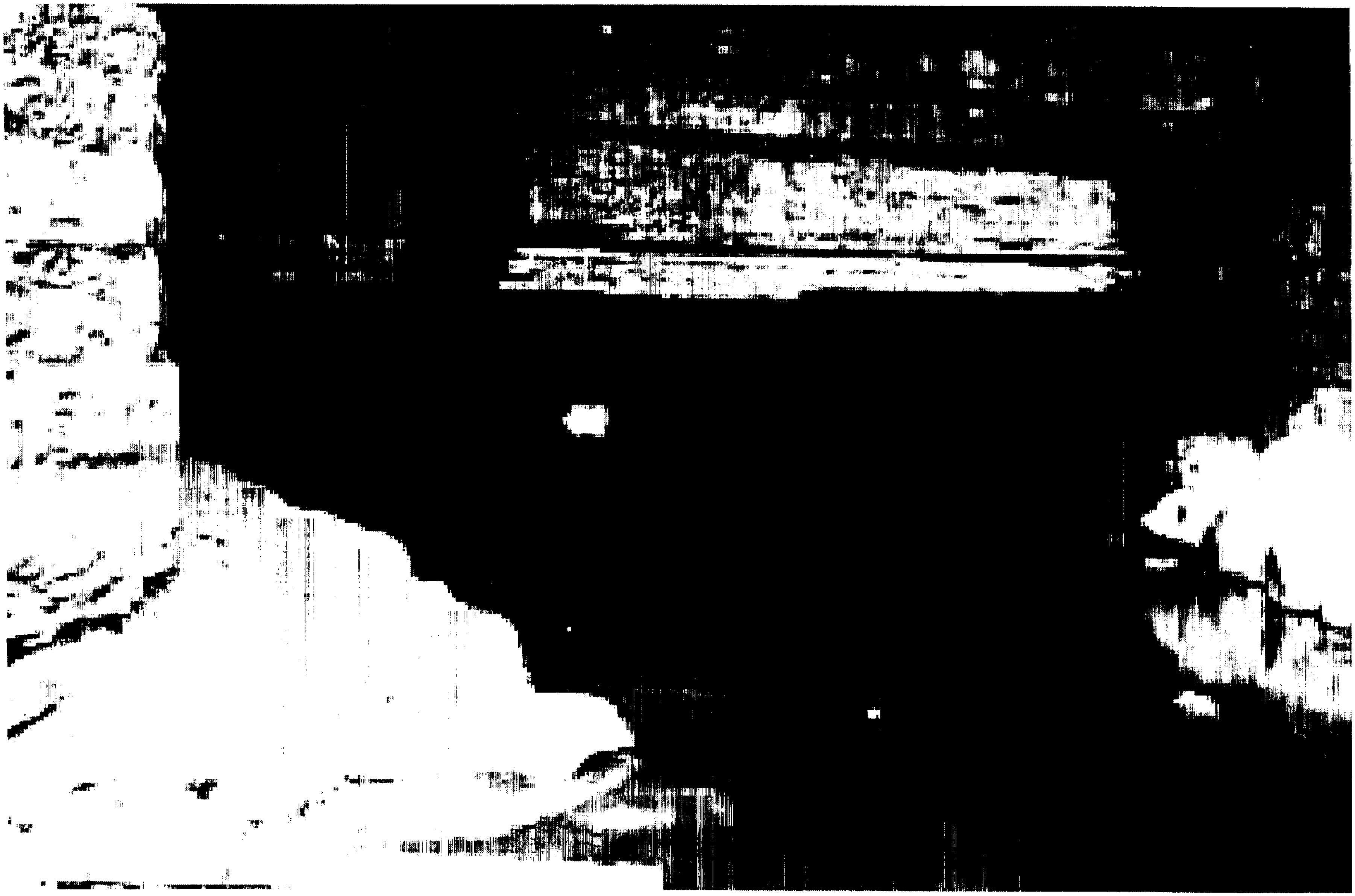
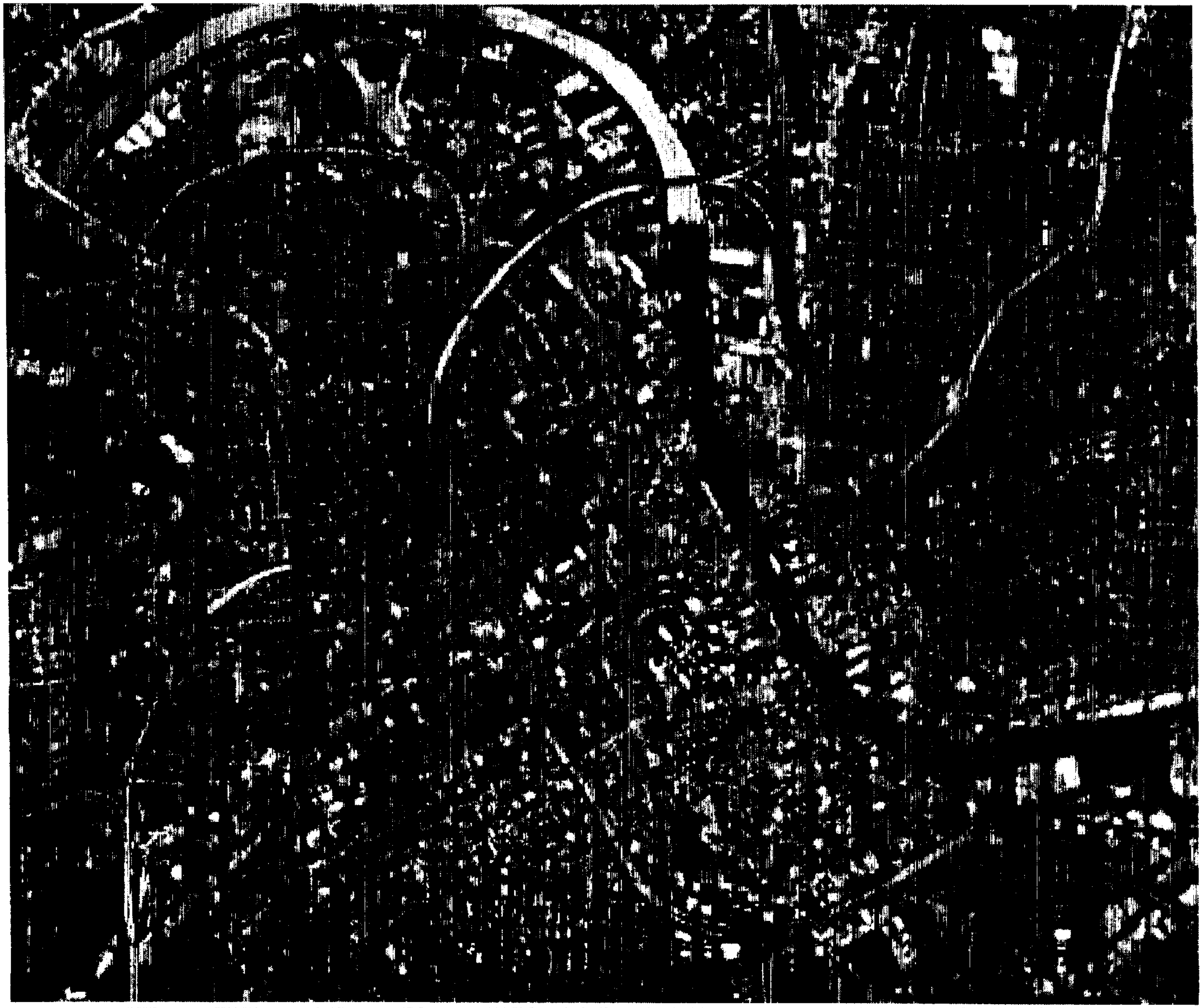


Watershed Impact Assessment

- LANDSAT Imagery (Shapefiles)
- Digital Orthophoto Quadrangles (DOQs)
- Digital Elevation Models (DEMs)
- ArcView GIS
- IDRISI GIS



USGS

Hydrologic Model

- Radnor Lake/Otter Creek has not been tested for water quality in over 10 years.
- We will test for P and N and turbidity – Sample points will be recorded using GPS unit.
- Differences between old and new results will be examined and compared using hydrological model of watershed runoff
- Potential sources of non-point source pollution will be located per results of the model.

NOVA Update

Dr. Leo Edwards, Fayetteville State University

Dr. Matthew Edwards, Spelman College

Dr. Victor O. Aimiuwu, Central State University

NASA

NOVA

NASA Opportunities for Visionary Academics

NOVA

NASA Opportunities for Visionary Academics

Incipit Vita Nova
(The new life begins)

NASA Opportunities for Visionary Academics

NOVA - Who We Are

NASA Headquarters

- Frank Owens
  - Education Division
- Malcom Phelps
  - Education Division

The University of Alabama

- Mike Freeman
  - Aerospace Engineering
- Kevin Whitaker
  - Aerospace Engineering
- Dennis Sunal
  - Science Education
- Jeanelle Hodges
  - NOVA Fellow

Fayetteville State University

- Leo Edwards
  - Math/Science Education Center
- Ron Johnston
  - Natural Sciences

University of Idaho

- Mike Odell
  - Science Education
- Bob Kearney
  - Physics

NASA Opportunities for Visionary Academics

NOVA Impact

- 69 institutions in 39 states, Virgin Islands and Puerto Rico in the NOVA Network (grants)
- More than 600 university faculty have participated in workshops
- More than 11,000 university students have taken NOVA courses
- 130 new/modified courses

NASA Opportunities for Visionary Academics

NASA Vision

... there will be a shortage of K-12 science, mathematics and technology teachers over the next five years.

*... it is important to focus on new opportunities to support initiatives in the preservice area. NASA's significant investments in R&D with institutions of higher education provide a unique asset to consider in identifying such opportunities.**

*NASA Implementation Plan for Education 1999-2003

NASA Opportunities for Visionary Academies

The NOVA Vision

NOVA will create change in higher education to enhance science, mathematics and technology literacy of preservice teachers.

NASA Opportunities for Visionary Academics

How does NOVA create faculty change?

- National workshops
- National conferences
- Grants to other institutions to create new or to modify existing content courses
- Research on change in higher education
- Continuous mentoring

NASA nova
NASA Opportunities for Visionary Academics

Specific NOVA Objectives

- **Disseminate NASA's preservice education model nationally** to a diverse population of higher education institutions, addressing critical concerns for equity and geographic distribution.
- **Continue development of NASA's preservice education model** aligned with NASA's Strategic Enterprises and the national standards and benchmarks for science, mathematics and technology.

NASA Opportunities for Visionary Academics

Specific NOVA Objectives
(continued)

- Sustain the change process by mentoring workshop participants and collaborating with NOVA partner institutions (grant recipients).

- Increase the collaboration among the NOVA partner institutions by providing a forum to exchange innovative ideas for change in preservice education.

- Stimulate and conduct research on the effectiveness of NASA's preservice education model.

NASA Opportunities for Visionary Academics

NOVA Workshops

Our primary dissemination vehicle is a university faculty development model with emphasis on:

Collaboration

Content

Pedagogy

Research

NASA Opportunities for Visionary Academics

Collaboration

- Interdisciplinary teams of faculty in science, mathematics, and/or engineering with faculty in education are required
- Additional faculty collaboration among the NOVA Network institutions as well as between institutions is emphasized

NASA NOVA NASA Opportunities for Visionary Academics

Content

- Aligned with NASA Strategic Enterprises
- Aligned with national standards for science, mathematics and technology
- Each institution targets appropriate science and mathematics courses to improve instruction for preservice teachers as well as non-science majors

NASA Opportunities for Visionary Academics

Pedagogy

- Instructional practices
- Inquiry-based learning
- Alternative assessment
- Cooperative learning
- Technology-facilitated learning
- Teaching for diversity
- Interdisciplinary approaches
- Aligned with national standards for science, mathematics and technology

NASA Opportunities for Visionary Academics

NOVA Workshops

Interdisciplinary teams ONLY

- content faculty (science, math, engineering, etc.)
- education faculty
- administrator(s)

NOVA subsidizes travel expenses for participants

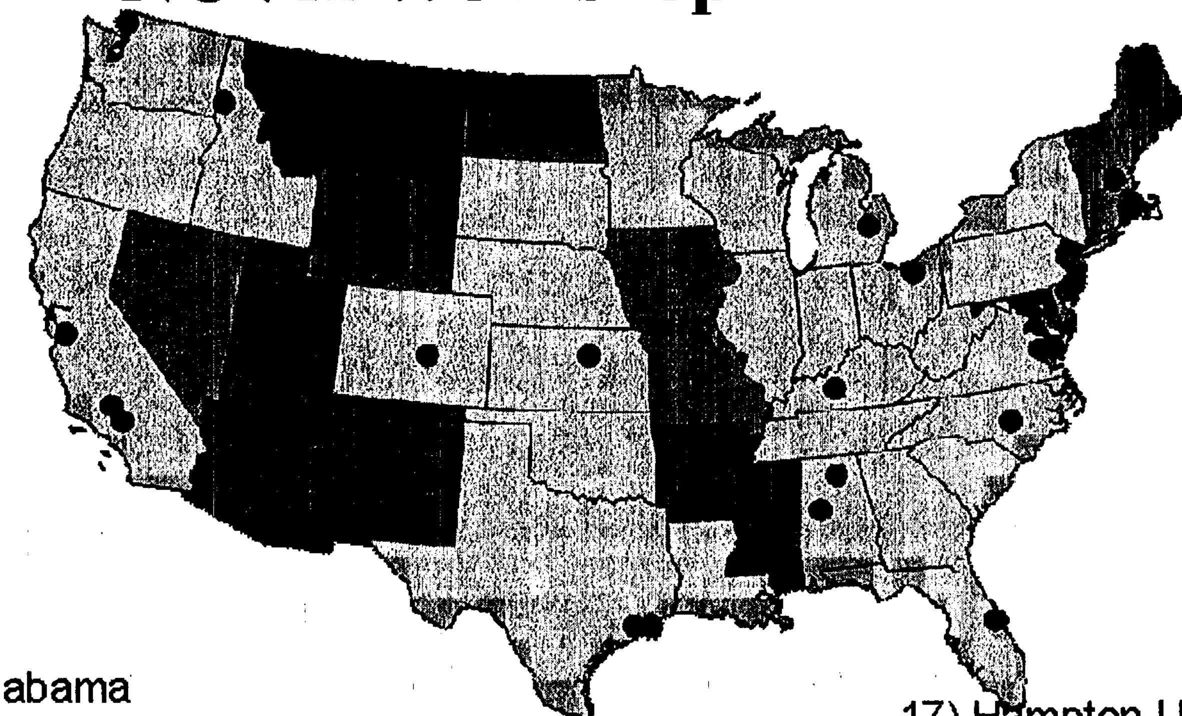
NASA Opportunities for Visionary Academies

NOVA Workshops

- 21 regional workshops scheduled
- 18 workshops held to date - 200 total institutions participating
- Process in place to help schools initiate or continue change after a workshop (Implementation Planning Grants)

NASA NOVA NASA Opportunities for Visionary Academics

NOVA Workshop Locations



1) Univ. of Alabama
2) Eastern Michigan Univ.
3) Fayetteville State, NC
4) NASA / JPL , CA
5) NASA / LaRC, VA
6) NASA / GRC, OH
7) Univ. of Idaho
8) New Mexico Highlands U
9) NASA / KSC, FL
10) NASA / JSC, TX
11) Univ. of New Hampshire
12) Kansas State Univ.
13) NASA / ARC, CA
14) Western Kentucky U.
15) Bellingham, WA
16) NASA / MSFC, AL(2/00)
17) Hampton Univ. (3/00)
18) Prairie View A & M Univ. (4/00)
19) Colorado Springs, CO (8/00;
20) NASA/DFRC, CA(2/01)
21) NASA/SSC, MS (8/01)

NASA nova NASA Opportunities for Visionary Academics

Implementation Planning Grants

- All workshop teams eligible to propose
  - quick review ~ 6 weeks after submission
- $30,000 limit with a one-to-one cost sharing requirement
- One-year duration

NASA Opportunities for Visionary Academics

Mentoring

ALL workshop participants are mentored after their workshop experience

- IP grant proposal preparation
- IP grant proposal revision(s)
- Implementation
- Institutional barriers
- Site visits

NASA NOVA
NASA Opportunities for Visionary Academics

Assessment and Evaluation

- Fully integrated into EDCATS
- Pre- and post-evaluation of participants
- Post-workshop surveys and interviews
- Workshop evaluations
- Evaluation of NOVA Network projects
- NOVA Network institution site visits

Electronic Dissemination

- NOVA Web Site (http://education.nasa.gov/nova/)
  - consortium information
  - curriculum materials
  - electronic workshop application
  - additional relevant links
- Grant Recipients' Web Sites
  - local institution information
  - curriculum materials
  - points of contact

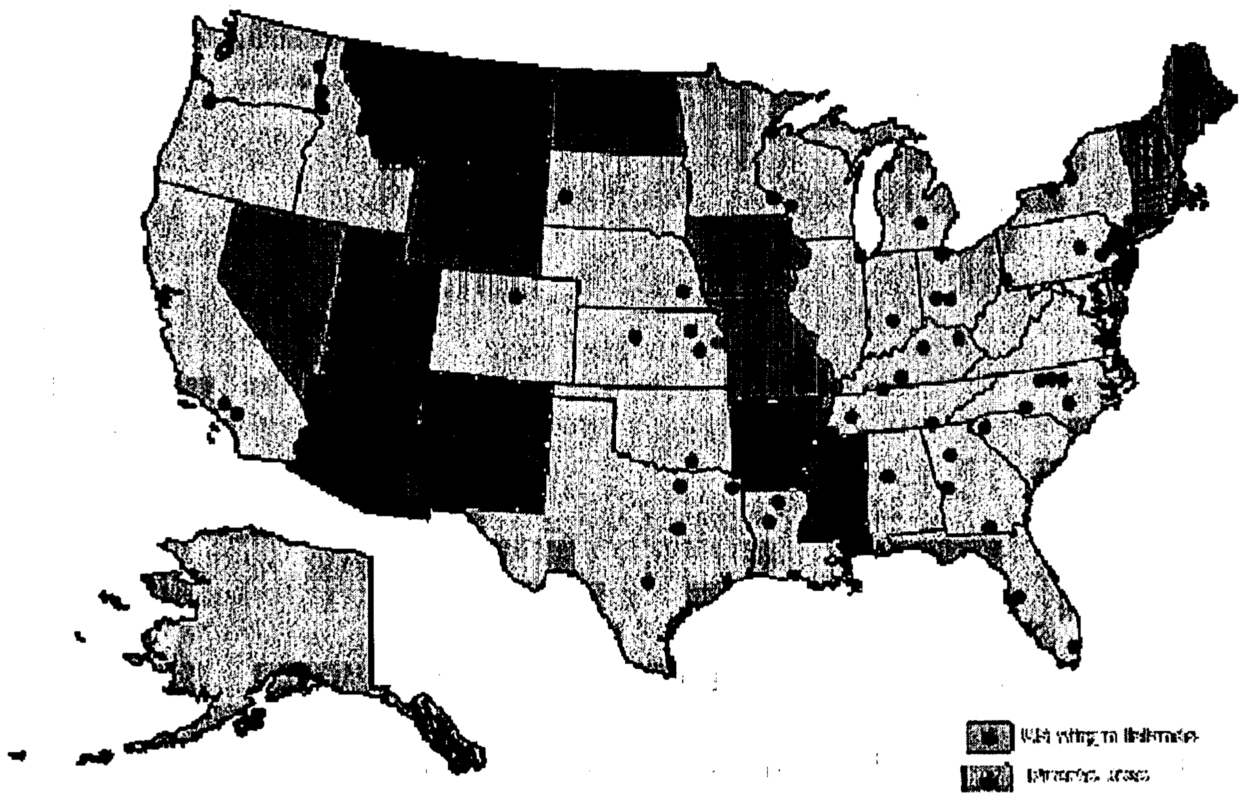
Leadership Development Conference

Grant recipients are brought back together to present their projects and research results, as well as to network with peers

- Annual (next - January 2001 in DC)
- Presentations along with focus groups to address key topics of concern
- 2 1/2 days
- Travel costs subsidized

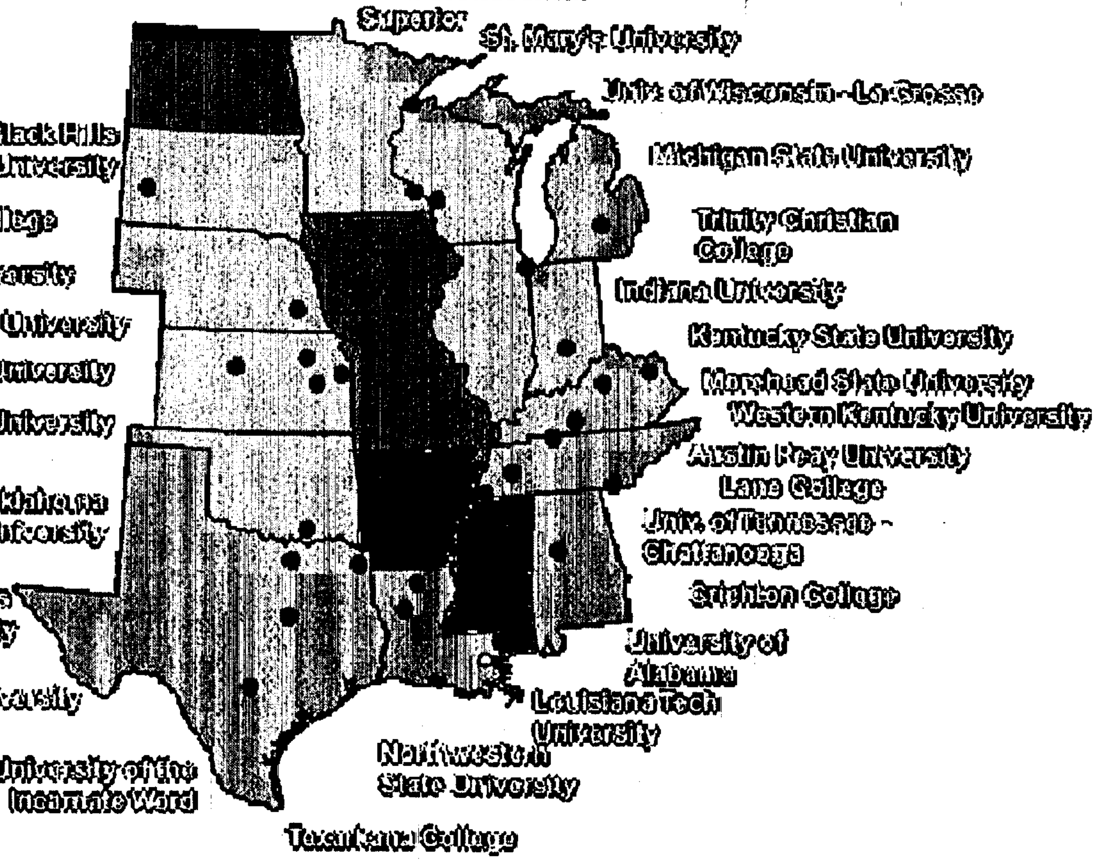
NASA Opportunities for Visionary Academics

The NOVA Network



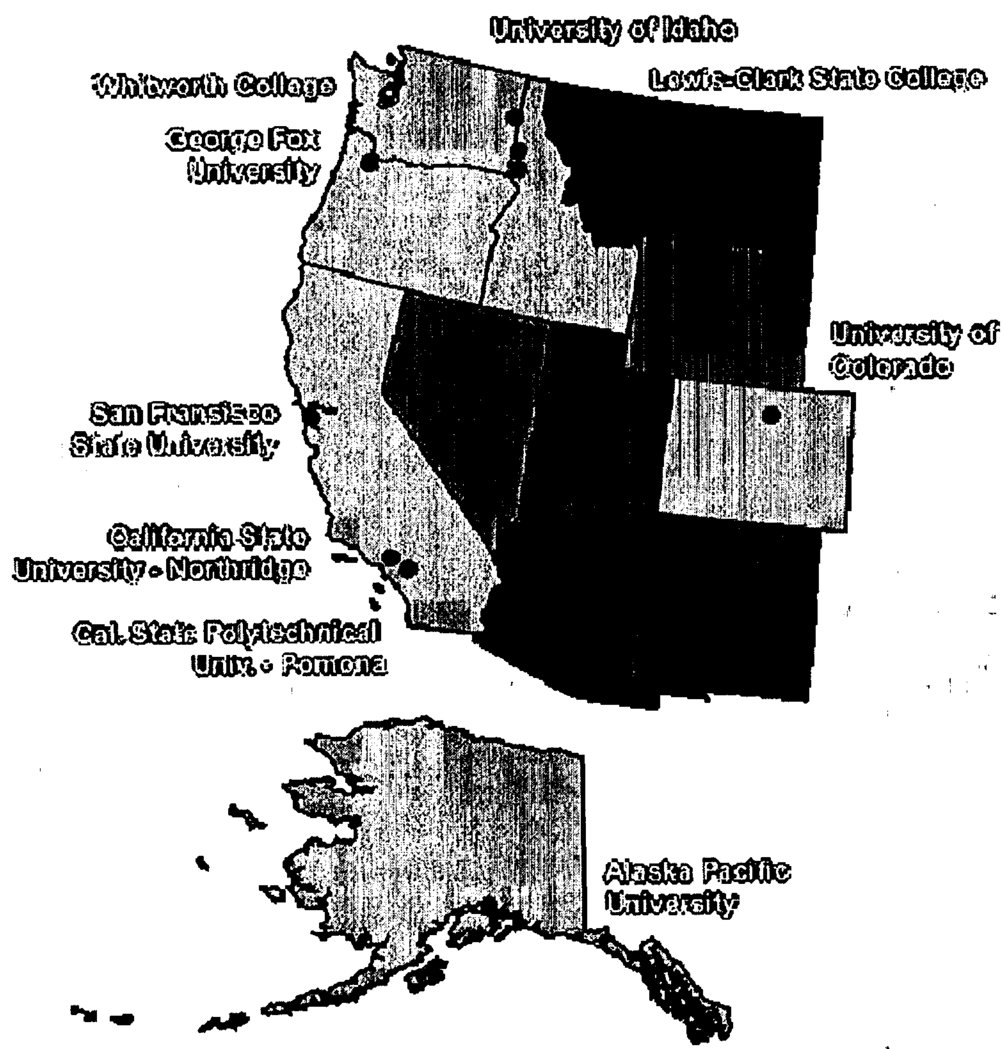
NASA Opportunities for Visionary Academics

NOVA Central



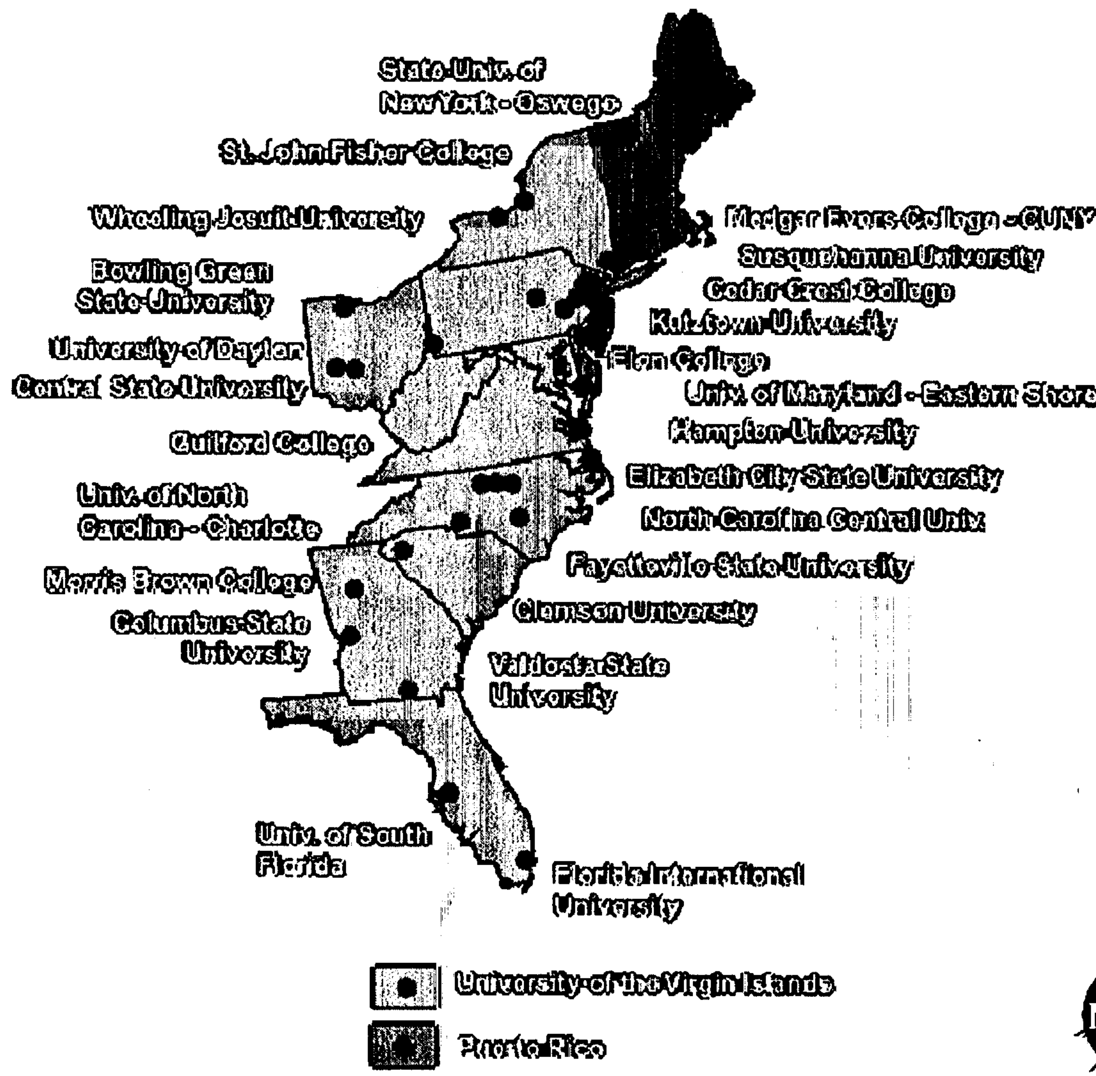
NASA NOVA NASA Opportunities for Visionary Academics

NOVA West



NASA Opportunities for Visionary Academics

NOVA East



NASA Opportunities for Visionary Academics

Stennis Space Center

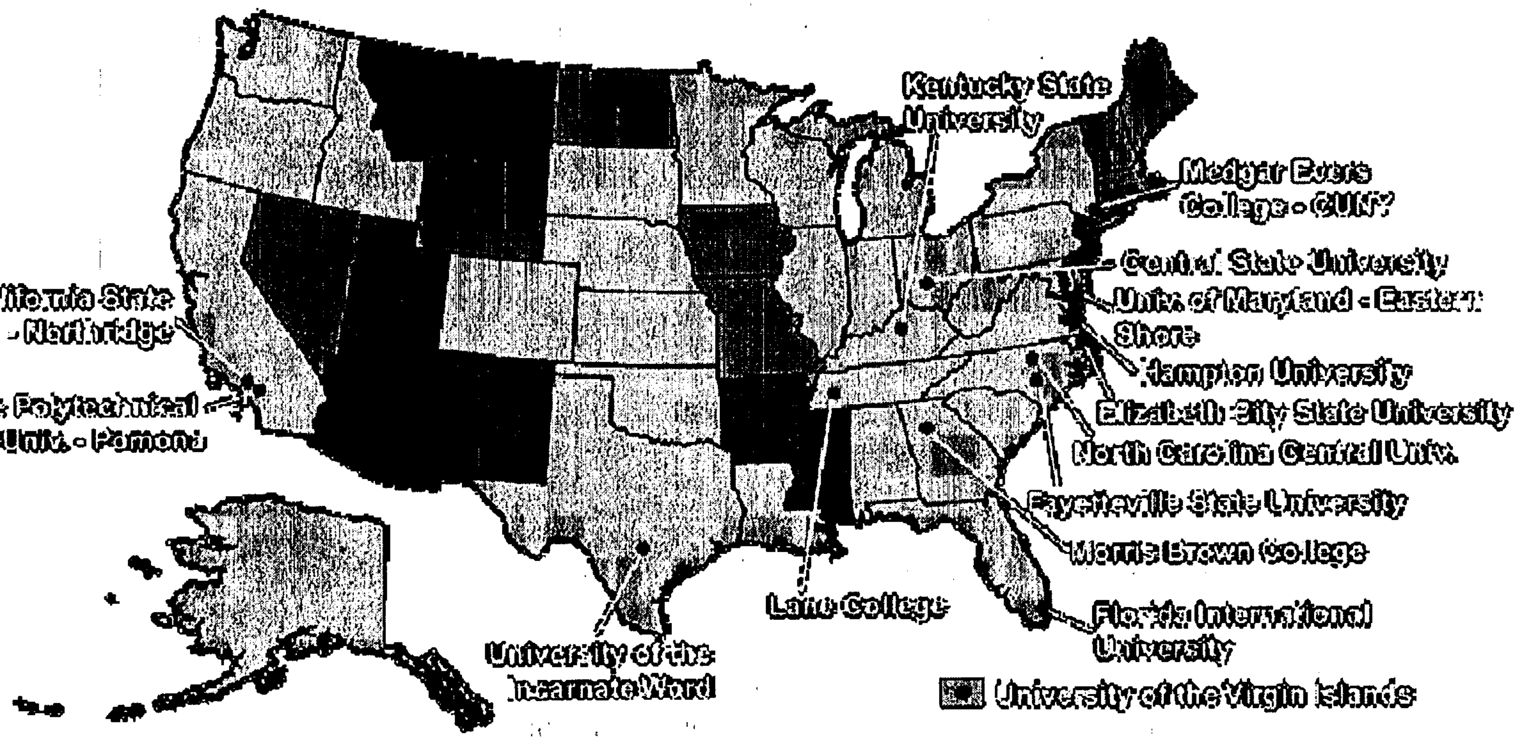
NASA Opportunities for Visionary Academics

NOVA/MUSPIN Workshop
April 17-19, 2000
Prairie View, TX

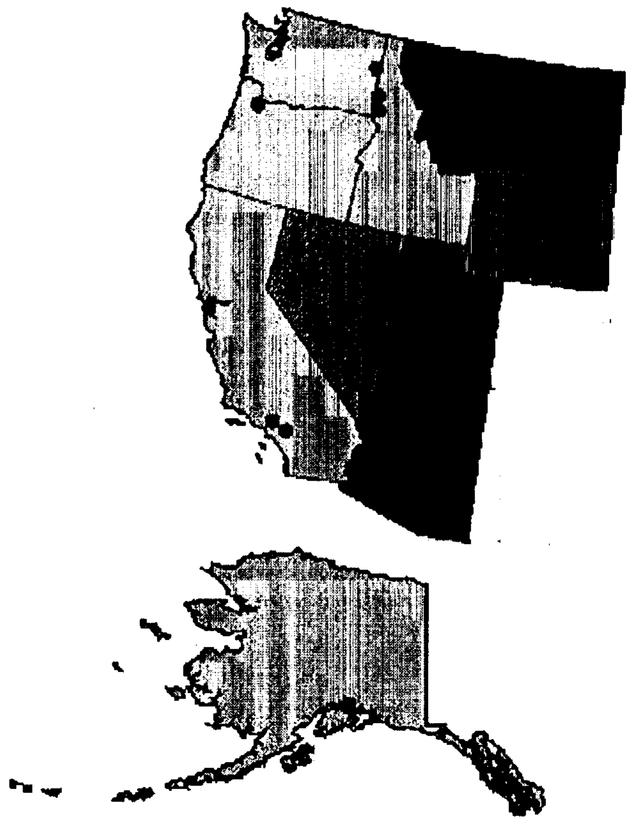
Alcorn State University
Benedict College
Central State University
Dillard University
Edward Waters College
Huston-Tillotson
Jarvis Christian College
Kentucky State University
Lane College
LeMoyne-Owen College
Paul Quinn College
Prairie View A&M University
Spelman College
Texas College
University of Texas-El Paso
Voorhees College
Wiley College

NASA Opportunities for Visionary Academics

Minority Institutions in the NOVA Network



Allen University
Claflin University

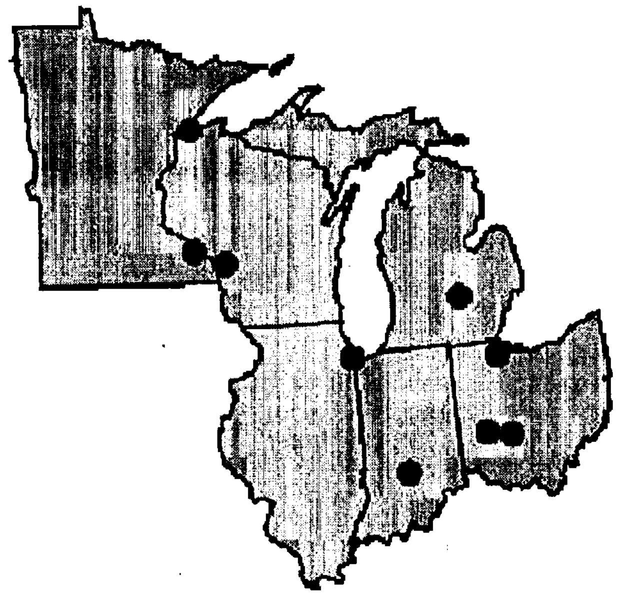


Ames Research Center

Alaska Pacific University
California State Polytechnical University - Pomona
California State Univ.- Northridge
San Francisco State University

George Fox University, OR
Lewis-Clark State College, ID
University of Idaho
Whitworth College, WA

NASA Opportunities for Visionary Academics

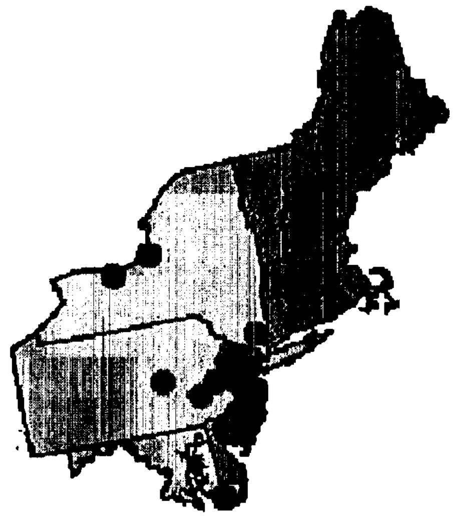


Glenn Research Center

Bowling Green Univ., OH
Central State University, OH
Indiana University
Michigan State Univ.
Univ. of Wisconsin- Superior

Trinity Christian College, IL
University of Dayton, OH
Univ. of Wisconsin-La Crosse
St. Mary's University, MN

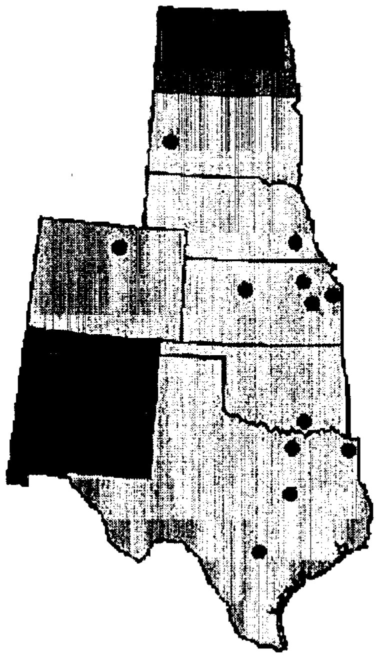
NASA Opportunities for Visionary Academics



Goddard Space Flight Center

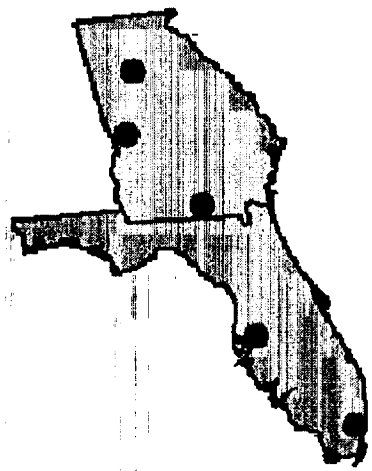
St. John Fisher College, NY
State University of New York-Oswego
Medgar Evers College - CUNY
Cedar Crest College, PA
Kutztown University, PA
Susquehanna University, PA
University of Maryland- Eastern Shore

NASA Opportunities for Visionary Academics



Johnson Space Center

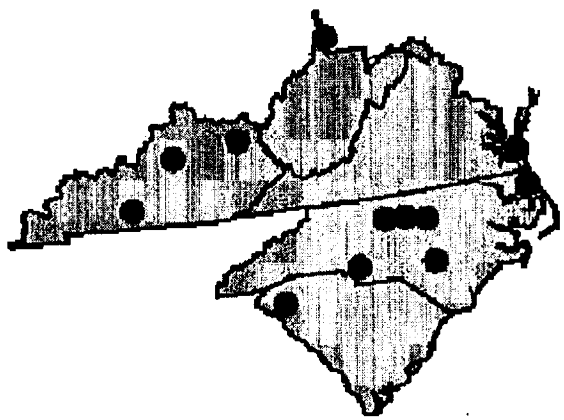
Baker University, KS
Baylor University, TX
Black Hills State Univ., SD
Doane College, NE
Emporia State Univ., KS
Texarkana College/Texas A&M University-Texarkana
University of Colorado
Fort Hayes State Univ., KS
Kansas State University
Southeastern Oklahoma State Univ.
Texas Womans University
Univ. of the Incarnate Word, TX



Kennedy Space Center

Columbus State University, GA
Florida International University
University of South Florida
University of the Virgin Islands
Valdosta State University, GA
Morris Brown College, GA

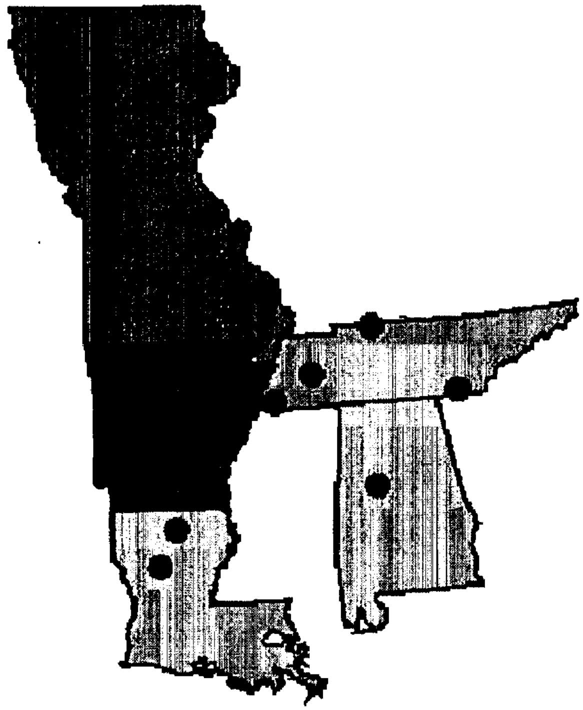
NASA Opportunities for Visionary Academics



Langley Research Center

Clemson University, SC	Morehead State Univ., KY
Elizabeth City State Univ., NC	Kentucky State University
Elon College, NC	North Carolina Central Univ.
Fayetteville State University,NC	UNC-Charlotte
Guilford College, NC	Western Kentucky University
Hampton University, VA	Wheeling Jesuit Univ., WV

NASA Opportunities for Visionary Academics



Marshall Space Flight Center

Austin Peay State Univ., TN	Northwestern State Univ., LA
Crichton College, TN	University of Alabama
Louisiana Tech Univ.	Univ. of TN- Chattanooga
Lane College, TN	

NASA nova NASA Opportunities for Visionary Academics

Stennis Space Center

NASA Opportunities for Visionary Academics

Connections to Strategic Enterprises

- Earth Science - <u>**51**</u> institutions (84%)
- Human Exploration & Development of Space (HEDS) - <u>**27**</u> institutions (44%)
- Space Science - <u>**27**</u> institutions (44%)
- Aero-Space Technology - <u>**9**</u> institutions (15%)

Most NOVA institutions have developed courses with connections to multiple NASA strategic enterprises

NASA Opportunities for Visionary Academics

Phase II Grants

- Schools eligible after completion of initial NOVA grant
- Up to $30,000 (with 1:1 match required)
- Expansion of initial NOVA project to other institutions (for example, feeder community colleges), additional faculty and other courses
- Education research

NASA nova
NASA Opportunities for Visionary Academics

Phase III Program

- Schools eligible after completion of initial NOVA grant
- Immersion into specific NASA centers and their research activities
- Products are required and include web assisted modules which become part of their NOVA courses
- 1999 pilot at GSFC
- 2000 weeklong program at MSFC

NASA Opportunities for Visionary Academics

Research

- Action research approach to course innovation in NOVA network
- Impact on students
- Impact on faculty
- Impact on departments and colleges
- NOVA research and evaluation program

NASA Opportunities for Visionary Academics

NASA NOVA

NASA Opportunities for Visionary Academics

My Experiences at a Mu-Spin/NOVA Workshop and NOVA's Overall Importance to Innovative Changes in Teaching Science and Mathematics

Matthew E. Edwards, Ph.D.
Associate Professor of Physics
Spelman College
Atlanta, GA. 30314

Presented at

MU-SPIN Tenth Anniversary Users' Conference

MURED Second Annual Education Conference
September 11-16, 2000
Morris Brown College and Atlanta Renaissance Hotel

In actuality I was not very thrilled about traveling to and attending a four-day NASA NOVA (NASA Opportunities for Visionary Academics) workshop as requested by my Provost; especially not excited, since, at that time, another demanding academic year was winding down and thereupon ushering in the typical rush of last minute material to be covered in classes and the inevitable close of school issues for the year. The workshop was scheduled to begin on April 16th, and I had received the request to attend only ten days earlier. I reluctantly agreed, along with a colleague from the Department of Education, to represent Spelman College at the workshop. Little did I know what awaited us at Prairie View A&M University, the workshop's host institution, nor did I think the workshop would be significantly beneficial to my professional duties at Spelman—teaching, research and college-community service. Nevertheless, I flew, on the evening of April 16, 2000 to Houston, Texas, to join other participants of the workshop—some fifty or so other faculty members, and the workshop organizers and presenters from NASA sites and various Universities.

Upon boarding a bus the next morning for the trip from Houston to Prairie View A&M University—we stayed in Houston and traveled the approximate one hundred-plus miles round trip daily—I, by happenstance, sat next to my colleague from Spelman, Dr. Judy B. McPherson, a relatively new faculty member at the College. From previously viewing each other as distant colleagues, working in different areas of the

College, we immediately began to converse about issues at the College and Atlanta and why we were tagged for this trip, as opposed to two other faculty members, and what we might expect at the workshop. From that morning onward, we sat together to and fro between Houston and Prairie View A&M University. This juxtaposition turned out to be an important arrangement in our correctly assimilating materials of the workshop; especially, it afforded us with a unique opportunity to anticipate the issues of the day on the forward trip and to reflect on them during the return, particularly in their connection to Spelman. Also, we discovered, over the four days, how valuable the workshop was to us in addressing changes in teaching patterns in science and mathematics, especially how the changes might affect pre-service teachers of grades K-12 and the pedagogy of College Professors.

On entering the site of the workshop for the first day, we each received a large-sized notebook; this handout was to become the main guide of instructional materials for the duration of the workshop. Some sections of the notebook were on:

1. An overview of NOVA,
2. Barriers to changes in an academic setting,
3. NASA Strategic Enterprises,
4. Innovative Instructional Strategies,
5. Inquiry-Based Learning/Conceptual Reconstruction,
6. Action Research,
7. Strategies that Facilitate Learning,
8. New Curriculum Goals and Connections to Standards,
9. Interdisciplinary Approaches in Teaching, and
10. Writing Proposals' Techniques for MU-Spin/NOVA.

My colleague and I discussed—primarily in transit between sites—these materials as they occurred over the duration of the workshop. Through these sessions and after the workshop presentations, we developed the fundamentals of a grant proposal on a possible course for modification in the curricula at Spelman. By workshop's end, only the particulars and a unifying theme for the proposal remained to be developed; these last aspects unfolded shortly upon our return to Atlanta from Houston.

In structuring the primary objectives of our grant application, we decided to infuse the concepts of: interactions between parts[1,2] as critical aspects of learning science correctly, conceptual reconstruction[3–5] to eliminate erroneous knowledge, as is often unintentionally or mistakenly provided to students, and thirdly, action research.[6–8] These three features provided the cohesion needed to solidify the grant application. Using these concepts we developed and submitted a planning grant application to Mu-Spin/NOVA to modify the course, Natural Science 101 (Interdisciplinary Science for non-science majors—a course in a developmental state, at Spelman, with good features already in place). We chose to revamp or enhance this course through the grant application with the objectives of:

1. Implementing the concept of interaction between parts, components, and systems as an essential feature in students' learning the conventions and methods of science,
2. Implementing conceptual reconstruction/inquiry-based learning by using the techniques of action research and learning cycles,
3. Completing the development of two-final course modules with one in materials science and the other in light and optics,
4. Providing for the inclusion of aspiring teachers or pre-service teachers in the course,
5. Providing for the systemic inclusion of reading comprehension and scientific writing, and
6. Embracing the missions of NASA in the full operations of this course as a partner with Spelman to address science literacy.

In achieving these objectives, successful outcomes for the course would be:

1. The total course's revision having interaction considerations between parts, components, or systems as a principal theme,
2. The total implementation of conceptual reconstruction and inquiry-based learning as the most important elements of effective teaching of this course,
3. The completion of a present module on light and optics, and the creation of a second on materials,
4. The infusion of reading comprehension, scientific writing, computer simulations and demonstrations in the final two modules of the course,
5. The development of non-science majors and pre-service educators with effective methods and techniques and meaningful knowledge of science, and
6. The inclusion of NASA's missions[9] and its technologies within the course.

These outcomes will be of significant enhancements to the instructional programs and the science objectives at Spelman.[10–12]

Once considered, it is readily apparent that interaction between parts or components is ubiquitous in the sciences, and therefore, science taught correctly must focus on this aspect. This single idea is the overwhelming motivation for its inclusion in our grant application. On the issue of conceptual reconstruction, it occurs to us that students bring to the learning arena terribly erroneous information, such as their thinking that lava during volcano eruption and some earthquakes comes from the liquid-core region of the earth—because at some point they were told that the earth's outer core was liquid, so that's where the liquid magma is coming from, with no thoughts about the involvement of the liquefiable asthenosphere and the actual distance between the earth's surface and its core; or their thinking that the seasons of the year on earth occur because of the distance from the earth to the sun, with no thoughts about the tilt of the earth's axis relative to the sun rays as the true cause. Therefore, systematic efforts must be critically sought-after to eliminate wrong information before true learning can occur. That is where our use of conceptual reconstruction with the inclusion of inquiry-based learning is to be used. Various techniques will be considered during our planning grant on how to implement conceptual reconstruction. And finally, the concept of action research, which is outside the normal professional training of most science faculty—it typically occurs in educational pedagogy, is an important concept in our grant application. It is meant to be the vehicle of immediate feedback and assessment in the classroom setting for "on-the-spot-delivery" of information—there's no meaningful purpose in continuing to teach a concept in the same manner if students are not grasping the basic ideas from that approach. Action research gives the instructor the impetus to adjust his/her delivery techniques. We will observe to what extent formal Action Research intervention "fits" with science teaching at Spelman. I suspect it to receive significant applicability. Therefore, during our present planning grant, these three concepts will be explored to determine their effectiveness.

Currently, we are beginning to consider how to initiate our grant objectives and how to assess the outcomes. I am poignantly mindful of the fact that none of these concepts, quite probably, in connection with NASA's mission and its technologies would be under discussion or consideration without our initial workshop participation at Prairie View A&M University and with the concomitant bus rides between the workshop site and the overnight-stay hotel. What began, for me, as a misconceived idea of another ho-hum trip has developed into a valuable planning grant, a greater understanding of the missions and objectives of: NASA, MURED (Minority University Research and Education Division), MU-Spin, and NOVA and the acquisition of new ideas on how to teach science and mathematics to deserving students.

References

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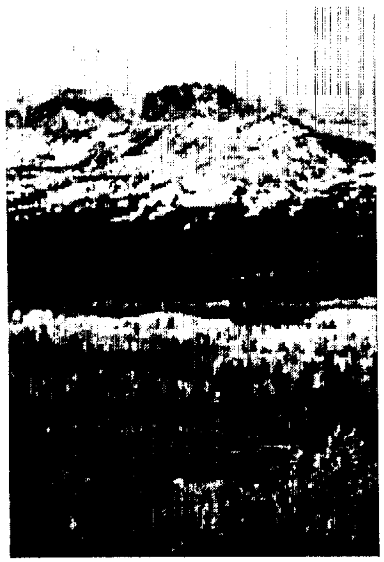
Space Science Courses

Dr. George Tuthhill, Montana State University

Space Science Courses: Internet Learning for Science Teachers

http://btc.montana.edu/nten
http://btc.montana.edu/ceres

MONTANA STATE UNIVERSITY
BOZEMAN



Montana

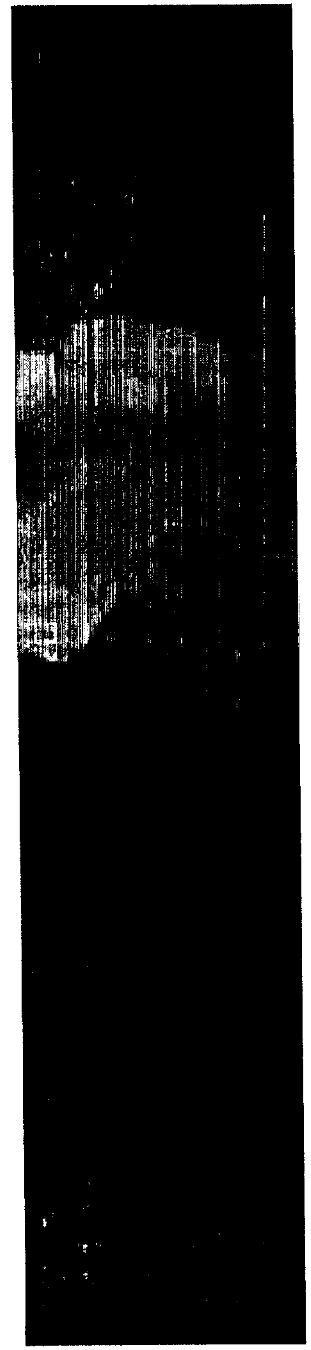
- 6 persons/mi^2
- remote access is essential!

MONTANA STATE UNIVERSITY BOZEMAN

National Teachers Enhancement Network (NTEN) and Center for Educational Resources (CERES)

- professional development for middle school and high school science teachers nationwide
- science, math, and science education courses delivered over the Internet
- exemplary web-based instructional materials in space science
- support from NSF and NASA

MONTANA STATE UNIVERSITY BOZEMAN



On-line courses - Goals

- deepen science understanding for teachers
- practicing scientists working w/ teachers
- make science content relevant to the classroom
- demonstrate "best practices" in science teaching & learning

MONTANA STATE UNIVERSITY BOZEMAN

On-line Courses - Academic Areas

Astronomy & Space Science (CERES)

- Biology
- Chemistry
- Earth Science
- Education
- Engineering
- Entomology
- Mathematics
- Microbiology
- Nutrition
- Plant Science
- Physics
- Environmental Science

MONTANA STATE UNIVERSITY BOZEMAN

On-line courses - Style

- asynchronous conferencing
- highly interactive & structured
- emphasis on discussion, collaborative work, real data
- max 25 students per class

MONTANA STATE UNIVERSITY BOZEMAN


NASA - MSU/Bozeman CERES Project - Netscape
Print
Stop
CERES Project
Center for Educational
Resources (CERES) Project

CERES Goals

- increase science understanding for K-12 teachers and students
- bring NASA-based electronic resources to classrooms
- map NASA-based resources to NRC Standards
- classroom-ready exemplary classroom activities for students on-line
- Internet-based courses for in-service K-12 teachers
- remote multimedia development capability

CERES Courses

Comparative Planetology

Observing the Universe

Astrobiology

<u>Course Characteristics</u>

- scientist / teacher development teams
- integrate pedagogy, content, and resources
- on-line, asynchronous
- interactive and collaborative learning
- modular organization
- graduate credit

NASA/MSU-Bozeman Internet Courses - Netscape

Forward Stop

http://btc.montana.edu/ceres/html/Courses.html

Internet Courses

Studying the Universe with Space Observatories:

Recent NASA missions have rapidly increased our ability to explore and understand the structure, dynamics and evolution of our universe. Mysteries from the inner workings of stars to the formation of galaxies and the beginnings of the universe itself are being unraveled with each new observation. At the same time, growth of the internet has allowed for rapid and direct dissemination of fundamental discoveries and scientific results to the public, sometimes even as they occur, and often without adequate scientific context or commentary. This course will provide the conceptual and scientific background necessary for understanding and interpreting the results of missions related to galactic and extragalactic space science. There has never been a more exciting time to become knowledgeable and involved in NASA's plan for the exploration of deep space.

Instructor

David M. Caditz, PhD is a Visiting Assistant Professor of Physics at Montana State University. Dr. Caditz has performed research in elementary particle

Online courses: What's needed

Students need:

- computer with Mac OS or Windows
- Internet connection
- <u>time</u> - these are rigorous, demanding courses

MSU supplies:

- software for conferencing and document exchange
- technical support
- logistical support

On-line course reactions....

- ***accessibility***

  " I doubt that I would be able to take this course or one like it any other way ...I live a long distance from the nearest University"

- ***interactivity***

  "I'm most surprised by the torrents of information that are coming through my computer. Don't these people have lives?"

And more reactions...

- ***collaboration***

  "I find the power of this weekly conferencing unmatched by any course or textbook I have read. This medium allows us to resonate and reflect our views."

- ***effectiveness***

  "These courses are highly successful ... not because they are electronic but because they are human."

CERES Astrobiology Course

- Formation of Stars and Planetary Systems
- Origin and Evolution of Life on Earth
- Habitable Zones Around Sun-Like Stars
- Water on Mars and the Martian Meteorite
- Extremophiles I: Hydrothermal Ecosystems in Yellowstone National Park
- Extremophiles II: Cryogenic Ecosystems in Antarctica

And….

- Oceans on Europa and the Moons Around Gas Giants
- Methods Used in Search for Extra-Solar Planets
- Analyzing Data on Extra-Solar Planets
- Dissecting the Drake Equation
- Radio Search for Extra-terrestrial Intelligence
- Aligning with the NSES & and NASA Roadmap for Astrobiology Research

CERES Innovative Instructional Materials Development

- keyed to:
  - **NSE Standards**
  - **NASA (OSS) mission statement**
- collaborative teacher/scientist teams
- capitalize on NASA resources
- next-generation educational technologies
- age-appropriate, interactive, classroom-ready
- http://btc.montana.edu/ceres/

Sample CERES On-Line Lessons

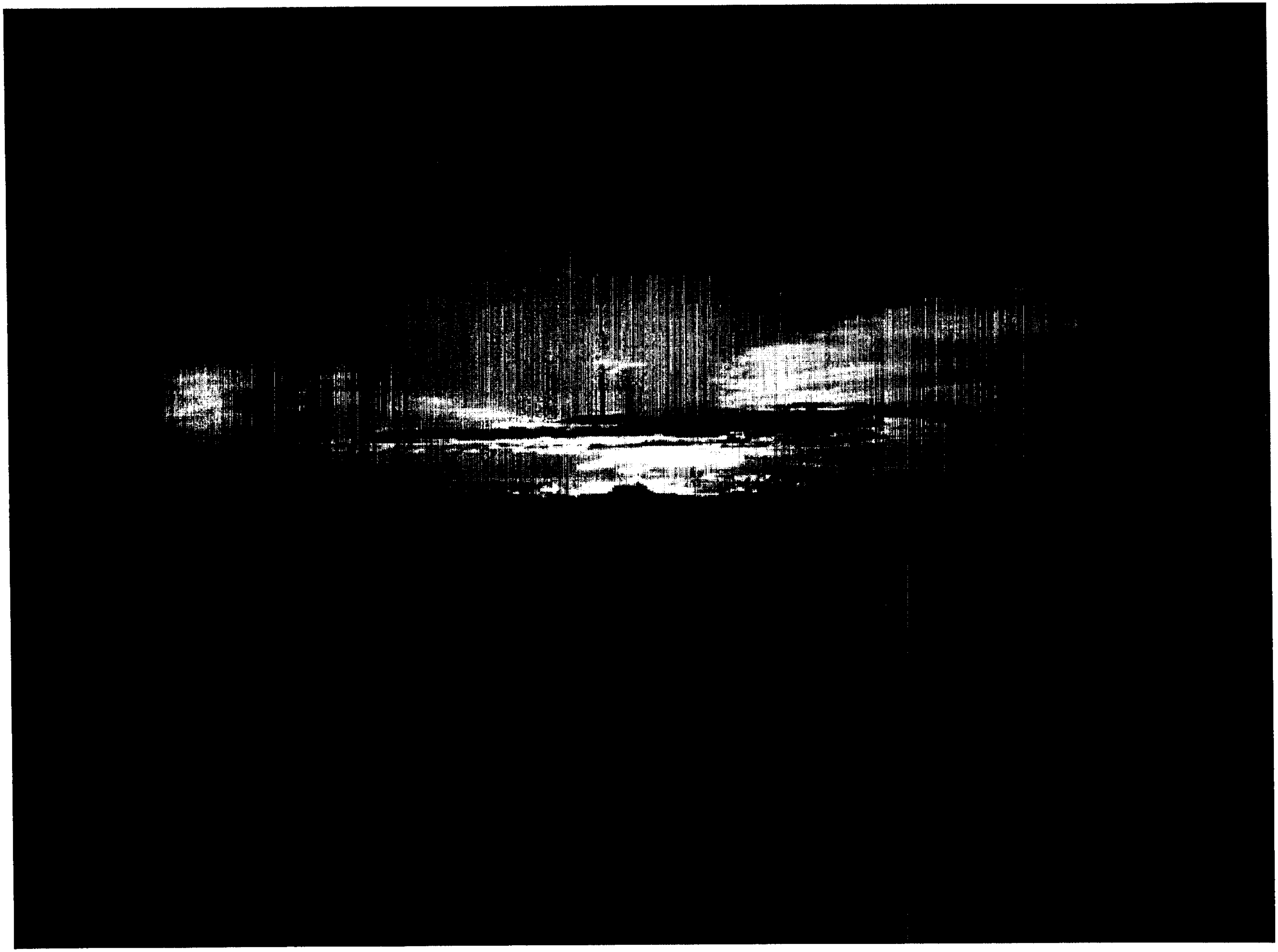
(combine hands-on and Internet hypermedia)

- Determine Planet Rotation Rates from NASA Movies
- Measure Sunspots and polar ice caps from NASA space probe photographs
- Convert NASA Digital Images to Binary and Transfer Information Electronically
- Use Galactic Redshift Velocities to Determine Expansion Rate of the Universe
- Sequence Hubble Space Telescope Images of Stars to Represent Star Life Lines

CERES/BTC Multimedia Lab

- develop on-line and classroom materials
- technology training for teachers

- **Web-based delivery tools & Web server**
- **audio and video digitizing**
- **CD-ROM production**
- **QTVR**
- **archiving and storage of files**
- **text and graphics production**
- **non-linear video editing**
- **video conferencing**
- **interactive Web tools**



Master of Science in Science Education

- ***Who is served?***

  Science teachers - middle school and high school.

- ***Why another degree program?***

  " I love to teach science. That is what I want to do with my life. I don't want to be an administrator."

  "At last, a degree that meets my needs - understanding science and how to teach it. And I can pursue the degree and keep my job."

What makes this degree different?

- Intercollege, interdepartmental degree. All students complete a group (15 cr) of core courses (math and ed) and select science courses (15 cr) to fit their needs.

- About 2/3 of courses and credits for the MSSE degree offered by distance - Students are on campus part of two summers and do distance learning for additional 5 terms.

How are things progressing?

- Program now in fourth year.
- Second cohort of 20 graduated in summer 2000.
- About half from Montana, half from other states.
- Admission:

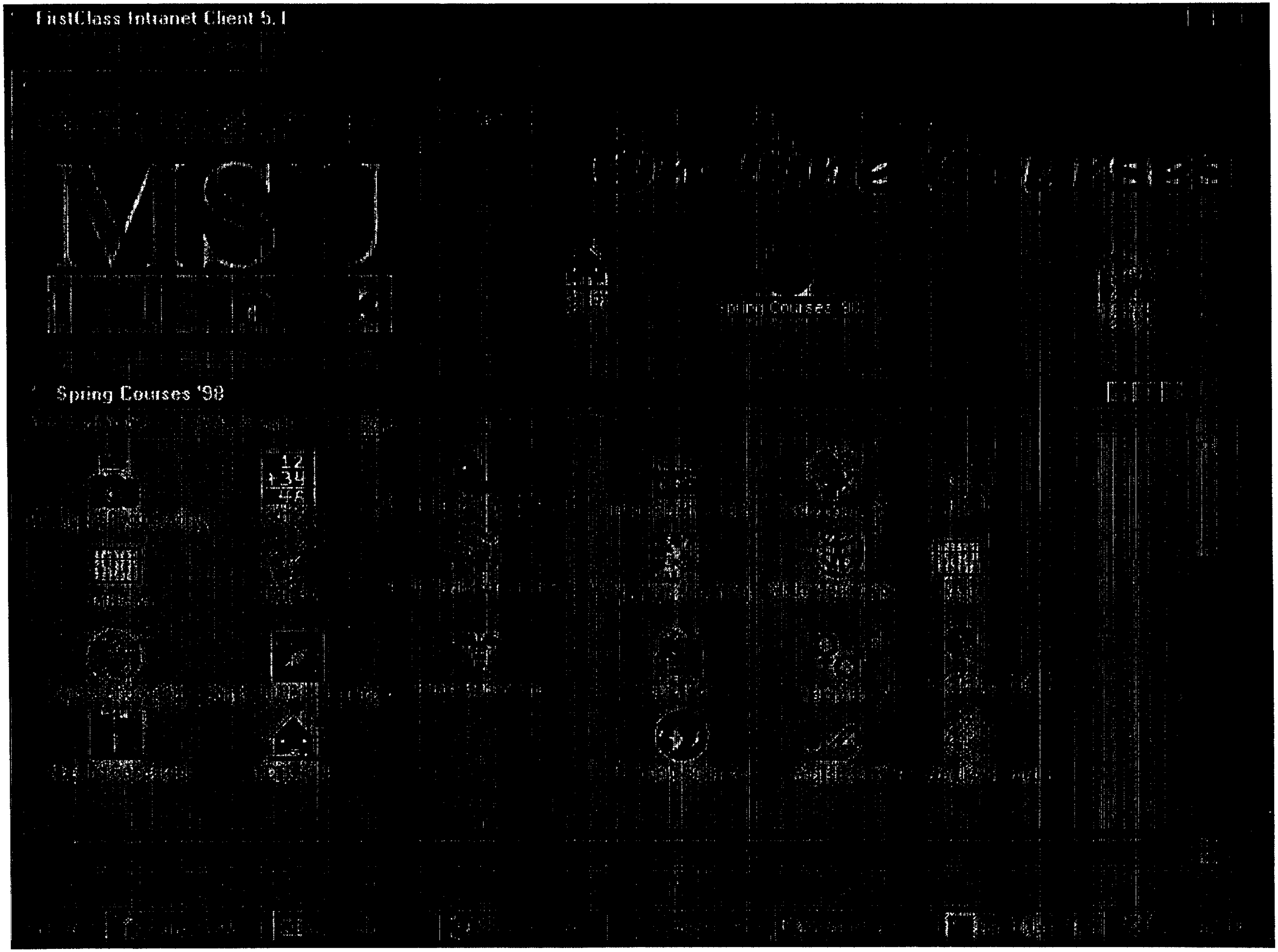
  Bachelor's in a science or in science education.

  Undergraduate GPA of 3.0 or higher.

  GRE scores - minimum of 1500 (V+Q+A)

  Two years experience teaching science.

  Certification to teach science.

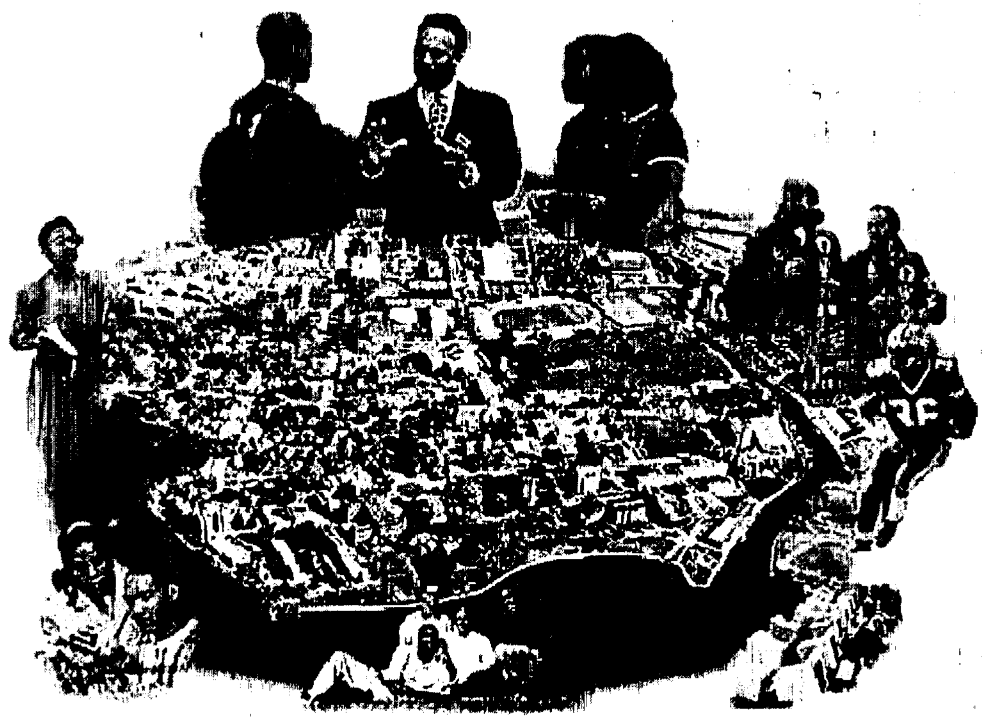

FirstClass Intranet Client 5.1
MSU
Spring Courses '98

ESSEA Program at Hampton University

Dr. Diane Robinson
Hampton University

Emancipation Oak

Hampton University



Dianne Q. Robinson, Ph.D.

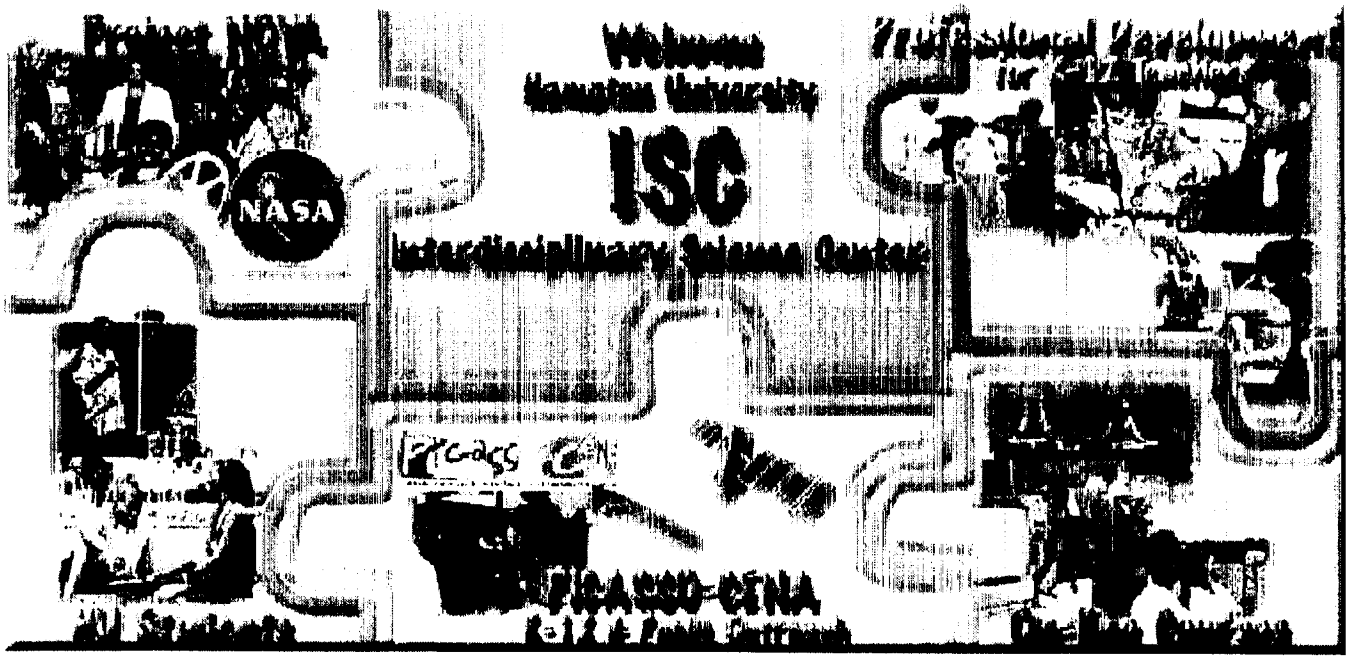
Director of the Interdisciplinary Science Center

dianne.robinson@hamptonu.edu

Emancipation Oak

Hampton University

Connecting Earth Science Opportunities for Educators

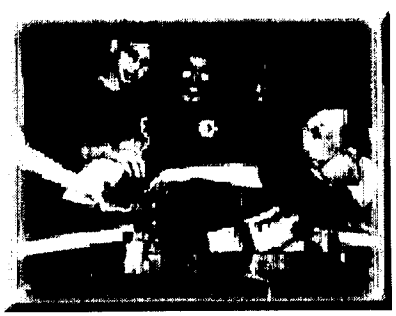


Emancipation Oak

Hampton University

Professional Development

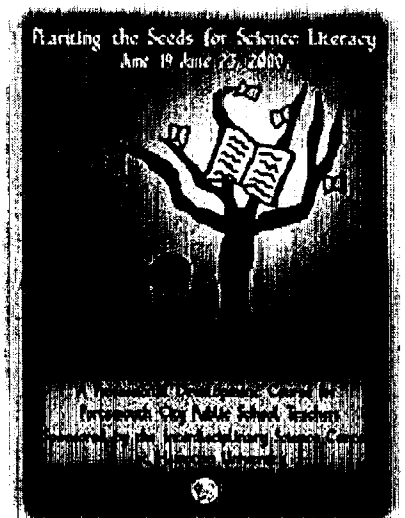
for k-12 teachers



Emancipation Oak

Hampton University

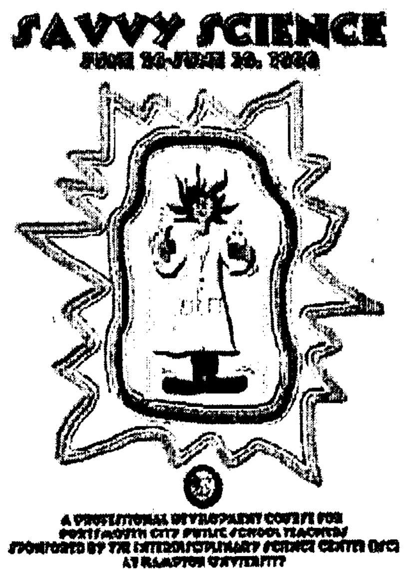
Planting the Seeds for Science Literacy



Emancipation Oak

Hampton University

Savvy Science



Emancipation Oak **Hampton University**

ISC Partners Include

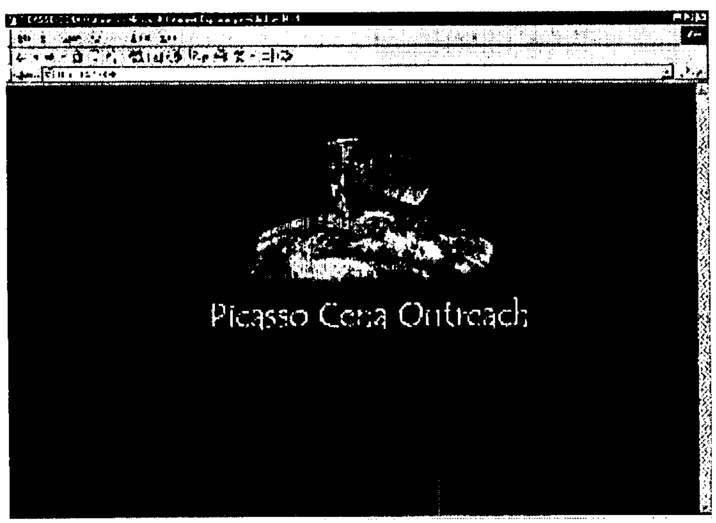
- School districts
- NSF
- MU-SPIN
- Project NOVA
- Department of Education
- Department of Energy
- Science Centers & Museums
- Center for Atmospheric Sciences at HU
- NASA

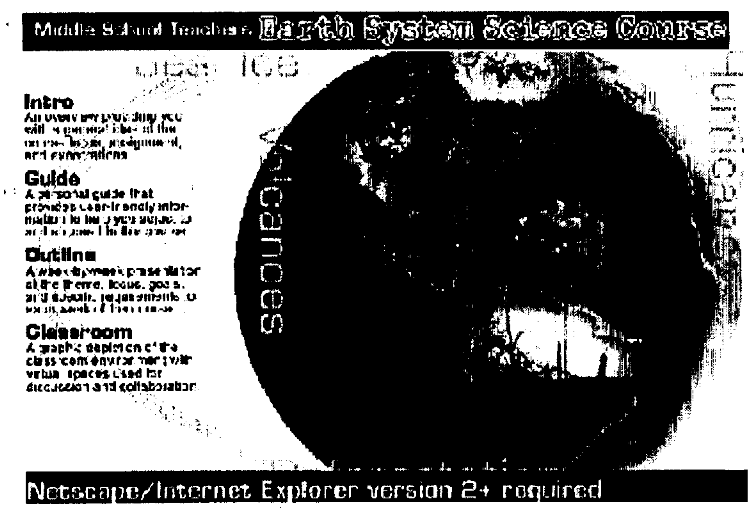
Hampton University

Emancipation Oak

The two most recent projects of the ISC

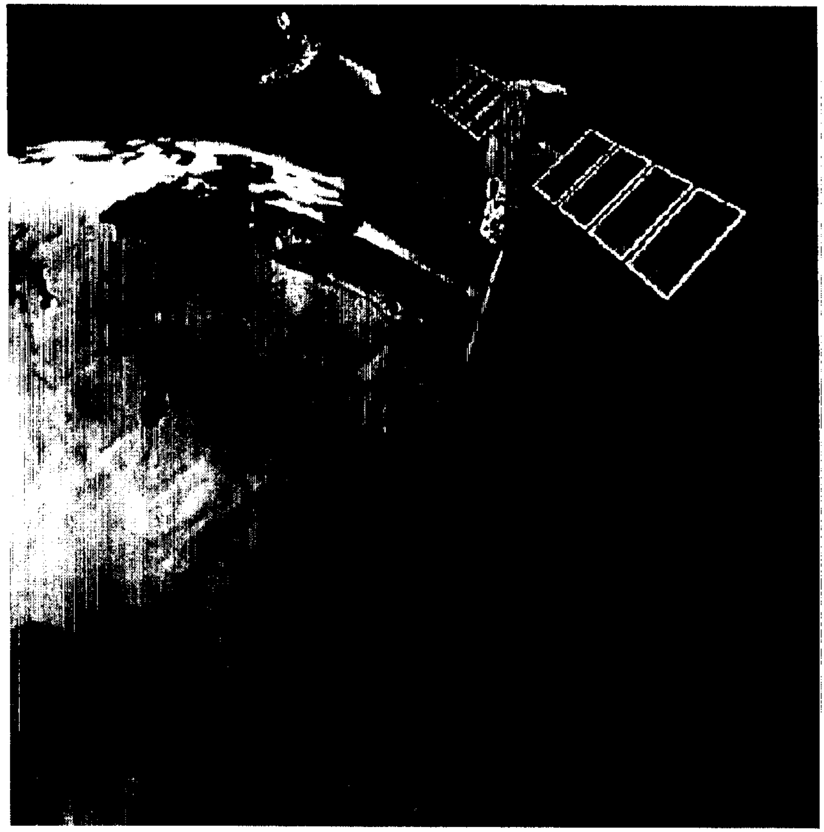
- •PICASSO-CENA Outreach Program
- •Online Courses (COTF & ESSEA)





Hampton University

Emancipation Oak



PICASSO-CENA Outreach Program

Pathfinder Instruments for Cloud and Aerosol Spaceborne Observations - Climatologie Etendue des Nuages et des Aerosols

Hampton University

Emancipation Oak

Middle School Teachers Earth System Science Course

Intro
An overview providing you with a general idea of the course focus, assignment, and expectations.

Guide
A personal guide that provides user-friendly information to help you adjust to and succeed in this course.

Outline
A week-by-week presentation of the theme, focus, goals, and specific requirements for each week of the course.

Classroom
A graphic depiction of the classroom environment with virtual spaces used for discussion and collaboration.

Earth System Science Course

Classroom

Hampton University

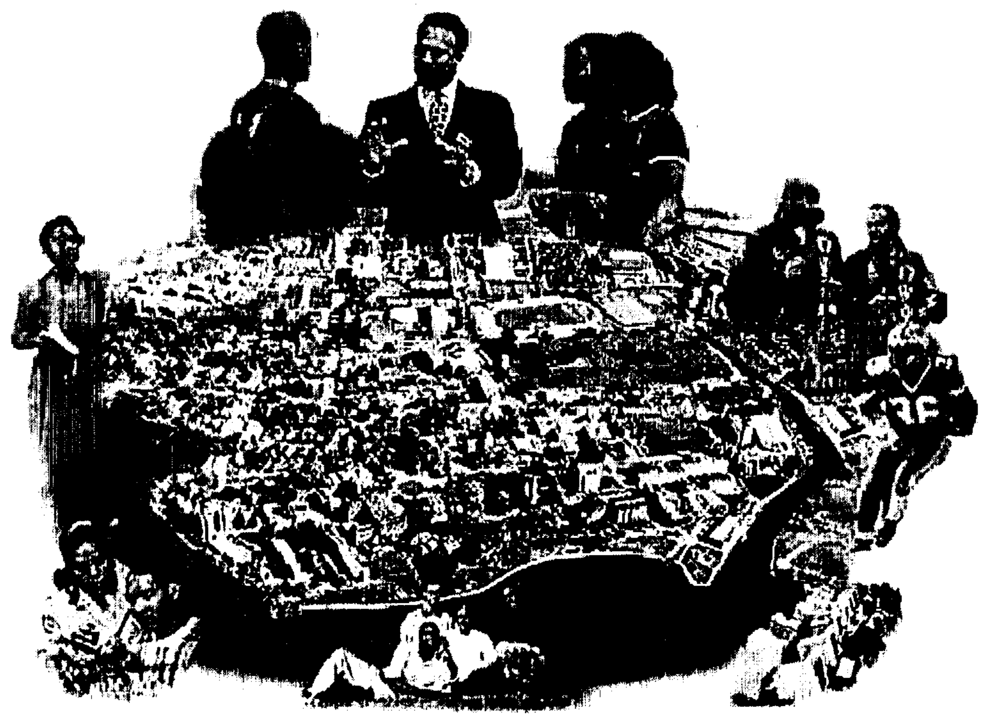
Emancipation Oak

Online courses expand teacher opportunities in earth system science

- Provides teacher enrichment beyond summer workshops
- Allows a geographically diverse group of teachers to participate
- Gives teachers the opportunity to obtain college credit during the academic year
- Permits teachers the feedom to work from their homes
- Increases the education network nationally of educators interested in earth science

Emancipation Oak

Hampton University



Dianne Q. Robinson, Ph.D.

Director of the Interdisciplinary Science Center

Dianne.robinson@hamptonu.edu

Project Vision: A Collaborative Effort on Curriculum Development/ Collaborative Research

Dr. Gustavo Roig
Florida Intternational University

Project VISION

(Very Intensive Scientific Intercurricular Onsite Education):
Teacher Training

Gustavo Roig
Associate Dean, College of Engineering
Florida International University
Alexandra Goncharova-Berenger
Project Specialist, Project VISION, College of Engineering
Florida International University
Belisa Marrero
Program Coordinator, Project VISION, College of Engineering
Florida International University
Casilda Canino
Program Coordinator, Project VISION
Universidad del Turabo
Robert Haynes
Program Coordinator, Project VISION
Florida Memorial College
Fredrick Milton
Program Coordinator, Project VISION
Bethune Cookman College
Kenny Aguilar
Director, Equal Opportunity
National Aeronautics and Space Administration/KSC
Henry Bursian
Technical Monitor, Project VISION
National Aeronautics and Space Administration/KSC
Jose Nunez
Technical Monitor, Project VISION
National Aeronautics and Space Administration/KSC

Abstract

Project VISION is a joint effort among NASA/John F. Kennedy Space Center, Florida International University, Universidad del Turabo, Bethune-Cookman College, Florida Memorial College, Miami-Dade County Public Schools, the Caguas/Gurabo Public Schools and Volusia County Public Schools District. The project's main mission is to enhance the science and mathematics curriculum for elementary and middle schools. A further aspect of the mission is to enhance the science and math education of the public elementary and middle school students during the training phase. Project VISION will not need to generate any new educational materials to fulfill its mission. Rather than generating new materials, Project VISION is using the vast quantities of high quality learning modules, lessons, hands-on experiments and other educational materials available at NASA and other scientific depositories. The project identifies, adopts and then adapts these learning modules or learning materials to best meet the needs and capabilities of the target student and teacher populations. A further goal of this project lies within the realms of NASA's Mission – to specifically focus our activities on middle schools that serve socially and economically disadvantaged students. Additionally, the project invites members of the private and public sectors to serve as lecturers, mentors and role models.

Introduction

The nation is experiencing severe changes in its national economy as a result of the world's continuing transformation into a global market. Greater numbers of scientists, mathematicians, and engineers will be required if our nation is to remain competitive in an increasingly technology-driven world economy. In recent educational surveys, our nation has been shown as trailing behind most of the industrialized nations in the quality of science and math education provided at the elementary, middle and senior high school levels. Comparison of test scores with those of other nations proves that our students' foundation in science and mathematics is greatly inferior. Without a quality science and mathematics back ground, our nation's students start their academic careers at a disadvantage when compared to the students from other industrialized nations. This disparity will eventually lead to a national shortage of highly qualified scientists, engineers, and mathematicians.

Another fact about our nation is that it has one of the best, if no the best higher educational system in the world. The large numbers of students from foreign countries who flock to enroll in our nation's institutions of higher learning attest to this fact. Our higher education system is an asset that we must harness for the benefit of those students still in the beginning stages of their academic careers.

In addition to the institutions of higher learning, our nation has another valuable asset that can be utilized to assist the public schools, The National Aeronautics and Space Administration (NASA). NASA, as mandated by Congress and directed in its strategic mission, has developed a wealth of up-to-date educational information and materials available for the public's use. Project VISION plans to maximize the use of this information and materials by identifying, adopting, and then adapting them to the elementary and middle school curriculum (NASA Spacelink website address is http://spacelink.nasa.gov)

Project VISION strives to develop a methodology by which the resources of NASA and our higher education system can be tapped in order to assist the nation's public schools in developing brighter, more resourceful scientists, mathematicians, and engineers. Project VISION developed a systemic approach to solidifying an alliance among NASA, four institutions of higher learning, and three local public school systems. The methods and successes, as well as failures, developed by this project will serve as a critical guide to expanding these activities nation-wide. The extent of our educational crisis is such that a model should be developed that could be replicated at every public school system in order to achieve the significant results needed to overcome this crisis.

Training Methodology

Project VISION has developed a training system for the science and math teachers of the elementary and middle schools consistent with the use of learning modules with their hands-on and minds-on activities. The learning modules to be used will be selected based on the level of the target audience, elementary or middle school, and on the given subject area, math or science. They were also selected in deference to the preference of the participating teachers and school administrators. The Project VISION Training Methodology consists of three components: *Learning Modules, Personnel,* and *Training Options.*

Learning Modules:

A basic premise of Project VISION is that there already exist sufficient educational materials (learning Modules) to compliment almost every subject, for every level of study from Kindergarten through 12th grade. These learning modules can be accessed through the Internet at the data repositories of the federal, state, and local governments, at public and private libraries and at public and private universities. Therefore, kit is not that there is a lack of learning modules that prevents local public school systems and teachers from incorporating them, with their hands-on activities or experiments, into the regular academic curriculum. Instead, it is a combination of not knowing where they can be found; how to access them; where they fit into the competency based curriculum (CBC) or equivalent national education standards; and, how to adapt these learning modules for use in the classroom. It is precisely at this point where the activities of Project VISION couples existing educational resources with prevailing needs in order to create an enhanced science and mathematics curriculum.

Personnel:

In order to perform the actual teacher training, the following personnel are involved at on stage or another.

Public School Teacher: This is the individual who is undergoing the training. For the purposes of this program, this teacher should instruct math and/or science classes at the participating public school.

Lead Teacher/Teacher Trainer: This is the individual who will perform the actual training and evaluation. The Teacher Trainer will present the learning module alone, or in conjunction with the public school teacher, depending upon the training option selected.

Training Assistant: This the individual who assists the Teacher Trainer to obtain the necessary materials and supplier, present the learning module, coordinate the hands-on activities, and serves as a general assistant during the entire process. The Training Assistant allows the Teacher Trainer to be able to conduct observation and evaluation and not be caught up procuring and distributing supplies, and other time consuming tasks.

Training Options:
Project VISION provides two (2) distinct training options or methods. The first option provides a more simplistic approach to teacher training. In this method, the project staff presents the learning module, while the public school teacher observes. The expectation is that the public school teacher, given copies of all the materials and information used, will be able to present this same learning modules on her/his own throughout the her/his teaching career. In the second option, a more didactic approach is taken. In this option, the public school teacher gradually increases her participation in presenting a learning module until she/he presents one completely on his/her own.

Option1: Project VISION staff provides 3 to 5 learning modules chosen by the target teacher from a list of recommended learning modules. The staff then prepares and presents these learning modules within an actual classroom setting. The target public school teacher serves as an observer or trainee in order to learn how to do the module. The teacher also assists the staff members in maintaining classroom discipline. After observing each learning module presentation, the target teacher should be able to understand the theory and application of the learning module, and should be able to present these learning modules on his/her own.

Option 2: The Project VISION staff conducts a more in depth training on the identification preparation and presentation of learning modules in a classroom setting. This option provides for a ten-step training process as follows:

Step 1: Consultation and Coordination
Step 2: Learning Module 1 – Pre-presentation Classroom Preparation
Step 3: Learning Module 1 – Presentation (Initial Learning Module)
Step 4: Learning Module 2 – Pre-presentation Classroom Preparation
Step 5: Learning Module 2 – Presentation (Pre-Solo Learning Module)
Step 6: Learning Module 3 – Pre-presentation Classroom Preparation
Step 7: Learning Module 3 – Presentation (Semi-Solo Learning Module)
Step 8: Learning Module 4 – Pre-=presentation Classroom Preparation
Step 9: Learning Module 4 – Presentation (Solo Learning Modules)
Step 10: Evaluation and Feedback

Step 1: Consultation and Coordination
During this step in the training system, the Teacher Trainer and the participating public school teacher meet to discuss delivery schedules choose three learning modules (Initial, Pre-Solo, and Semi-Solo) and coordinate other matters.

Step 2: Learning Module 1 (Initial) – Pre-presentation classroom Preparation
In step 2, the public school teacher presents to the target classroom the theoretical other sources of information that the teacher would normally use for class lectures.

Step 3: Learning Module 1 (Initial) - Presentation
In this step, the Teacher Trainer and an assistant present the learning module to the target classroom. This presentation includes the hands-on activities that involve all the students in the classroom. The public school teacher serves as an observer during this presentation. However, the responsibility for class discipline remains with the public school teacher. The supplies and materials needed for this activity are obtained and funded by Project VISION.

Step 4: Learning Module 2 (Pre-Solo) - Pre-presentation Classroom Preparation
During this next step, the public school teacher presents to the target classroom the theoretical information that correlates with the subject matter of the second learning module. Again, this background material is obtained from the assigned textbook, the learning module, or any other sources chosen by the teacher.

Step 5: Learning Module 2 (Pre-Solo) - Presentation
In this step, the Teacher Trainer and the public school teacher present the learning module to the target classroom jointly. This presentation should be a team effort involving both individuals (one-third by the public school teacher and two-thirds by the Teacher Trainer). The responsibility for class discipline remains with the public school teacher. The supplies and materials needed for this activity are obtained and funded by Project VISION.

Step 6: Learning Module 3 (Semi-Solo) - Pre-presentation Classroom Preparation
During this next step, the public school teacher presents to the target classroom the theoretical information that correlates with the subject matter of the third and final learning module.

Again, this background material is obtained from the assigned textbook, the learning module, or any other sources chosen by the teacher.

Step 7: Learning Module 2 (Semi-Solo) - Presentation

In this step, the Teacher Trainer and the public school teacher present the learning module to the target classroom jointly. This presentation should be a team effort involving both individuals (two-thirds by the public school teacher and one-third by the Teacher Trainer). The responsibility for class discipline remains with the public school teacher. The supplies and materials needed for this activity are obtained and funded by Project VISION.

Step 8: Learning Module 3 (Solo) - Pre-presentation Classroom Preparation

During this next step, the public school teacher presents to the target classroom the theoretical information that correlates with the subject matter of the third and final learning module. Again, this background material is obtained from the assigned textbook, the learning module, or any other sources chosen by the teacher.

Step 9: Learning Module 3 (Solo) - Presentation

In this step, the public school teacher presents the learning module to the target classroom. The Teacher Trainer is present during the presentation, but only serves as an observer and guide. The responsibility for class discipline remains with the public school teacher. The supplies and materials needed for this activity are obtained by the public school teacher and are funded by the school.

Step 10: Evaluation and Feedback

In the last step of the training system, the Teacher Trainer provides the public school teacher with feedback concerning his/her performance during the learning module presentations. The feedback is provided in a fully professional manner, and an evaluation is provided to the teacher that lists the possible strengths and weaknesses observed. If requested, the Teacher Trainer may provide the administration of school with confidential and specific written results based upon observation and evaluation conducted during the training

The public school teacher will be engaged in 3 to 5 learning modules. Each learning module will be divided into two sections: Pre-presentation Classroom Preparation and the Presentation. During each of the Pre-presentation Classroom Preparations, the public school teacher presents the theoretical background on the subject matter to be presented during the learning modules. Thereafter, the learning modules are presented. The public school teacher increasingly conducts more and more of the learning module presentations. Therefore, during the first learning module presentation, she/he is strictly an observer. During the second, she/he conducts one-third of the presentation. During the third, she/he conducts two-thirds. During the fourth, the public school teacher conducts the entire presentation. In this manner, the public school teacher gradually gains the knowledge and experience to conduct learning module presentations on his/her own, without the assistance of the project staff.

In the last step of this training option, the Teacher Trainer provides the public school teacher with feedback concerning his/her performance during the learning module presentations. The feedback is provided in a fully professional manner, and an evaluation is provided to the teacher that lists his/her possible strengths and weaknesses observed.

Conclusion

With the advent of the Internet, the first step in providing instantaneous, low-cost, and standardized educational materials to all parts of the nation has been achieved. Building upon the Internet, many federal and state agencies, as well as public and private institutions have created and compiled outstanding repositories of high quality education materials. These learning modules, with their hands-on and minds-on activities, can be used to enrich local area classroom curriculums. This enriching process may make the difference between producing students with a standard or mediocre understanding of the principles of math and science, or students who have mastered these areas and have the potential, as well as the motivation to become the next generation of scientists, mathematicians, engineers and leaders. Project VISION has developed its own website that contain links to several hundred quality learning modules at http://www.eng.fiu.edu/vision/.

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Extending Learning Time for Disadvantaged Students. Internet address: hftp://inet.ed.gov/pubs/Extending/brochure/index.html

Prisoners of Time - April 1994: Recommendations. Internet address: http://www.ed.gov/pubs/PrisonersOfTime/Recommendations.html

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Roig, Gustavo, et. al., **"Project VISION: Using Technology to Enhance the Science and Math Curriculum in the Middle Schools,"** presented at the NASA/MUSPIN Eighth Annual Users' Conference in Albuquerque, New Mexico, October 20 -23, 1998.

The Pigeon Adventure and ECHO Books

Ms. Ginger Butcher
NASA Goddard Space Flight Center

Echo the Bat
&
The Pigeon Adventure

Ginger Butcher, SSAI
NASA Goddard Space Flight Center
Presentation to the 10th Annual MU-SPIN conference, 2000

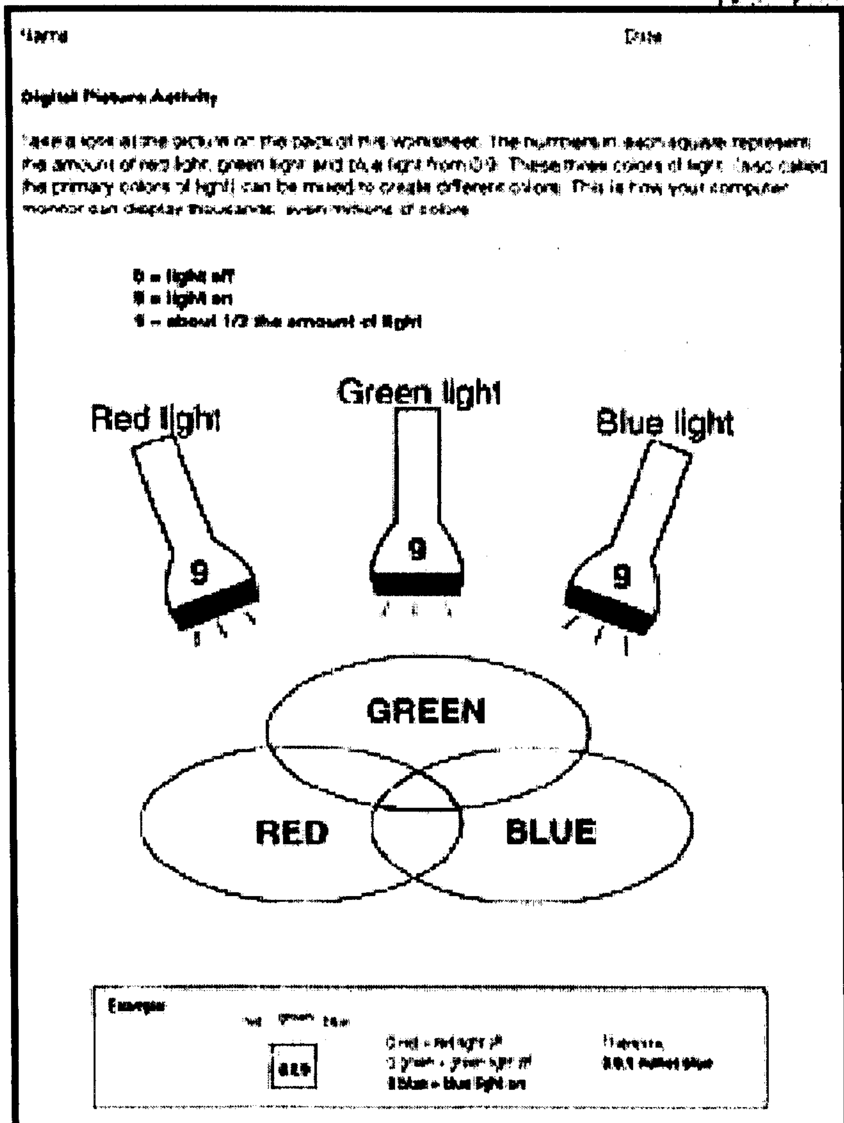
IMAGERS

Interactive Multimedia Adventures for Grade-school Education using Remote Sensing

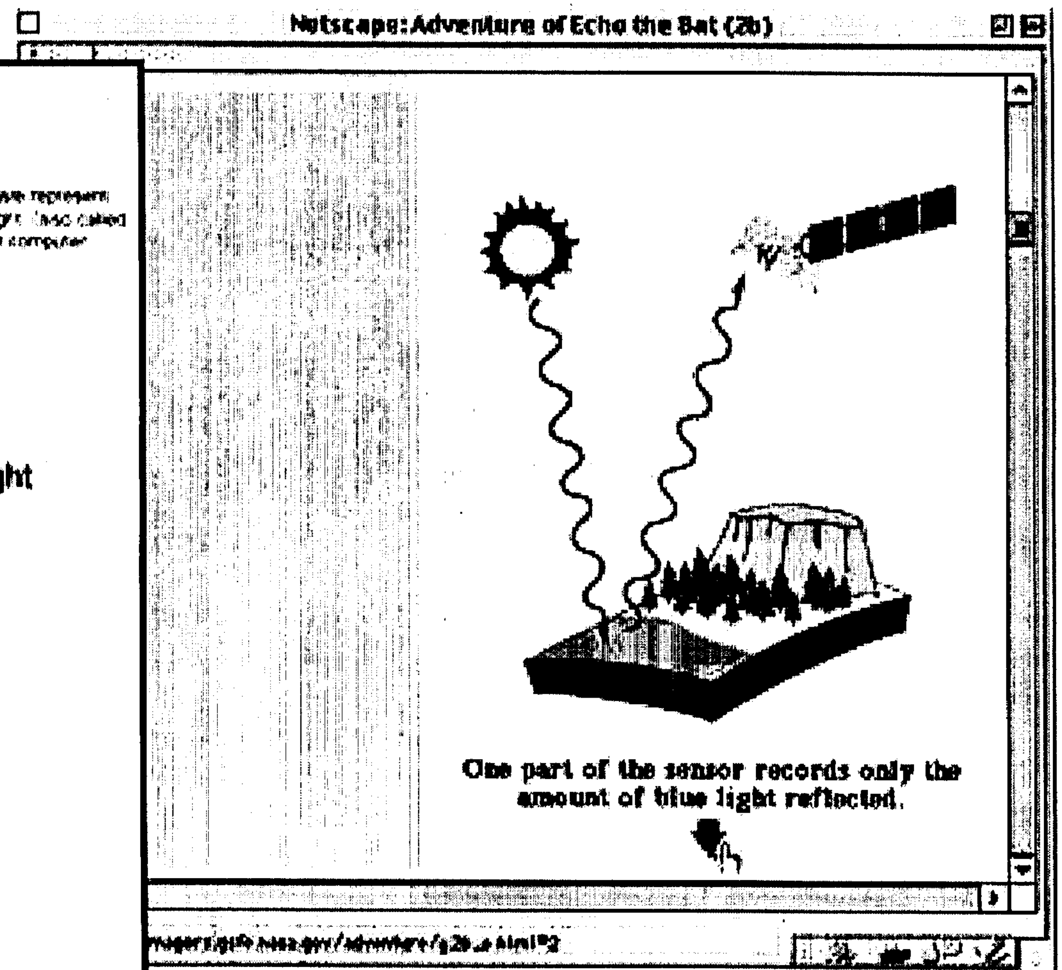
Student's Site

Teacher's Guide

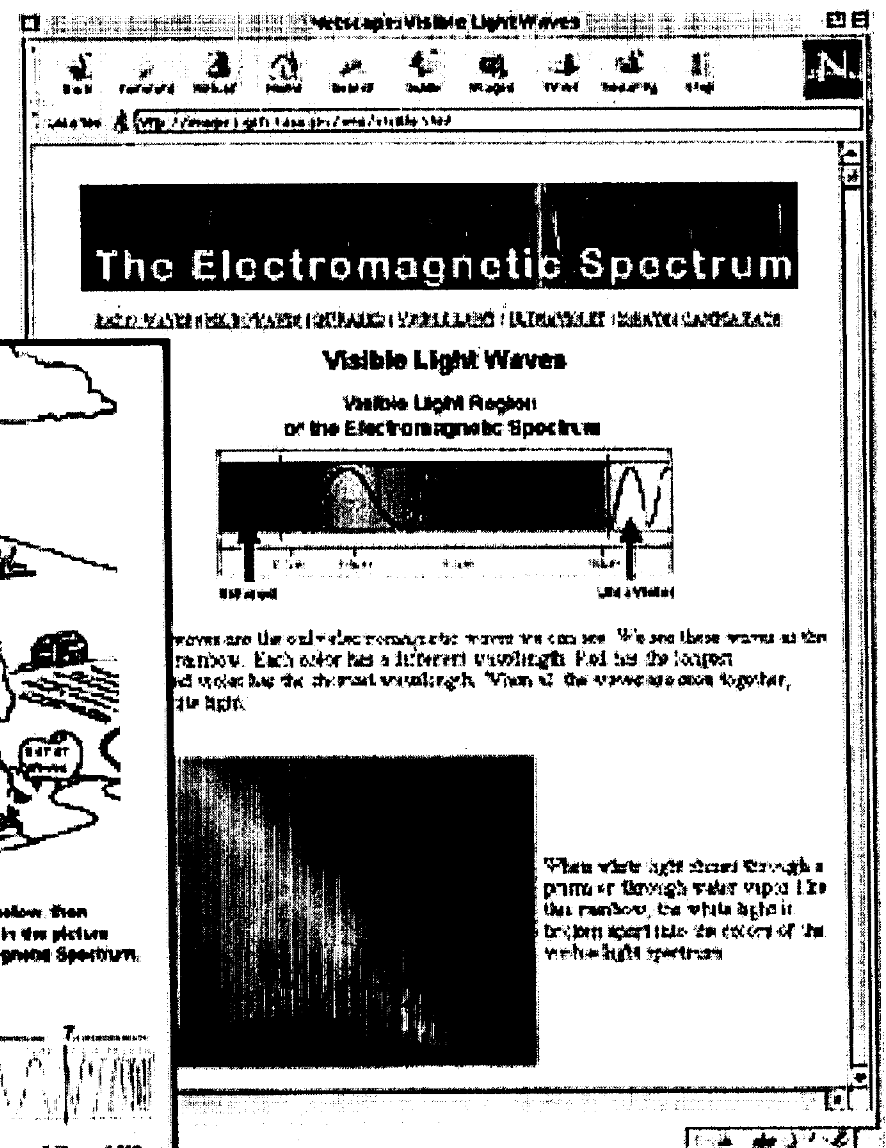
Activity on Primary Colors



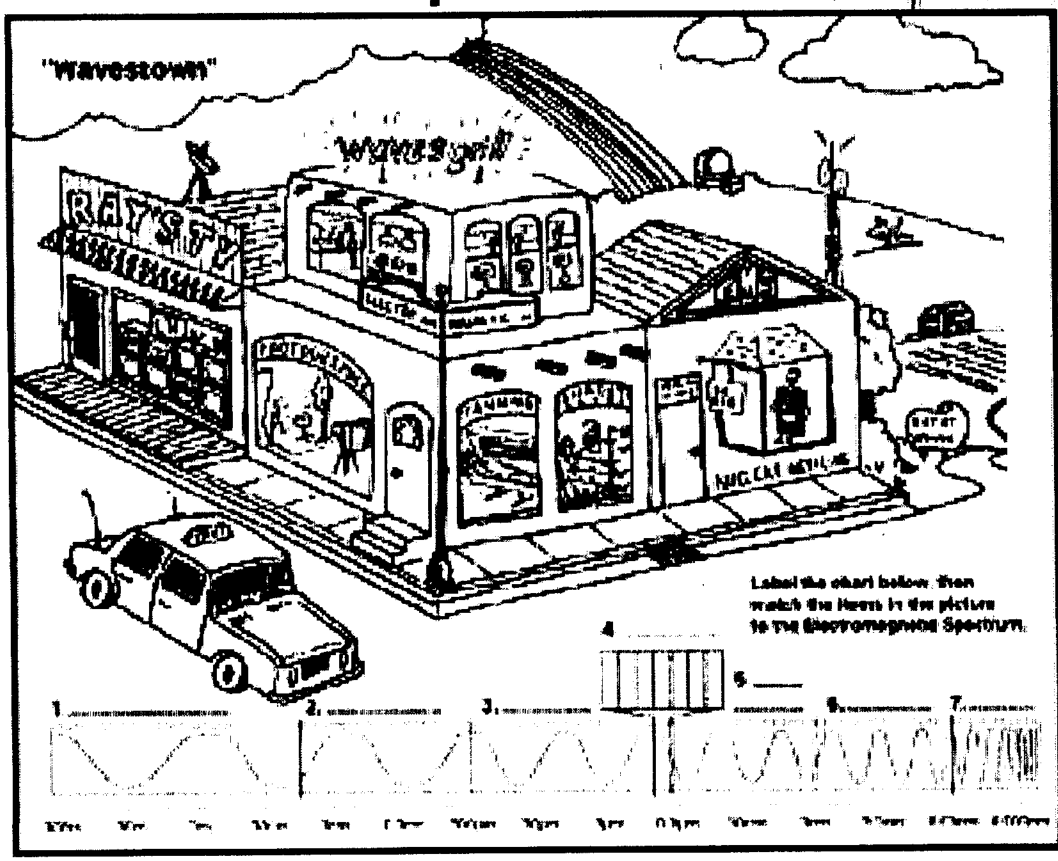
Content from the Adventure



Electromagnetic Spectrum Site



Wavestown Activity

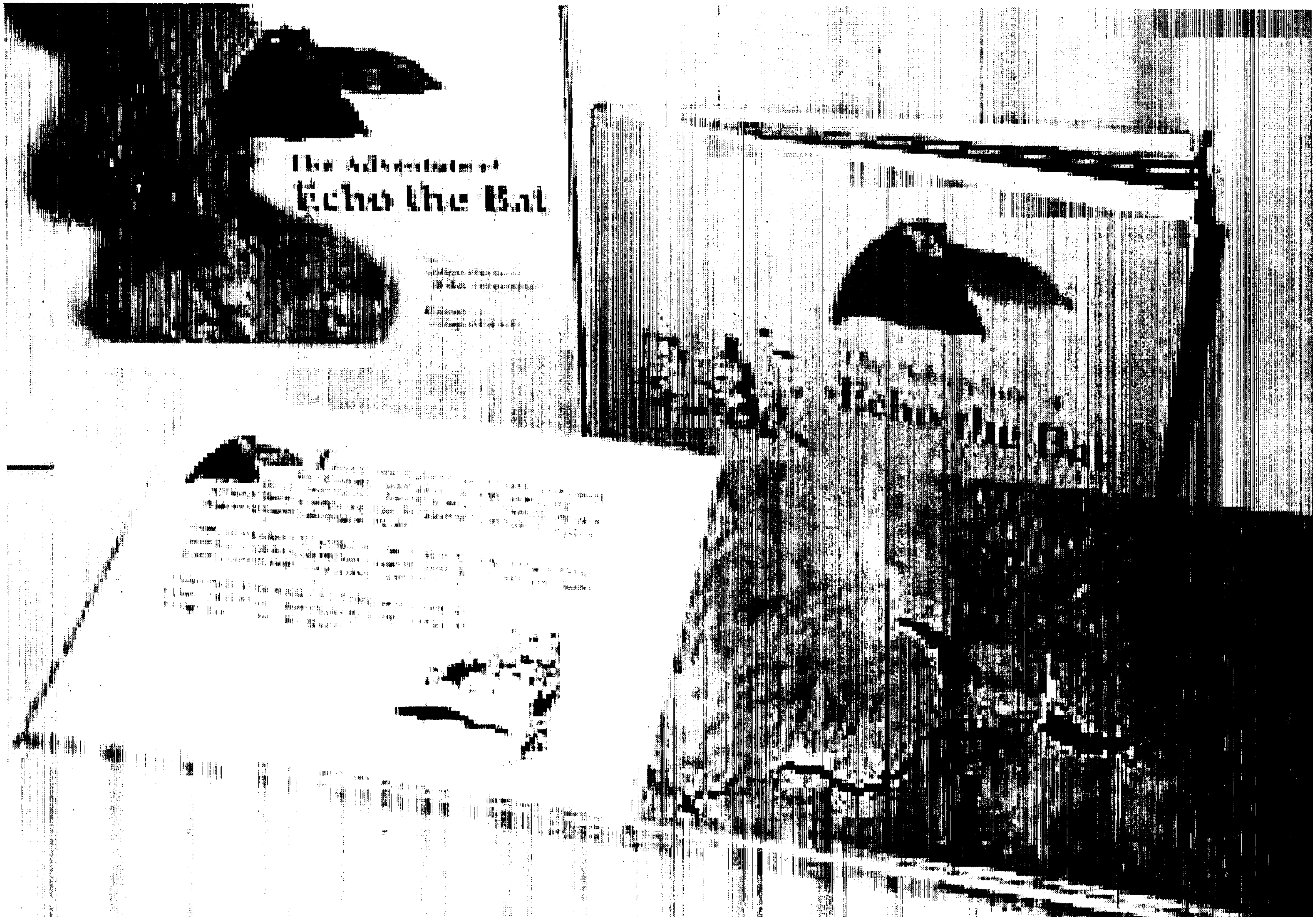


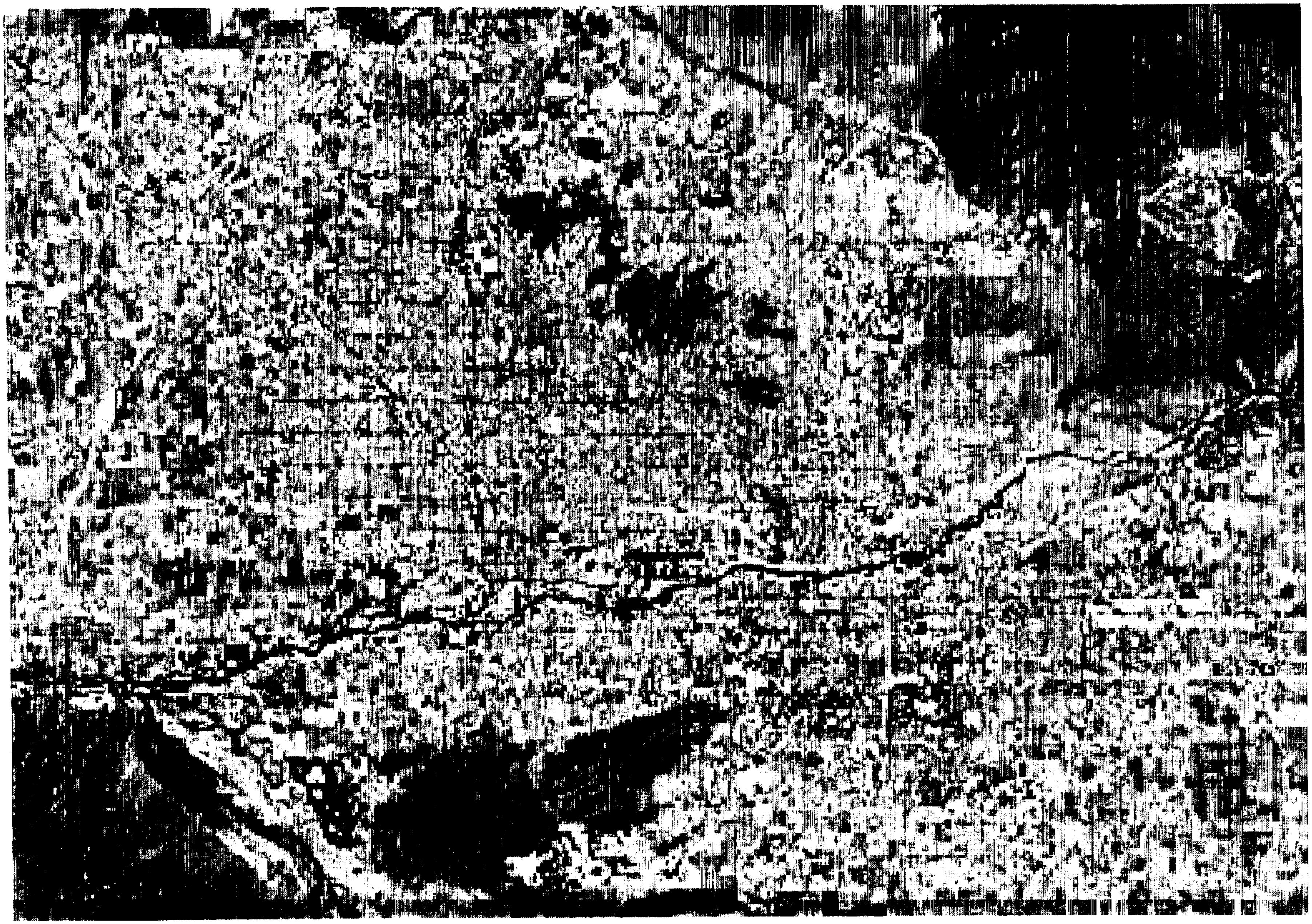
Echo the Bat Successes

- "Outstanding Educational Product"
  - NASA's Earth Science Enterprise Educational Products Review
- Science Magazine
- Washington Times
- Net Mom - 4th edition of the "Internet Family & Kids Yellow Pages"

Echo & MU-SPIN

- Echo's Funding cut short
- Delivered project in Feb. 98
- MU-SPIN funding enabled us to pilot test, revise and prepare Echo for the NASA's Earth Science Enterprise Education Review
- Continued support led to the development of Echo the Bat Book


Echo the Bat



Echo the Bat Book

Supplemental guide with hands-on activities to encourage parents & teachers to explore remote-sensing concepts with their children.

The Pigeon Adventure (K-4)

- Online Adventure
  - based on Adventure of Echo the Bat
  - reinforces abstract concepts through engaging multimedia environment
- Curriculum support materials
  - meets educational reform efforts
  - teaches science while connecting to other curricula

Lessons & Activities

- **UNIT 1:** Earth from Above
- **UNIT 2:** Our Changing Earth
- **UNIT 3:** The Urban Habitat

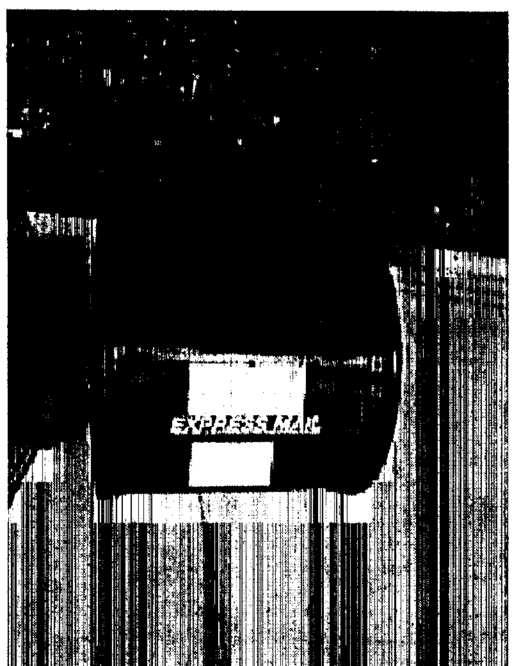
Individual lessons for K-2 & 3-4

Objectives

- Identifying shapes, patterns and textures in R.S. imagery
- Identifying prominent features
- Describing change over time
- Identify changes in habitats
- Relating change to major historical events

Perspective

- Looking at common objects from top and side views.




Amelia Earhart

Story Introduction

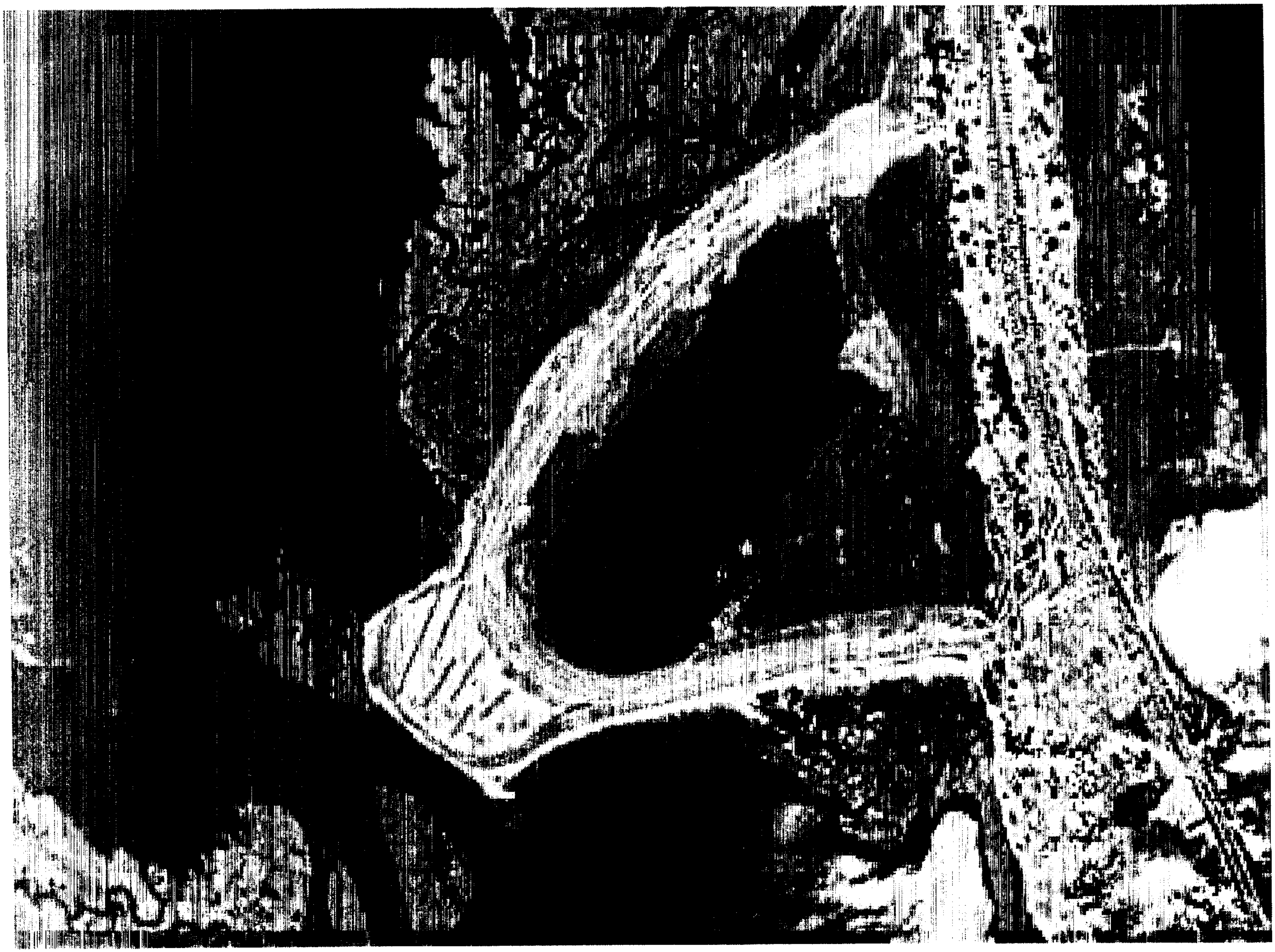
- Story of a child caring for their homing pigeon in their Brooklyn Apartment

Interactive web pages

Learners are introduced to the visual and historical changes of each location through a family history narrative.

Stumpy John Silver

Battery Park, 1865

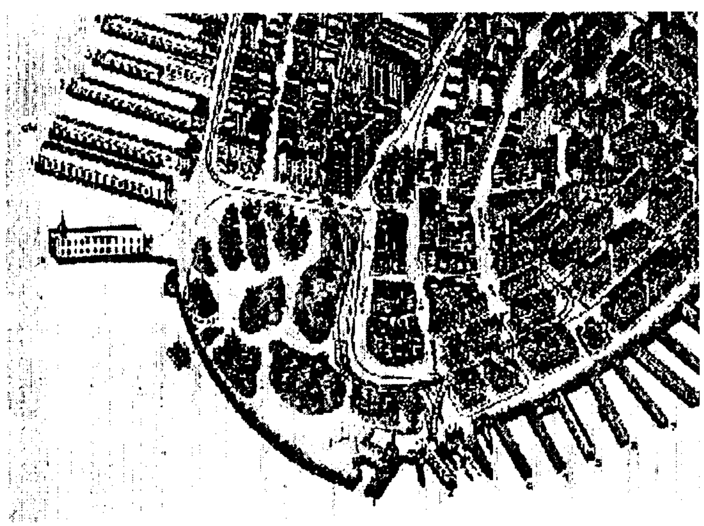


Introduce Satellite View

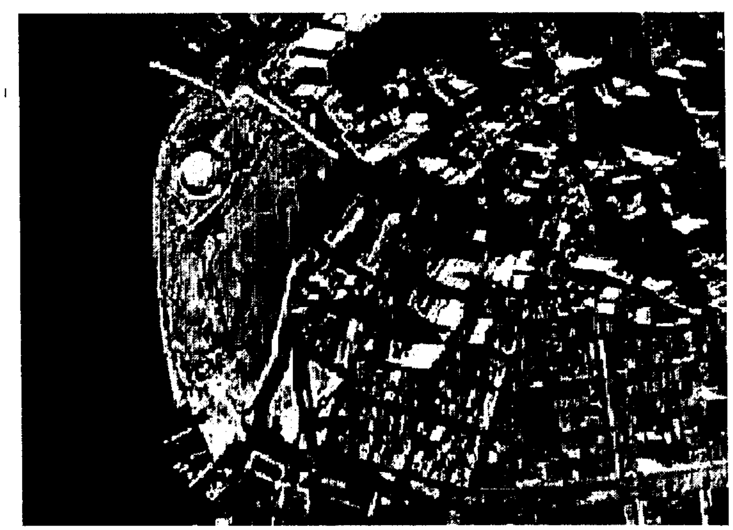
- Jamaica Bay Wild Life Refuge

Learner interactions

- Sequencing close to far (aerial - satellite)
- Sequencing images over time (technology and change in features)



1900



1940

Pigeon Timeline

- Nov. 2000 - Testing of classroom lessons
- Fall 2000 - Production of online adventure
- Spring 2000 -Testing of online adventure
- Spring 2000 - Submission to ESE review
- Summer 2000 - Official launch of site

www.EchoTheBat.com

For more information contact:

Ginger Butcher

ginger@ltpmail.gsfc.nasa.gov

American Association for the Advancement of Science

Mr. Joseph Watson
AAAS

[redacted]

Science Literacy
for a Chaning Future

[redacted]

[redacted]eading scientific society and the largest [redacted]ration of scientific and engineering [redacted]eties

[redacted],000 individual members and 300 [redacted]ate organizations

[redacted]olisher of "Science" magazine

- kground information
- ort to eradicate science illiteracy
- ect 2061 Tools
- lding alliances with Minority versities

tbook Evaluations

fessional Development Programs

(a) Standard-based education

(b) Design based on national standards

(c) Research-base teaching and learning

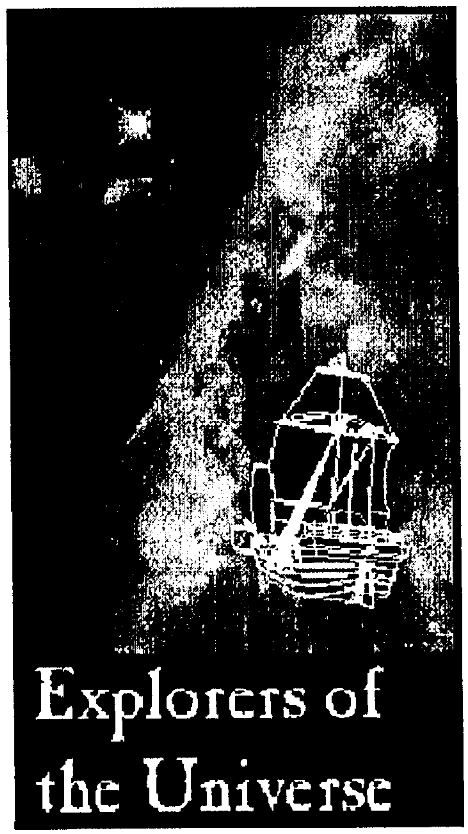
New Beginnings

Identifying ways that
oject 2061 might collaborate with
Minority Universities

Negotiating the Learning Process Electronically

Dr. Marino C. Alvarez
Dr. Michael Busby
Dr. Geoffery Burks
Ms. Goli Sootohi
Ms. Montanez Wade
Ms. Keinan Brooks
Tennessee State University

Negotiating the Learning Process Electronically



MU-SPI

Tenth Annual Us
Conference

Atlanta, Georgia

September, 2000

Explorers of the Universe Scientific Literacy Project

- The Explorers of the Universe is affiliated with MU-SPIN through NRTS project.
- Explorers has expanded to include minority undergraduate and graduate students enrolled in NASA CASS/CREST/NRTS programs.

NASA Space Missions

- NASA JPL
- NASA Marshall - JASMIN
- NASA Langley
  - Demonstration of line of sight control of an inflatable/rigidizable structure
  - PI: Lucas Horta, NASA Langley
  - Co-Is: David Cadogan, ILC Dover, Inc.
  - Jer-Nan Juang, NASA LaRC
  - Richard Longman, Columbia University
  - Marino C. Alvarez, Tennessee State University
  - Leehyun Keel. Tennessee State University

Collaborative Exchanges

- Information is posted by students [illegible]d feedback is given by their mentors.
- Research is negotiated between the stud[illegible]d the mentor.
- The learning process is enhanced due to the [illegible] collaborative exchanges.
- Network provides opportunities for students t[illegible] "Learn Beyond the Walls" of the classroom.

Interactive Electronic Network

- Features
  - Electronic Journal
  - Concept Maps
  - Vee Diagrams
  - Portfolio
  - Library
- Professors and researchers are assigned as mentors to students (mathematics, engineering, technology, and geography).

TSU Summer Workshop

- Attendees:
  - 7 Center Researchers
  - 4 Faculty from College of Arts and Sc
  - 6 Faculty from College of Engineering
  - 1 Faculty member from College of Education
  - 48 Undergraduate and Graduate Students
- Researcher Notebook

Expansion

- South Carolina State University fa[illegible]ulty and students will become part of the Exp[illegible]rs educational network.
- Workshops and training sessions with be [illegible] with faculty and students.
- Students engaging in similar research projec[illegible] between universities will enhance the learning and mentoring process.

Respond to Student Input and Questions

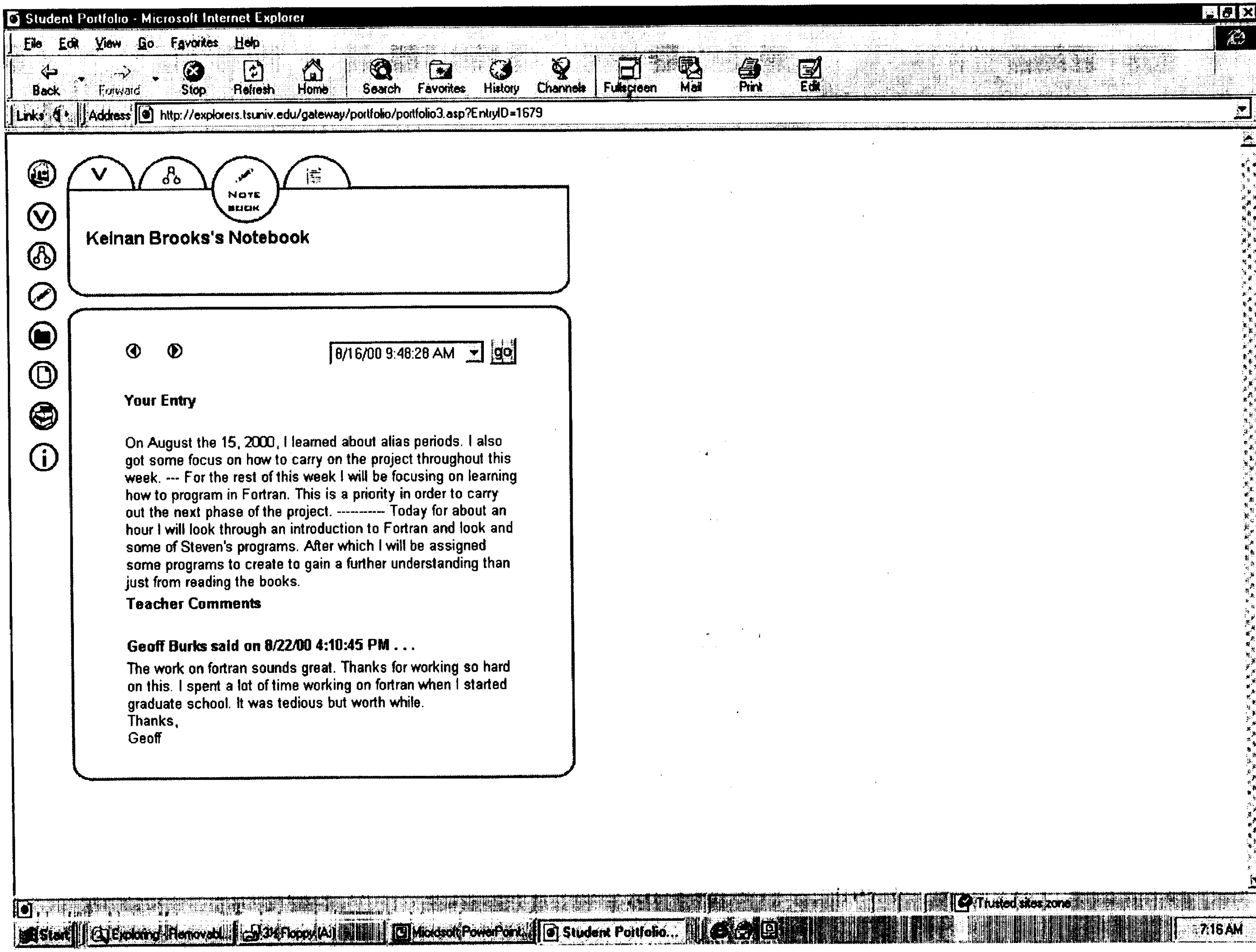
- Provide motivation and respond to questions using the Student Notebook.
- Provide feedback and correct misconceptions using the Concept Maps.
- Provide encouragement and help the student focus on the overall project using the Vee Diagram.

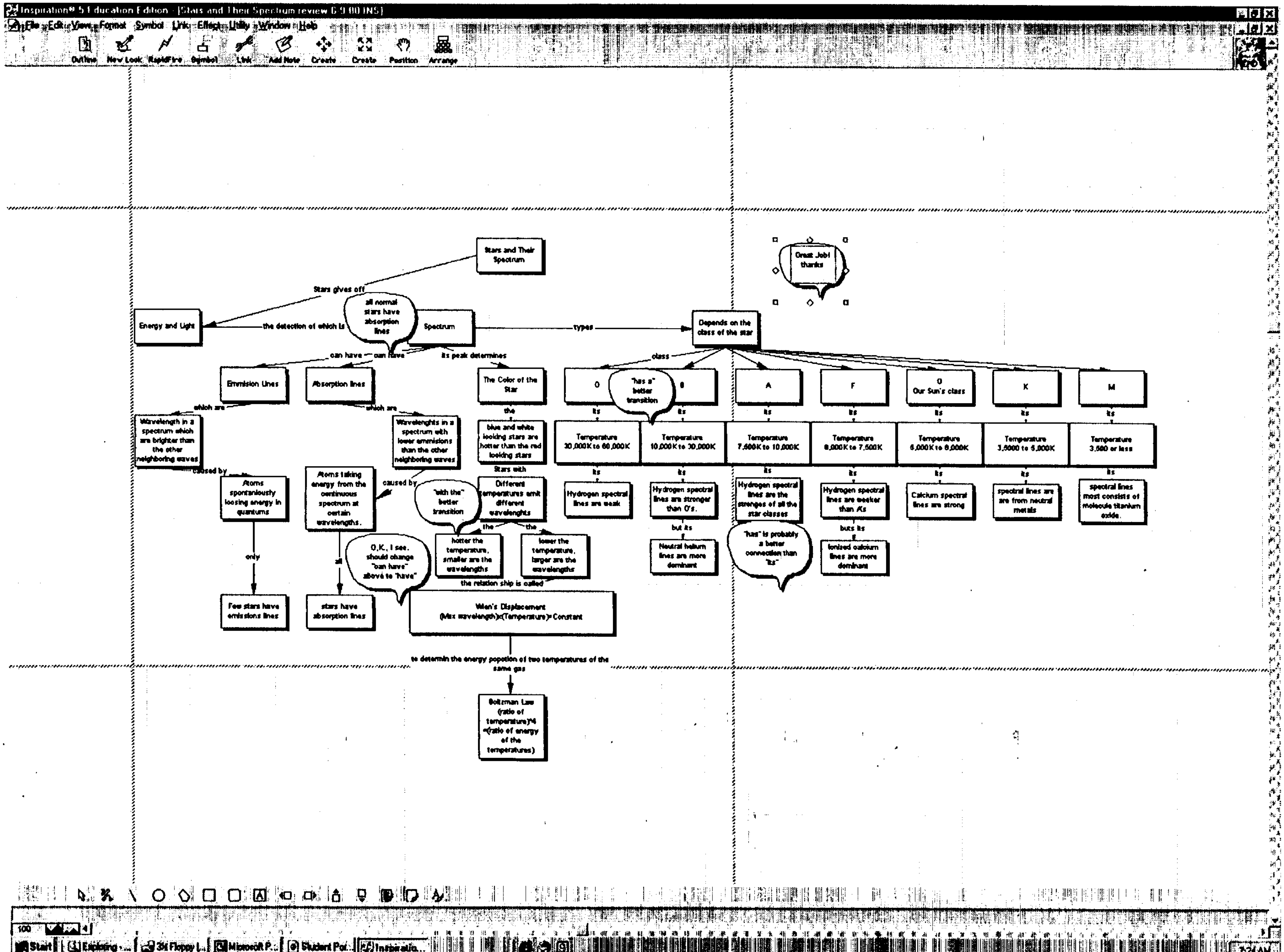
Role of the Mentor: Facilitating Research

- Provide background information.
- Respond to student input and questions.
- Adjust the Project to meet the student's increasing abilities.

Provide Background Information

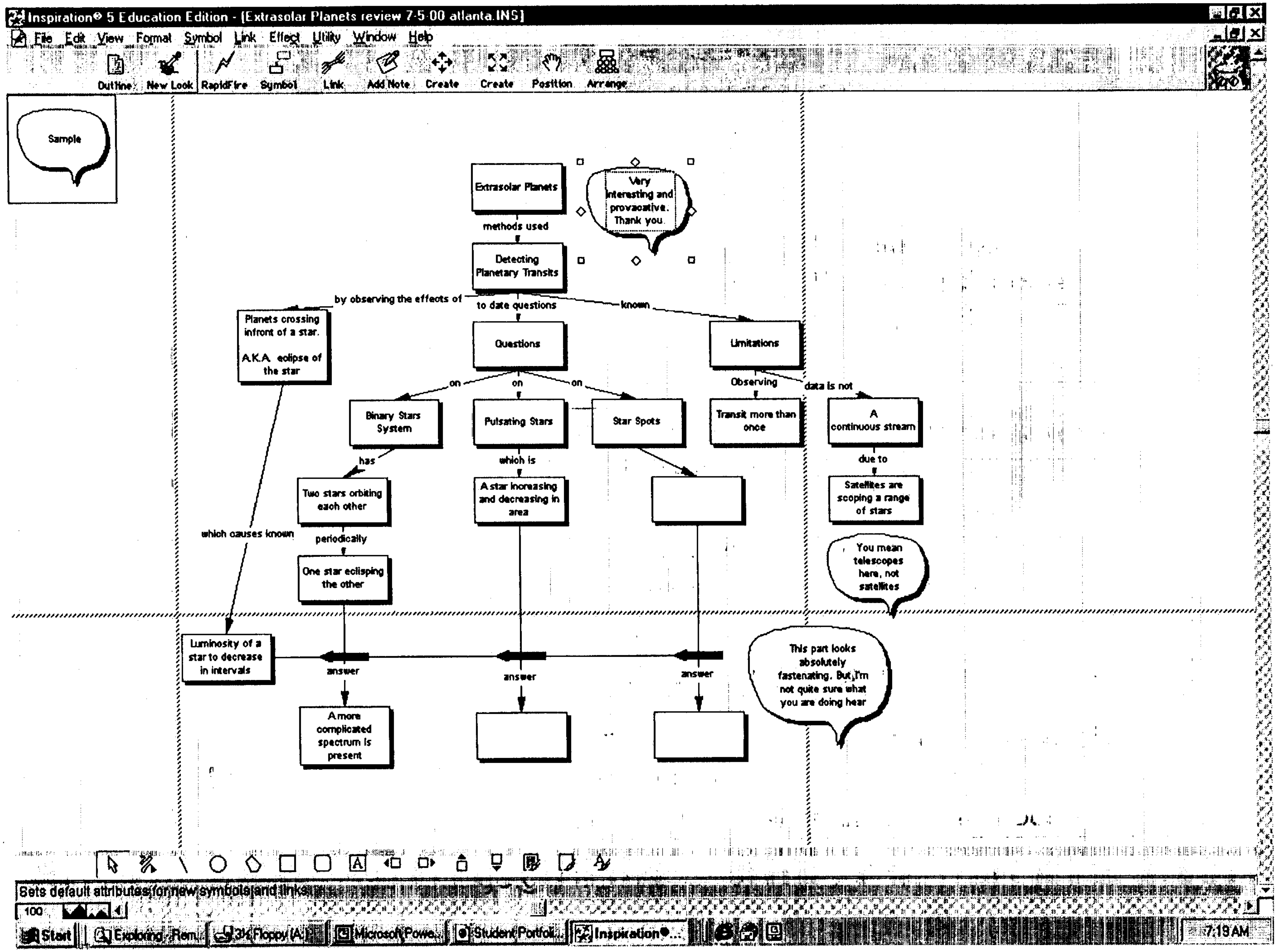
- Interview the student to ascertain the student's background, interests, and strengths.
- Find appropriate material to motivate the student and minimize frustration.
- Encourage the student to find new material on the subject.


Student Portfolio - Microsoft Internet Explorer
File Edit View Go Favorites Help
Back Forward Stop Refresh Home Search Favorites History Channels Fullscreen Mail Print Edit
Links Address http://explorers.tsuniv.edu/gateway/portfolio/portfolio3.asp?EntryID=1679
NOTE BOOK
Kelnan Brooks's Notebook
8/16/00 9:48:28 AM go
Your Entry
On August the 15, 2000, I learned about alias periods. I also got some focus on how to carry on the project throughout this week. --- For the rest of this week I will be focusing on learning how to program in Fortran. This is a priority in order to carry out the next phase of the project. ---------- Today for about an hour I will look through an introduction to Fortran and look and some of Steven's programs. After which I will be assigned some programs to create to gain a further understanding than just from reading the books.
Teacher Comments
Geoff Burks said on 8/22/00 4:10:45 PM . . .
The work on fortran sounds great. Thanks for working so hard on this. I spent a lot of time working on fortran when I started graduate school. It was tedious but worth while.
Thanks,
Geoff
Trusted sites zone
Start Exploring Removabl... 3½ Floppy (A:) Microsoft PowerPoint... Student Portfolio...
7:16 AM



Inspiration® 5.1 Education Edition - [Stars and Their Spectrum review 6-9-00.INS]
File Edit View Format Symbol Link Effects Utility Window Help
Outline New Look RapidFire Symbol Link Add Note Create Create Position Arrange
Stars and Their Spectrum
Stars gives off
Energy and Light
the detection of which is
all normal stars have absorption lines
Spectrum
types
Depends on the class of the star
Great Job! thanks
can have — can have
its peak determines
Emmision Lines
Absorption lines
The Color of the Star
which are
Wavelength in a spectrum which are brighter than the other neighboring waves
which are
Wavelenghts in a spectrum with lower emmisions than the other neighboring waves
the
blue and white looking stars are hotter than the red looking stars
Stars with
Different temperatures emit different wavelenghts
caused by
Atoms spontaniously loosing energy in quantums
Atoms taking energy from the continuous spectrum at certain wavelengths.
caused by
"with the" better transition
the
the
hotter the temperature, smaller are the wavelengths
lower the temperature, larger are the wavelengths
only
all
O.K. I see. should change "can have" above to "have"
the relation ship is called
Few stars have emissions lines
stars have absorption lines
Wien's Displacement
(Max wavelength)x(Temperature)= Constant
to determin the energy popotion of two temperatures of the same gas
Boltzman Law (ratio of temperature)^4 =(ratio of energy of the temperatures)
class
O
"has a" better transition
B
A
F
G Our Sun's class
K
M
its
Temperature 30,000K to 60,000K
Temperature 10,000K to 30,000K
Temperature 7,500K to 10,000K
Temperature 6,000K to 7,500K
Temperature 5,000K to 6,000K
Temperature 3,5000 to 5,000K
Temperature 3,500 or less
its
Hydrogen spectral lines are weak
Hydrogen spectral lines are stronger than O's.
Hydrogen spectral lines are the stronges of all the star classes
Hydrogen spectral lines are weaker than A's
Calcium spectral lines are strong
spectral lines are are from neutral metals
spectral lines most consists of molecule titanium oxide.
but its
Neutral helium lines are more dominant
"has" is probably a better connection than "its"
buts its
Ionized calcium lines are more dominant
100
Start
Exploring -...
3½ Floppy (...
Microsoft P...
Student Poi...
Inspiratio...
7:24 AM

57o

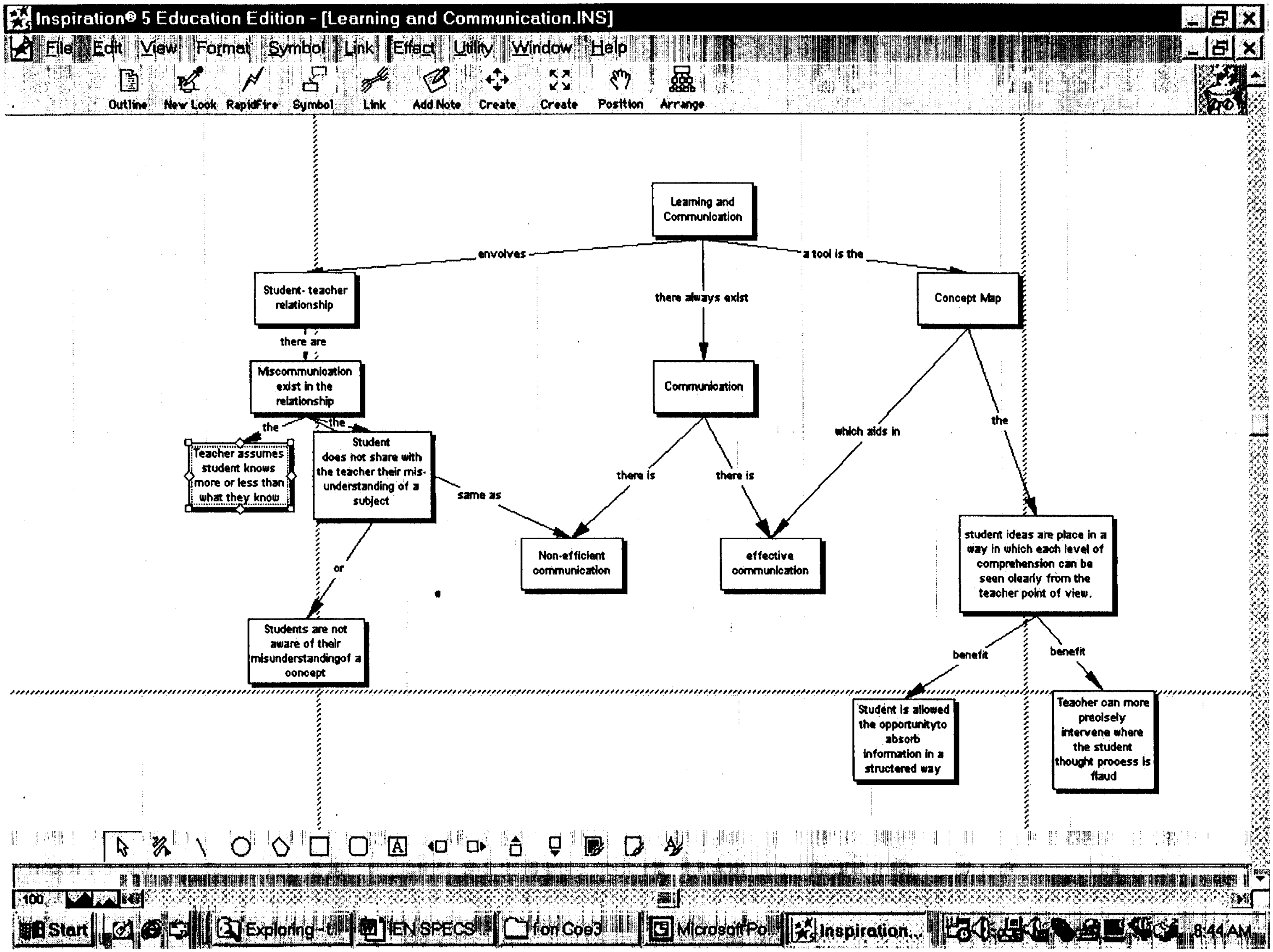

Inspiration® 5 Education Edition - [Extrasolar Planets review 7-5-00 atlanta.INS]
File Edit View Format Symbol Link Effect Utility Window Help
Outline New Look RapidFire Symbol Link Add Note Create Create Position Arrange
Sample
Extrasolar Planets
Very interesting and provacative. Thank you.
methods used
Detecting Planetary Transits
by observing the effects of
to date questions
known
Planets crossing infront of a star. A.K.A. eclipse of the star
Questions
Limitations
on
on
on
Observing
data is not
Binary Stars System
Pulsating Stars
Star Spots
Transit more than once
A continuous stream
has
which is
due to
Two stars orbiting each other
A star increasing and decreasing in area
Satellites are scoping a range of stars
which causes known
periodically
You mean telescopes here, not satellites
One star eclipsing the other
Luminosity of a star to decrease in intervals
answer
answer
answer
This part looks absolutely fastenating. But, I'm not quite sure what you are doing hear
A more complicated spectrum is present
Sets default attributes for new symbols and links
100
Start
Exploring - Rem...
3½ Floppy (A:)
Microsoft Powe...
Student Portfol...
Inspiration®...
7:19 AM

Adjust the Project to the Student's Increasing Abilities

- Each student is unique.
- As the student reaches a higher [illegible] of sophistication, the research projec[illegible] evolves.
- Guide the student in contributing to a research paper based on their project.

Mr. Brooks Case

- Originally we were going to compare certain computer programs' effectiveness in finding planetary transits.
- Mr. Brooks worked in learning LINUX , programs and programming.
- We moved the project to finding periodicity in early F-stars (The fastest way to get a peer reviewed paper.).



Inspiration® 5 Education Edition - [Learning and Communication.INS]
File Edit View Format Symbol Link Effect Utility Window Help
Outline New Look RapidFire Symbol Link Add Note Create Create Position Arrange
Learning and Communication
envolves
a tool is the
there always exist
Student- teacher relationship
there are
Miscommunication exist in the relationship
the
Teacher assumes student knows more or less than what they know
Student does not share with the teacher their mis-understanding of a subject
same as
or
Students are not aware of their misunderstandingof a concept
Communication
there is
there is
Non-efficient communication
effective communication
Concept Map
which aids in
the
student ideas are place in a way in which each level of comprehension can be seen clearly from the teacher point of view.
benefit
benefit
Student is allowed the opportunityto absorb information in a structered way
Teacher can more precisely intervene where the student thought process is flaud
100
Start
Exploring
EN SPECS
for Coe3
Microsoft Po
Inspiration...
8:44 AM

An Illustration of the Hybrid Model of Instruction: Energy and its Transformation

Dr. Subhash C. Bhatia
Morehouse College

An Illustration of the Hybrid Model of Instruction: Energy and its Transformation

By

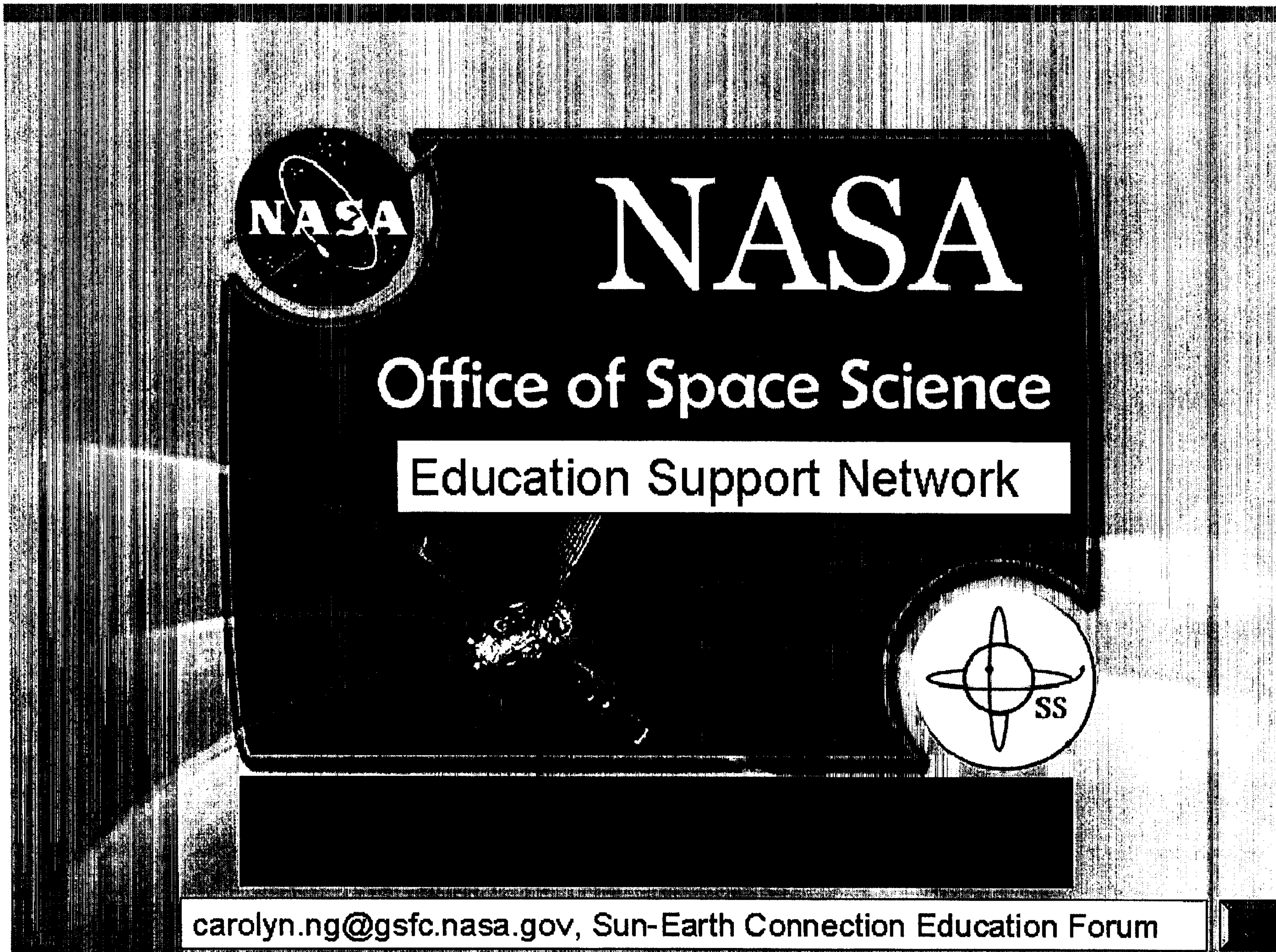
Subhash C. Bhatia
Chemistry Department, Morehouse College
830 Westview Dr., Atlanta, GA 30314
sbhatia@morehouse.edu
(404) 681-2800 ext.2286 (v)
(404) 614-3782 (fax)

Abstract

The two prevalent models of education can be broadly classified as traditional American (episodial and procedural) and traditional European (developmental and conceptual). The strengths and drawbacks of these two models can be debated and judged by the outcomes observed. Different variations of these models with various pedagogical approaches (peer instruction, collaborative learning, workshop, process workshop, topic based, lab based, guided inquiry, etc.) have been developed and implemented. This work will present a new model of instruction termed “Hybrid Model”. Hybrid Model is a combination of different approaches with the objectives of a) building necessary skills; b) teaching how to do science. The motivation, guiding principles, and implementation strategy will be discussed. The detailed implementation will be illustrated for the topic energy and its transformation. This topic and other topics were developed as co-curricular activities for pre-freshman component of the Program in Physical Sciences (PIPS), which is funded by ONR.
The contributions of Dr. Hylton and support of Dr. King are acknowledged.

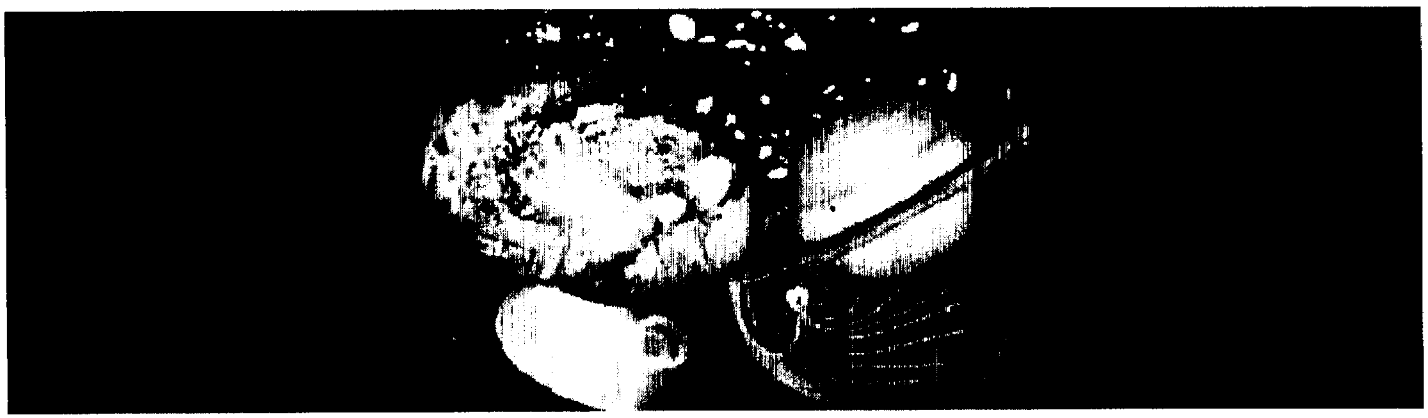
Sun-Earth Connection Education Forum

Ms. Carolyn Ng
NASA Goddard Space Flight Center


NASA
NASA
Office of Space Science
Education Support Network
SS
carolyn.ng@gsfc.nasa.gov, Sun-Earth Connection Education Forum

Office of Space Science
Education and Public Outreach

Four Themes in Space Science



- Origins of the Universe
- Structure and Evolution of the Universe
- Solar System Exploration
- Sun-Earth Connection

http://spacescience.nasa.gov

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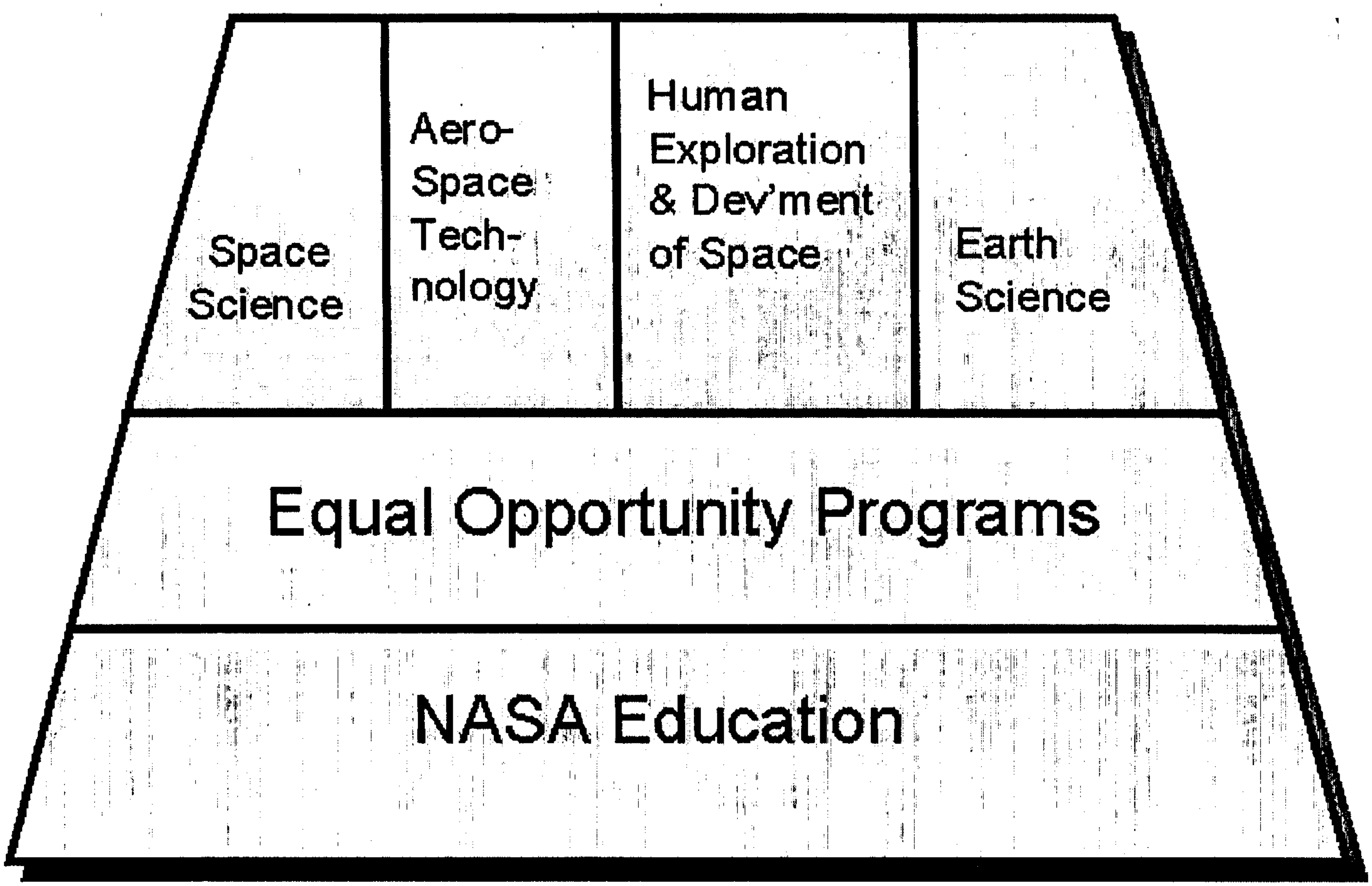
Education and Public Outreach

Enterprise-Embedded Education



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Education and Public Outreach

An EPO Support Network

- Flight missions and research programs
- Four Education Forums
  - Origins
  - Structure and Evolution of the Universe
  - Solar System Exploration
  - Sun-Earth Connection
- Five Broker/Facilitators
  - Ohio Aerospace Institute
  - SouthEast Regional Clearing House
  - DePaul University
  - Lunar and Planetary Institute
  - Space Science Institute

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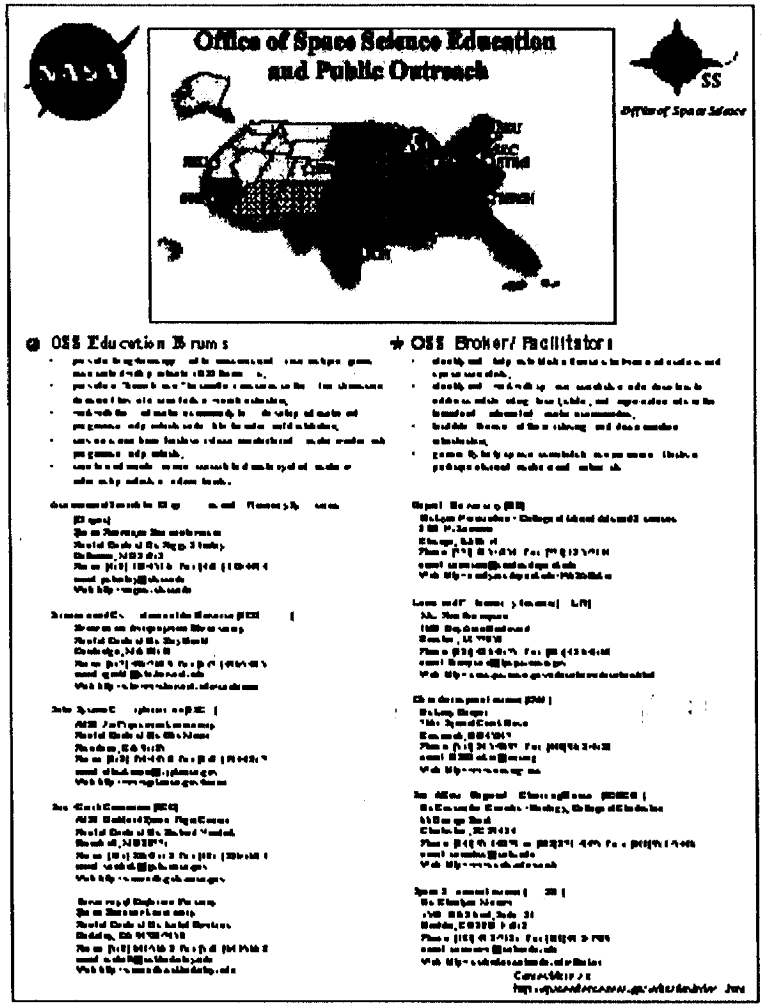
Education and Public Outreach

Points of Contact in the Support Network



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Sun-Earth Connection Science

SEC researchers at NASA GSFC, ARC, and MSFC investigate:

Quest I: Why Does the Sun Vary?
-Solar Variability and Its Effects on the Corona and Solar Wind

Quest II: How Do the Planets Respond to Solar Variability?
-Geospace Environment and Comparative Planetary Space Environments

Quest III: How Do the Sun and Galaxy Interact?
-Understand the Heliospheric Boundary and Nearby Galactic Environment

Quest IV: How Does Solar Variability Affect Life and Society?
-Space Weather

http://www.lmsal.com/sec/Roadmap/

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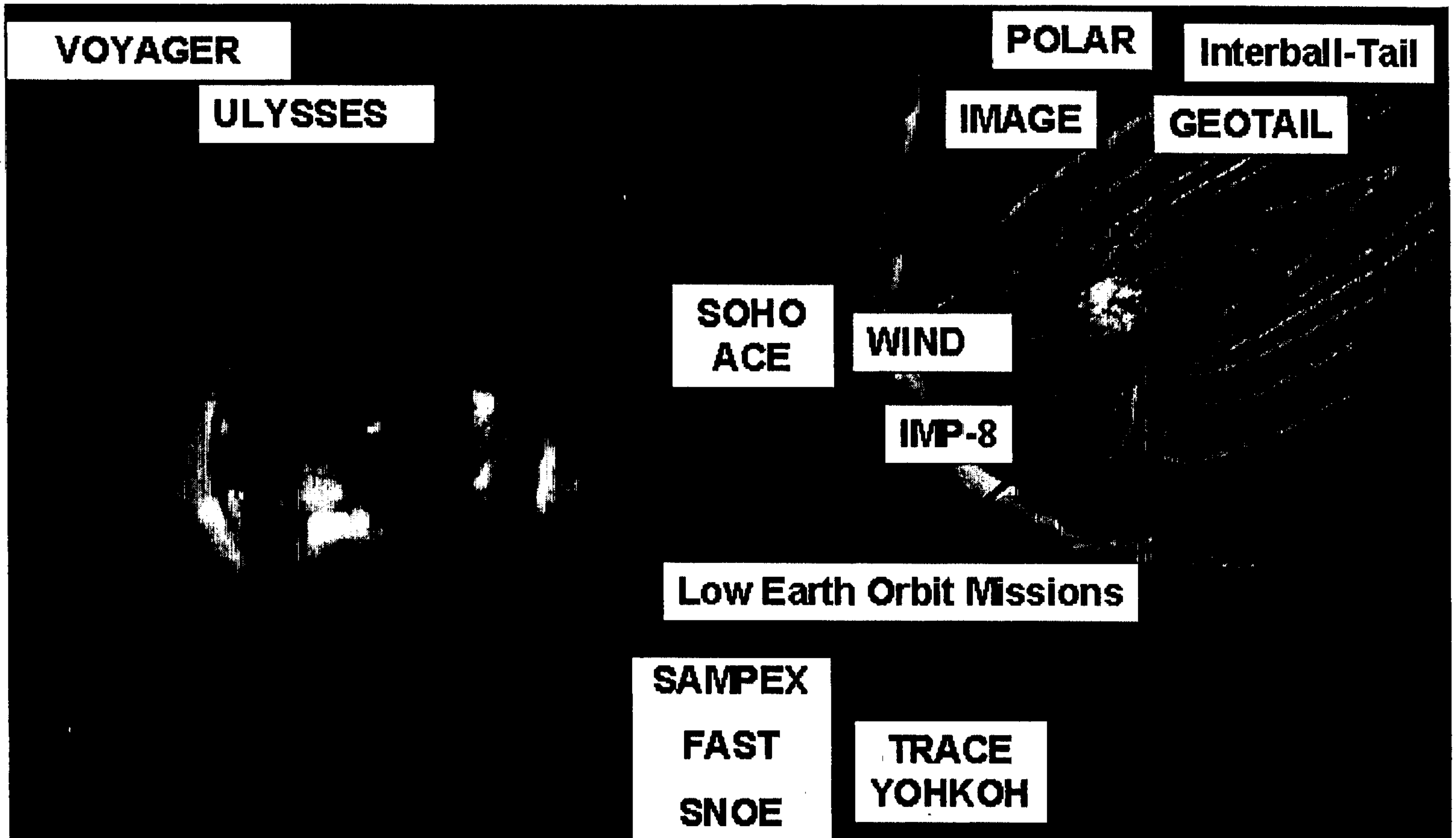
SEC Operating Missions



http://sunearth.gsfc.nasa.gov/scientists/missions.html

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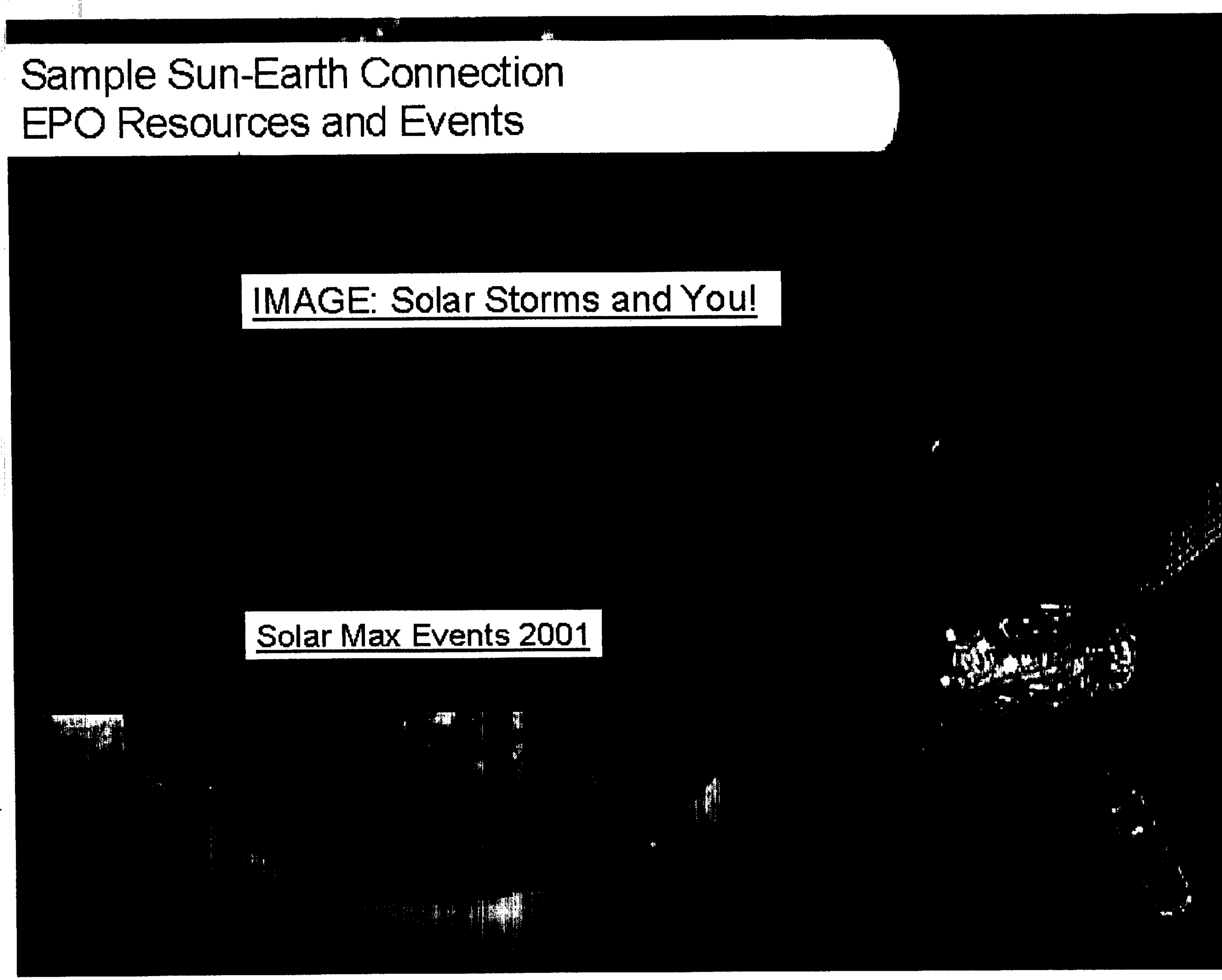
Sample Sun-Earth Connection
EPO Resources and Events
IMAGE: Solar Storms and You!
Solar Max Events 2001

Office of Space Science
Education and Public Outreach

IMAGE

Ms. Sue Higley
Maryland Teacher of the Year, 1999

- Enhances Math, Science, and Language Arts curriculum for Grades 7-9
- 19 classroom activities covering basic math skills, data analysis, reading, writing, and simulation techniques
- Topic Areas include:

-Solar Activity Cycles, Solar Wind, and Magnetic Storms

-Satellite Impacts, Human Activity and Solar Storms

-Satellite Design

-Planning a Trip to Mars and Radiation Dosages

Developed by Dr. Sten Odenwald (IMAGE/POETRY) and Ms. Sue Higley (Cherry Hill Middle School, Elkton, MD)

http://image.gsfc.nasa.gov/poetry/activities.html

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Office of Space Science
Education and Public Outreach

ISTP and SOHO

- *Storms from the Sun - Tormentas Solares*
  - Thousands of copies printed in English and Spanish
  - Distributed nationally at NSTA, ASTC, NCTM, APS, AGU, and La Raza
  - Available through NASA CORE
  - Available with movies on the web
- *The Dynamic Sun* CD-ROM
  - Multimedia, educational presentation on the Sun with video clips and animations
  - Version 3 has slides for elementary school as well as middle school and high school, with teacher's guides
  - Available through NASA CORE

http://www-istp.gsfc.nasa.gov/istp/outreach/
http://sohowww.nascom.nasa.gov/explore/materials.html

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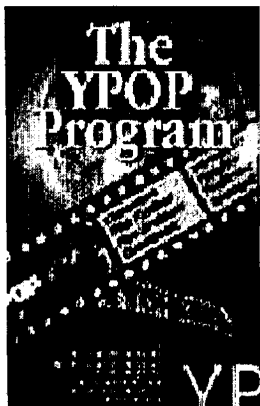
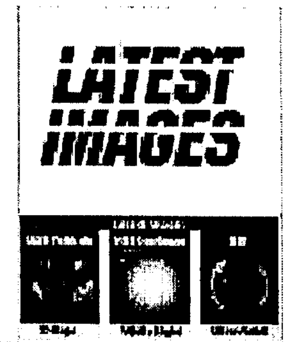
Office of Space Science
Education and Public Outreach

Yohkoh: YPOP Outreach Website

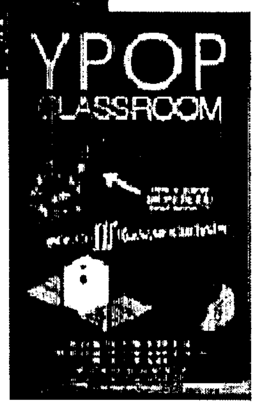


The Yohkoh Public Outreach Project (YPOP)
Produced by Lockheed Martin and Montana State University



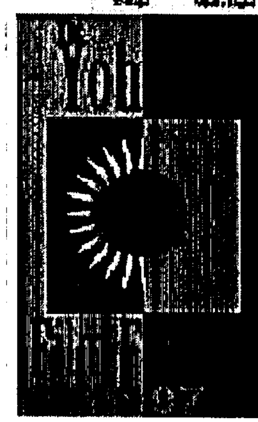
Latest Images from Space

Provides access to latest data from Yohkoh, SOHO & TRACE



Solar Classroom

Collection of hands-on activities for the classroom



Yohkoh Movie Theater

View pre-packaged movies or make your own.

Register for Solar Week 9-13 October 2000

http://www.lmsal.com/YPOP

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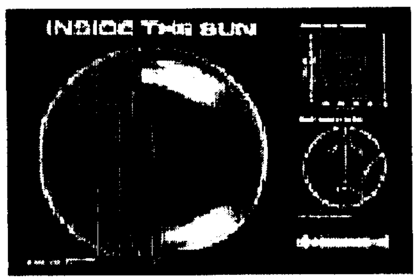
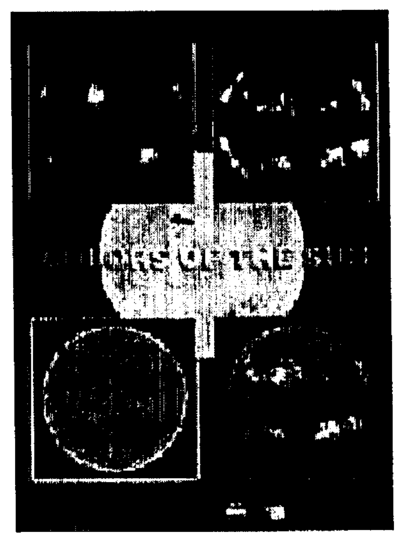
Education and Public Outreach

Posters of the Sun by Lockheed Martin



Helioseismology
Solar Cycle
and Others...

Build Your Own
Spectroscope



http://solar-center.Stanford.EDU/posters/

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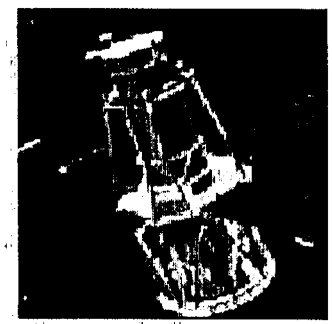
Upcoming Missions

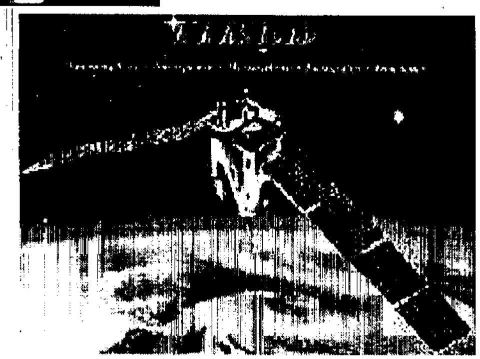
GENESIS SEARCH FOR ORIGINS

- **Chemistry of the Solar Wind**
  - http://www.genesis.org/



- **HESSI**
  - **Solar Flares**
  - http://hesperia.gsfc.nasa.gov/hessi/

- **TIMED**
  - **Structure, Dynamics, and Chemistry of Earth's Upper Atmosphere**
  - http://stp.gsfc.nasa.gov/timed.htm



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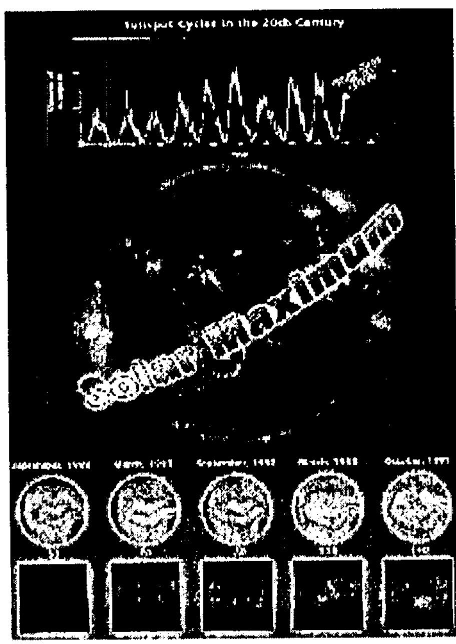
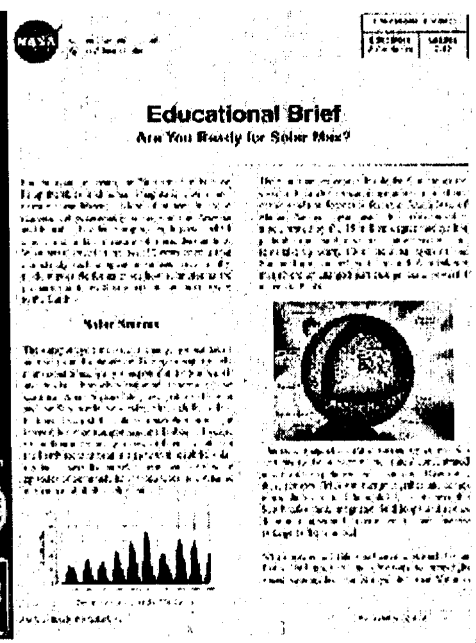
New Solar Max Packet

Solar Max Folder



Educational Brief



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Student Symposium Summary
Dr. Valerie Thomas

MU-SPIN Student Symposium

Facilitator: Mr. Chevell L. Thomas
Technology & Logistical Support: Mr. Eduardo Takamura and Ms. Taunya B. Jenkins
Overall Coordination: Dr. Valerie L. Thomas

During the September 2000 joint Minority University-Space Interdisciplinary Network (MU-SPIN) Tenth Anniversary Users' Conference and Minority University Research and Education Division (MURED) Second Annual Education Conference, MU-SPIN hosted its first Student Symposium. The Symposium consisted of student research competition, career development workshops, a cyber café, and one-on-one conferences. Most of the students who participated in the Poster Session also participated in the Student Symposium. The presentations for the Symposium were organized in four categories: Space Science, Earth Science, Technology, and Earth Science - Graduate. In addition, two high school students requested and were granted permission to present the results of their research and have their presentations judged. A total of 22 students, including the high school students participated in the Symposium.

There was a considerable amount of interest in and support for the Student Symposium. Thirteen volunteers from across the country were actively involved with judging the students' presentations. Mildred Boyd, Edutech; Cynthia Dinkins, The Howard Foundation; Gloria Walker, National Oceanic and Atmospheric Administration (NOAA); and Roger Hathaway, NASA/Langley Research Center were very instrumental in providing prizes for the competition winners. The prizes consisted of weather radios, summer internships at NASA/Langley Research Center, and crystal clocks and a paperweight. All of the participants received certificates and gifts.

Student Competition

The student competition was held on Wednesday and Thursday morning, September 13 and 14, respectively. The students presented very informative results on their research in Space Science, Earth Science, and Technology. The winners and judges for each of those categories were:

Space Science

First Place: Ms. Tamara L Battle, Medgar Evers College, *Ionization Structure of the Irregular Galaxy NGC 44*

Second Place: Mr. Taran Tulsee, Queens College/Queensborough Community College, *A Comparison of CCD Images of M57 Taken with Different Cameras*

Judges:

Dr. Chivey C. Wu, California State University at Los Angeles
Mr. Mario Diaz, University of Texas at Brownsville
Dr. George Carruthers, Naval Research Laboratory
Mr. James S. Barrowman, NASA/Goddard Space Flight Center

Earth Science

First Place: Ms. ToWanda Samples, University of Maryland Eastern Shore, *UMES-AIR: A NASA-UMES Collaborative Experiential Learning and Exploratory Research Project*

First Place: Nasraddine Fouad, LaGuardia Community College, *A Comparison of Aerosol Hand-held Polarimeter and GISS Sunphotometer Results*

Judges:

Dr. Ken Hardy, Florida International University
Ms. Carolyn Ng, NASA/Goddard Space Flight Center
Dr. Clarence Coleman, Norfolk State University
Terrence Reece

Technology

First Place: Ms. Iliana Zuniga & Ms. Aracely Sandoval, University of Texas at El Paso, *Incorporating Digital Media to Create Interactive Presentations*

Second Place: Ms. Witzar Destin, Medgar Evers College, *Mathematical Treatment of Buffered PH*

Judges:

Dr. Gustavo Roig, Florida International University
Dr. Henry Gore, Jackson State University
Dr. Willard Smith, Tennessee State University
Mr. Maurice Foxwell, Foxwell & Dinkins, Inc.

Earth Science - Graduate

First Place: Mr. Lorenzo Williamson, Medgar Evers College, *Aerosol Optical Depth & Extinction Analysis Using Langley Regression*

Second Place: Mr. Colley Baldwin & Dereck Skeete, Medgar Evers College, *Comparative Analysis of New York City's Multi-Filtered Rotating Shadow-band Radiometers Network Data and its Use in Validation of the Student Polarimeter Aerosols and Cloud Experiment*

Judges:

Ms. Cheryl Davis, Tuskegee University
Ms. Joan Gil, Cantutillo Independent School District

The high school students who presented were:

Ms. Sarai Arnold, Baton Rouge Magnet School, *Environmental Factor-Induced Dopaminergic Degeneration: Relevance to Parkinson's Disorder*

Ms. Jasmyn Dyer, McKinley Senior High School, *Wear Properties of Novel Al-Cu-Fe Quasicrystal-Polymer Composites*

Davis and Gil also judged them.

Career Development Workshops

The career development workshops included the following topics: internships, how to write a resume, improving presentations, and feedback from young career professionals. Mr. Dillard Menchan, NASA/Goddard Space Flight Center, and Mr. Al Corea, National Oceanic and Atmospheric Administration (NOAA) provided information on internship opportunities in their respective agencies. Ms. Cynthia Dinkins, The Howard Foundation, provided information on internship opportunities with her Board members (in the telecommunications, entertainment, and media industries.) Ms. Mildred Boyd, Edutech, gave a comprehensive presentation on topics such as what should and should not be included in the resume, how to format the resume, and how to frame a resume to reflect the experiences from research projects, internship opportunities, etc. The formal workshop on improving presentations was cancelled; however, in response to a special request by some of the students, Mr. Chevell L. Thomas gave an informal presentation on this topic that was well received. The participants on the Young Professionals Feedback Panel included: Mr. Eduardo Takamura, ADNET Systems, Inc.; Mr. Marcus Britt, Alltel; Mr. Dereck Skeete, Medgar Evers College; and Ms. Alicia Joseph, Medgar Evers College. They have graduated from (and/or worked in) NASA partner institutions. The panel served not only as a testimonial of these students who were affected by MU-SPIN and MURED programs in their respective colleges/universities, but also served as a focus for open discussion on keys to success..

Cyber Café

The Cyber Café was open to the students during the Wednesday and Thursday sessions. Four laptops were available for accessing the Internet. The Cyber Cafe was a convenience for the students to visit web sites that were referenced in the presentations or other activities.

Education and Research Opportunities Exploration

This session allowed for students to have one-on-one conferences with representatives from government, industry, and academia. Mr. Dillard Menchan & Ms. Carolyn Ng, NASA/Goddard Space Flight Center; Mr. Roger Hathaway, NASA/Langley; Ms. Gloria Walker, NOAA; Mr. Harry Schulte, University of Texas at El Paso; Dr. Leon Johnson, Medgar Evers College; and Dr. William Lupton, Morgan State University, participated in these conferences with students. Ms. Cynthia Dinkins had to leave unexpectedly and could not participate in the session. Since she was specifically looking for minority students for internships, she left her e-mail address (cdinkins@sbca.org) interested students to contact her.

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P. Shukla: ADNET Systems, Inc., Potomac, Maryland

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13. ABSTRACT *(Maximum 200 words)*

The Minority University-Space Interdisiplinary Network (MU-SPIN) Program and NASA's Minority University Research and Education Division (MURED) both reached their 10th anniversaries. In honor of this occasion, the 2000 Annual Users' Conference held at Morris Brown College in Atlanta, Georgia, September 11-15, 2000, was the first to be jointly hosted by MU-SPIN and MURED. With the theme *"Celebrating Our Tenth Year With Our Eyes on the Prize,"* the conference provided a national forum for showcasing successful MU-SPIN and MURED Program (MUREP) experiences to enhance faculty/student development in areas of scientific and technical research and education.

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