



MU-SPIN Conference

NASA Space Science EPO Ecosystem

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Sun-Earth Connection Education Forum

http://sunearth.ssl.berkeley.edu and http://sunearth.gsfc.nasa.gov

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What is the Space Science Ecosystem?

- ***Introduction***

- What is NASA Space Science?
- Goals of NASA Education and Public Outreach
- Elements of NASA EPO
- Space Science Ecosystem: Forum and Facilitators

- ***Results: Other Forums and Brokers***

- Selected Works of Forums and Brokers

- ***Results: Sun-Earth Connection Education Forum***

- Multimedia Resources (TV, CD-ROM, Video)
- Printed Resources (Workbooks, Posters, Brochures, Workshops)
- Exhibits for Public Outreach (Northern Lights, Space Weather Traveling Exhibit)
- Special Projects (SUNBEAMS, INSPIRE, and Radio JOVE)

- ***Space Science Ecosystem and You***

- Result Recaps: SECEF Efforts
- Upcoming SEC Events
- How Can We Collaborate?



What is the Space Science Ecosystem?

Part I

Introduction: Structure, Goals, and Elements



NASA Space Science Enterprise



THE SEARCH FOR ORIGINS

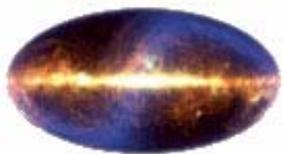
Origins Theme

- How did galaxies form?
- Are there other habitable planets outside our solar system?
- Is life unique to Earth and if not, where else?



Solar System Exploration (SSE) Theme

- How habitable is Earth? What extraterrestrial resources are available?
- How did the solar system form? How has it evolved?
- What is the origin of life and its existence beyond Earth?



Structure and Evolution of the Universe (SEU) Theme

- What is the structure of the Universe?
- How are the cycles of matter and energy exchanged between stars?
- What are the ultimate limits of gravity and energy in the Universe?

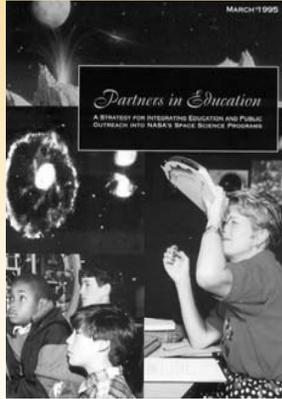


Sun-Earth Connection (SEC) Theme

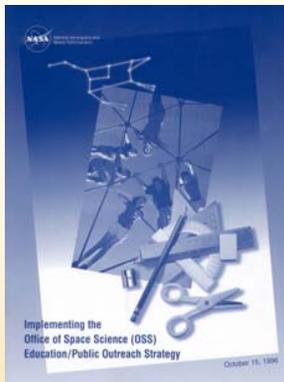
- How and why does the Sun vary?
- How do the Earth and planets respond?
- What are the implications for humanity?



Goals of NASA Space Science Education and Public Outreach



Partners in Education,
1995



Education Implementation Plan,
1996

- **Contribute to systemic reforms in science, mathematics, and technology education;**
- **Develop partnerships between the space science community and the communities responsible for science, mathematics, and technology education;**
- **Contribute to the creation of the talented scientific and technical workforce needed for the 21st century;**
- **Promote the involvement of underserved / underutilized groups in Space Science EPO and their participation in R&D;**
- **Share the excitement of discoveries and knowledge with the public.**



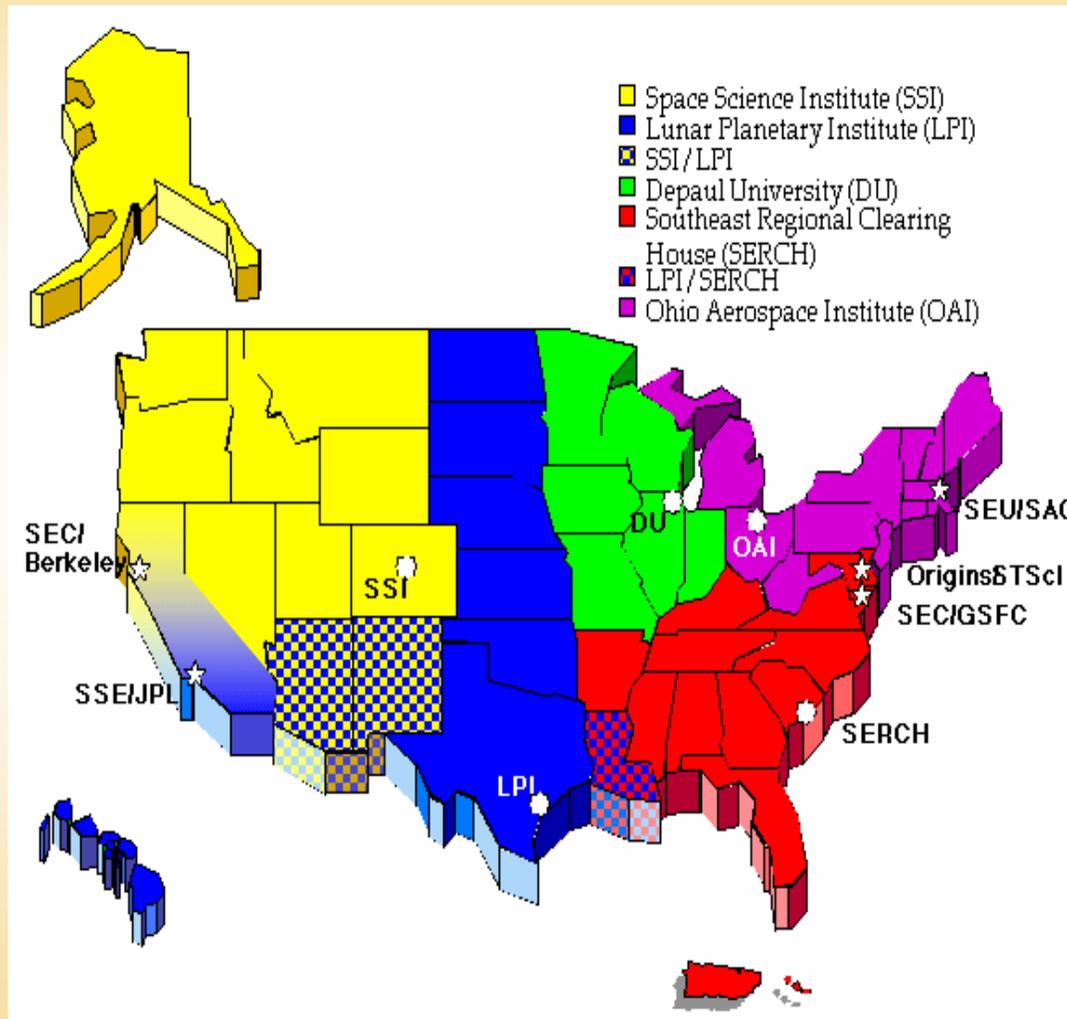
Space Science EPO Ecosystem: Education Forums

- National Coordination
- Long-term Sustainability
- Improve the Effectiveness of SEC EPO Activities
- Identify and Disseminate Best EPO Practices
- Coordinate EPO Programs from Missions
- Prevent Duplication of Effort
 - Conference participation
 - Participation in high leverage EPO events
 - Create EPO resource directory
 - Assess and respond to user needs
- Seek High-Leverage Opportunities through Partnerships
- Make Connections with Existing Education Networks





Space Science EPO "Ecosystem": Broker/Facilitators



- Identify high-leverage opportunities

- Arrange collaborations between scientists and educators



Elements of NASA EPO in Space Sciences

- **Missions**
 - All space science missions now have EPO activities
 - Missions are the most productive source of EPO products
- **Scientists**
 - Primarily supported by SR&T grants or by own institutions
- **Sun-Earth Connection Education Forum (SECEF) and three other national forums**
- **Five Regional Broker/Facilitators**
- **Special Projects**



What is the Space Science Ecosystem?

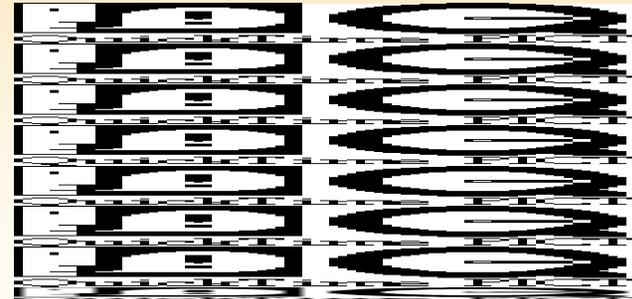
Part II

Results: Other Forums and Brokers



Selected Works of Forums and Brokers

- **Origins (F)**
 - Space Science Resource Directory
 - IDEAS Grants (<http://ideas.stsci.edu/>)
- **SE U (F)**
 - Mission EPO Products
- **SSE (F)**
 - Mission Teacher Ambassadors
 - List of Space Science Resources
- **SERCH (B)**
 - Braille Map of the Solar System
 - Rural Schools
- **LPI (B)**
 - Public Libraries





What is the Space Science Ecosystem?

Part III

Results: Sun-Earth Connection Education Forum

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Use of the Media for SEC Outreach

The Space Place Launch Pad

Progress into 21st Century on Cable TV

- Voyager/Ulysses Project Outreach
- Program aired in 6 Los Angeles Counties

Award-Winning Space Web Site for Kids



Passport to Knowledge - Live from the Sun

- 'Electronic field trip' - broadcast TV, videotape, Web chats, e-mail, teachers' guides
- 250 PBS stations and NASA-TV
- Estimated reach: 1.5 to 2 million people
- SEC mission participation: ISTP, SOHO, ACE

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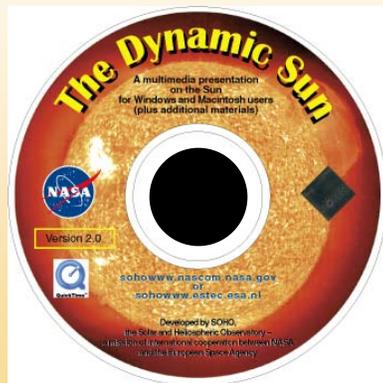


Multimedia Presentation: SOHO

Dynamic Sun CD-ROM

- Multimedia, educational presentation on the Sun with over 30 video clips and animations; middle school and high school versions, with teacher's guides
- 30,000 produced in 1999 (~80 cents each) - 6,000 left

QuickTime™ and a Cinepak decompressor are needed to see this picture.



Described by one workshop presenter as "a huge success!"

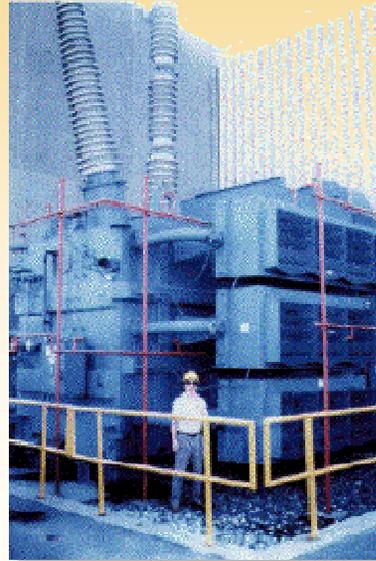
Video Clip Showing Solar Activity

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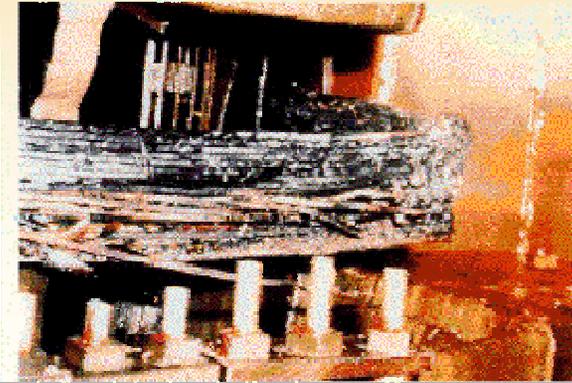
IMAGE/POETRY: *Blackout!* Video

Blackout! developed by the Event-Based Science Program through a grant from the National Science Foundation. Written by a team of master teachers, and published by Addison Wesley.



PJM Public Service
Step Up Transformer

Severe internal damage caused by the space storm of 13 March, 1989.

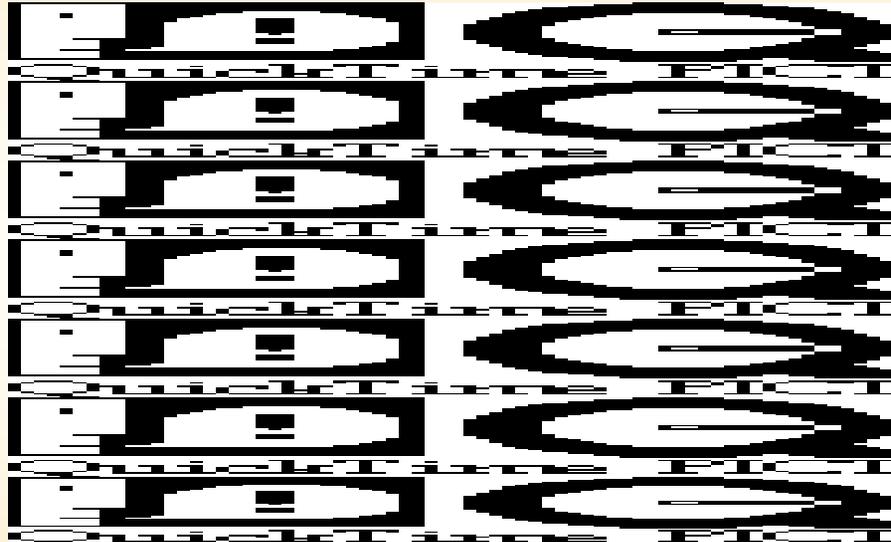


- Collaboration with IMAGE/POETRY and Event-Based Science
- 40,000 middle school science teachers use EBS modules annually
- Highly-regarded, integrated math/science/English curriculum
- IMAGE/POETRY scientist interviews featured
- IMAGE/POETRY soda bottle magnetometer featured 'hands-on' activity
- Accompanying 'Solar Storms' video for students describing SEC issues



Workbooks by IMAGE/POETRY

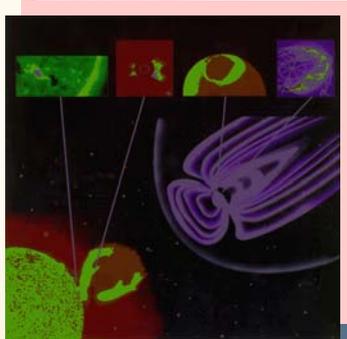
- IMAGE Program's Education and Public Outreach effort
- Public Outreach, Education, Teaching and Reaching Youth (POETRY)
- Selected Teacher Resources:



- > **'Solar Storms and YOU!'** math and science workbook Grades 7-9
- > **'Northern Lights and Solar Sprites'** space science activities, Grade K-6
- > **'The Mission and Instruments of IMAGE'** space science for Grades 10-12



Sharing Scientific Discoveries



Through Printed Materials

Storms from the Sun –

Tormentas Solares

- Posters in English and in Spanish
- 60,000+ distributed at national education conferences
- Available through existing NASA dissemination channels
- Included in *Live from the Sun* teacher kit
- Available with movies on the web:

<http://www-istp.gsfc.nasa.gov/istp/outreach>

Through Workshops

SECTRA Teacher Workshops

- National reach
- Workshops for teacher leaders in science curriculum development & teacher training
- Responsive to constructivist learning and National Science Education Standards
- ISTP scientists partner with educators
- Participants conduct additional workshops in their home states and districts

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Space Weather

coming soon to a museum near you

- A partnership between SSI and GSFC
- Producing a 200 sq. ft. traveling mini-exhibit
- Will include graphics, real-time data, and interactives
- Will reach 750,000 people/year





SUNBEAMS

Students United with NASA Becoming Excited About Math and Science

Sharing
the Process
and Excitement
of Science
and Technology



Student Workshops



Teacher Workshops



Family Nights



PARTNERS

NASA Goddard Space Flight Center
District of Columbia Public Schools
District of Columbia Alliance of Corporate Partners

<http://www.gsfc.nasa.gov/sunbeams/>

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Projects INSPIRE and Radio Jove



- High School Projects
- Observing natural and manmade radio waves in the audio region
- Studying Earth's ionosphere; Jupiter and the Sun

Planetary
Radio
Astronomy



for
Schools

<http://image.gsfc.nasa.gov/poetry/inspire/> and <http://radiojove.gsfc.nasa.gov/>

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What is the Space Science Ecosystem?

Part IV

Space Science Ecosystem and You



Result Recaps: SECEF Efforts

- **Developing a Resource Directory**
- **Inventorying SEC EPO Activities**
- **Identifying and Sharing Best Practices**
- **Coordinating Conference Participation**
- **Supporting Programs that Target Underserved and Underutilized Groups**
- **Evaluating Activities for Quality and Impact**
- **Facilitating High Visibility Events**
- **Communicating with the Public Scientific Inquiry**



Upcoming SEC Events for 1999-2000

- **Solar Max Coordination**
Multi-mission and program EPO activities
- **Live from the Sun**
More TV broadcasts in the Fall and Spring
- **IMAGE Satellite Launch**
First light and launch
- **HESSI Satellite Launch**
Launch
- **GEMS Curriculum Guide - Seasons**
A math and science book on "Seasons"
- **Space Weather Traveling Exhibit**
Mini exhibit sponsored by GSFC
- **Connections Planetarium Programs**
IMAX-quality programs at Rice University
- **Educator Workshops**
Teacher training in SEC curriculum topics
- **Resource Directory**
Resource review and population

<http://sunearth.ssl.berkeley.edu> and <http://sunearth.gsfc.nasa.gov>

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How Can Space Science Ecosystem Collaborate with You?

- **Proposals**
 - Partner
- **Resources**
 - Develop the directory's user interface
 - Develop curriculum support materials
 - Pilot and field test materials
 - Review and rate materials
 - Use and promote them!
- **Training**
 - Design, organize, and participate in workshops
- **Exhibits**
 - Develop and display