



Accelerating Convergence of Earth and Space Data in Teaching and Learning Through Participatory Design

NEREID

Network for Earth-space Research, Education and Innovation with Data



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Catherine B. Cramer, Stephen Miles Uzzo : ESIP Winter Meeting : 8 January 2020

Data Science for All Initiative (DS4All)



- Community of practice
- Data literacy essential principles
- Needs of multiple sectors

Community Based Organizations

Bloomberg Data for Good Exchange (D4GX) 2017, 2018



Graphic: Alexander, 1998



- Address the **need for data literacy** in underserved communities
- Make data-based activities **meaningful and relevant**
- Democratizing knowledge about **artificial intelligence**
- Libraries and Census 2020



Graphic: Alexander, 1998

Big Data for Little Kids

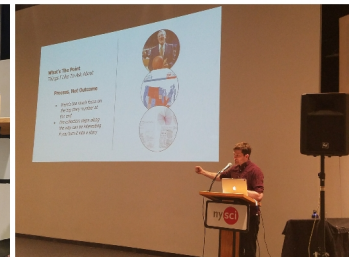
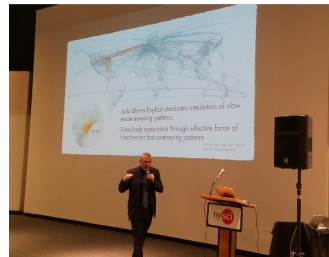
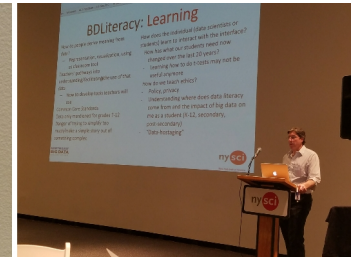
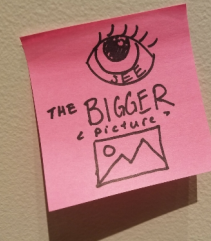
- *Structure:* 7-week workshop, meeting once per week for 1.5 hours
- *Theme:* Use data to help you design a new exhibit for the Hall of Science.
- *Families:* Each iteration involved 7-10 local families
- *Languages:* Facilitators spoke English, Spanish, Mandarin



Data Literacy Framework



Big Data
Literacy
Workshop



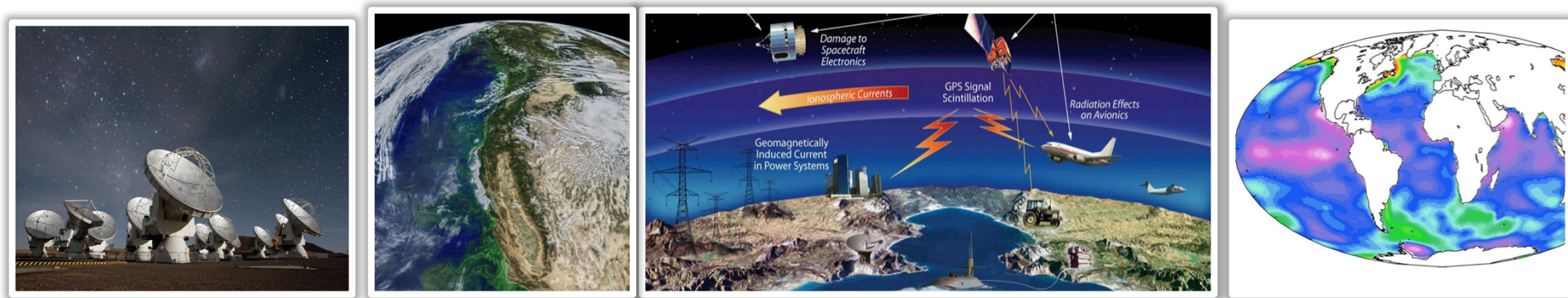
Graphic: Alexander, 1998

Formal Education Needs



All citizens in the 21st century should be data literate by the time they graduate from high school.

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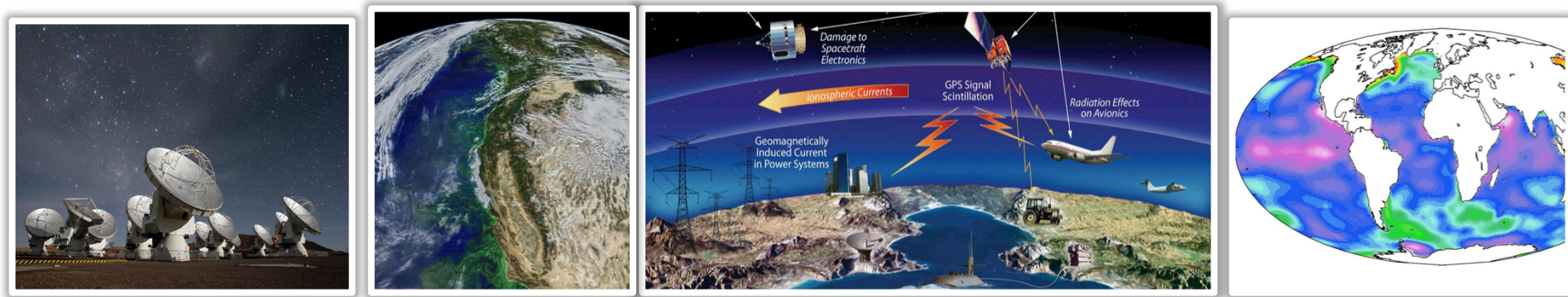


Mission: *NEREID ('nirē'id) advances research and innovation through education and engagement with big data in Earth-space sciences.*

Goals:

- Explore the challenges and implement solutions
- Build an interdisciplinary community of practice
- Develop and disseminate research-based best practices and curricular resources
- Bring together industry, academia, and policy makers to build a data literate society

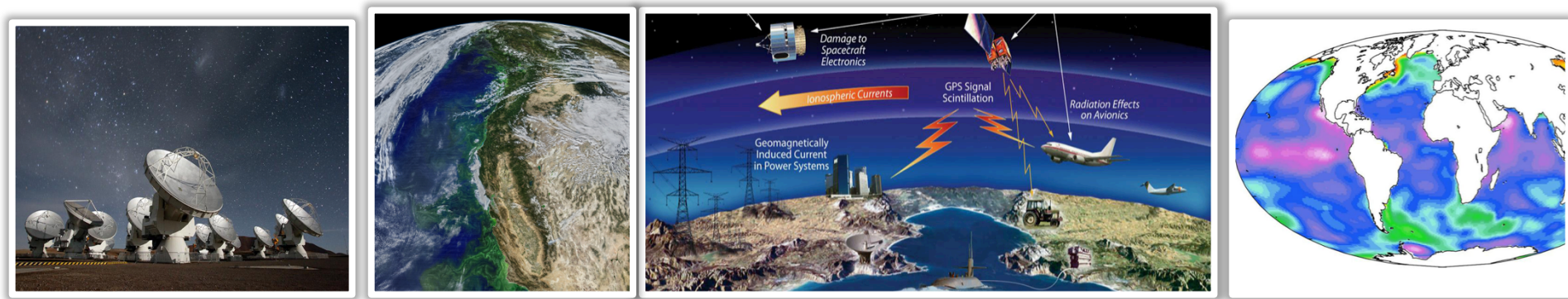
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Why NEREID and why now?

- Widening learning/workforce skills gap
- Changes in experimental design
- Needs of diverse populations
- Move toward convergence

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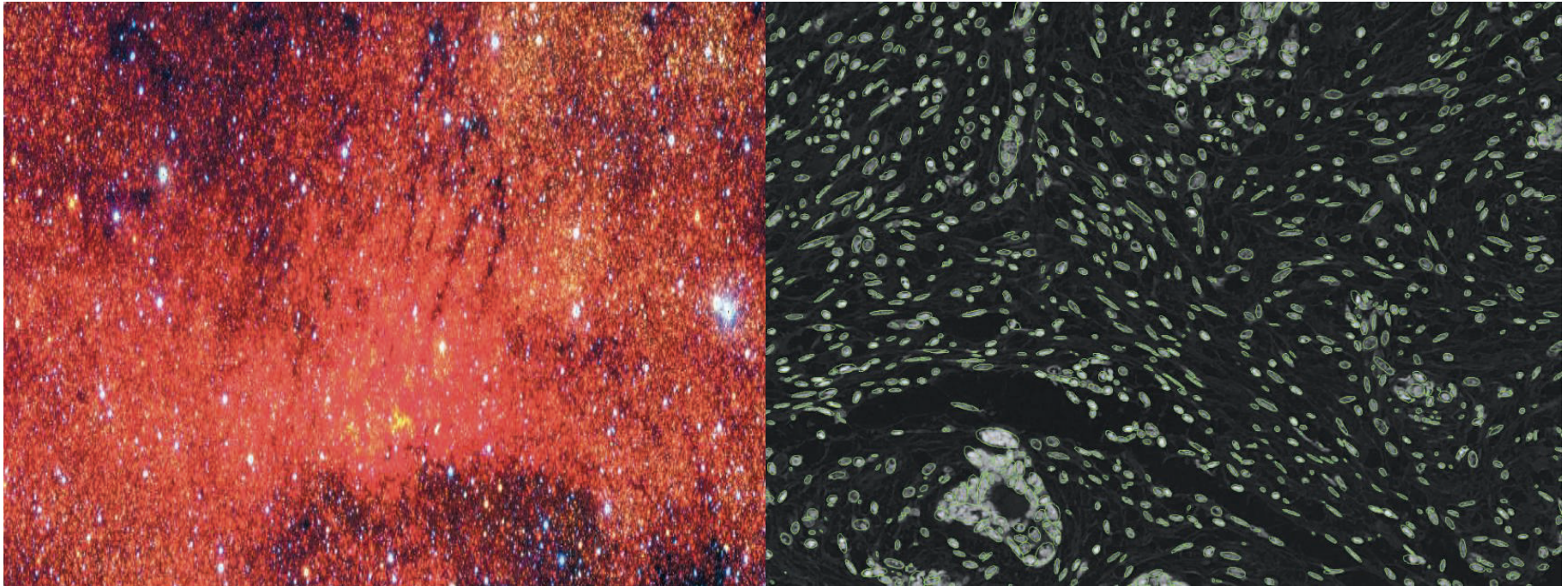


Green Bank Observatory November, 2019



- K-14 and community education programs are valuable resources for testing the acceleration of Earth-space sciences convergence, as the data used in each individual program often spans multiple disparate scientific domains.
- Educating both the current and next generation to embrace complexity and use a variety of data tools, including sophisticated AI-driven data tools, will be essential for accelerating convergence of Earth-space science.

New Synergies



Using the data visualization tool 3D Slicer for analyzing both astronomical and medical data
= *Astronomical Medicine*

New Synergies

- Teaching **Astronomy** or **Geography** within the informatics-focused context of **Big Data** and **Data Science**, using the **National Geography Education Standards**:
 - Where is it located?
 - What is significant about its location?
 - How is its location related to locations of other things?
 - Locate and gather information from a variety of sources
 - Record observations about its physical characteristics
 - Prepare maps
 - Make inferences & draw conclusions from maps
 - Use maps to interpret spatial relationships between objects
 - Use tables and graphs to interpret trends and relationships
 - Use text and photos to interpret trends and relationships
 - Interpret information obtained from satellite-produced images



Combined image of 2 Vermeer paintings:
The Astronomer, and The Geographer
[http://en.wikipedia.org/wiki/The_Astronomer_\(Vermeer\)](http://en.wikipedia.org/wiki/The_Astronomer_(Vermeer))



These standards could apply to Data Science Education within either the Geography or the Astronomy curriculum.