



# **New Frontiers in Astronomy**

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Space Telescope Science Institute



- Visible – Hubble Space Telescope
- Gamma rays – Compton Gamma Ray Obs.
- X-rays – Chandra X-ray Observatory
- Infrared – Spitzer Space Telescope



# Community Missions Office



Optimize the science from community-led astrophysics missions and projects.



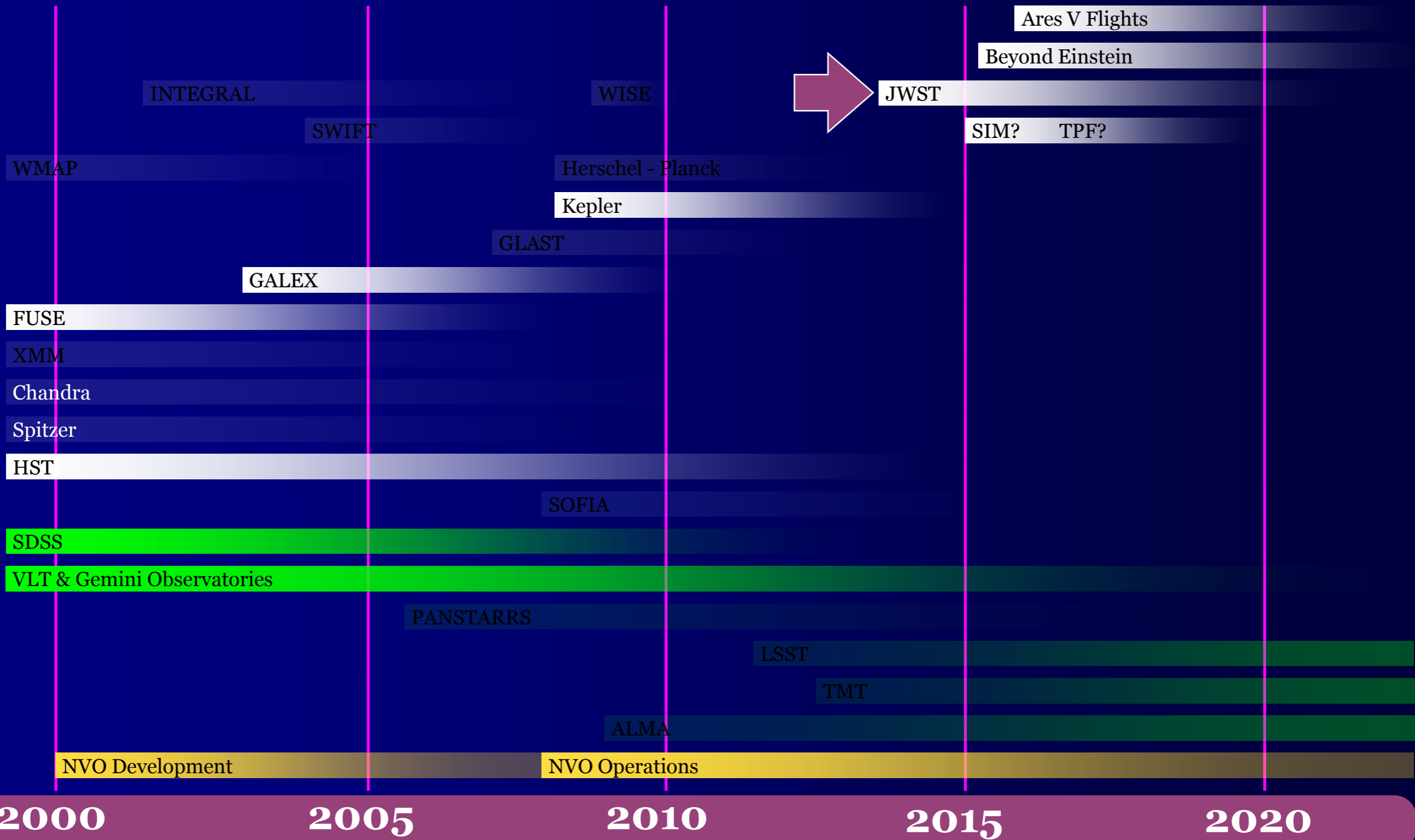
Develop, nurture, and share innovations in space astronomy science operations.



Collaborate on the next generation of space astrophysics programs.

# Astronomy Project Timeline

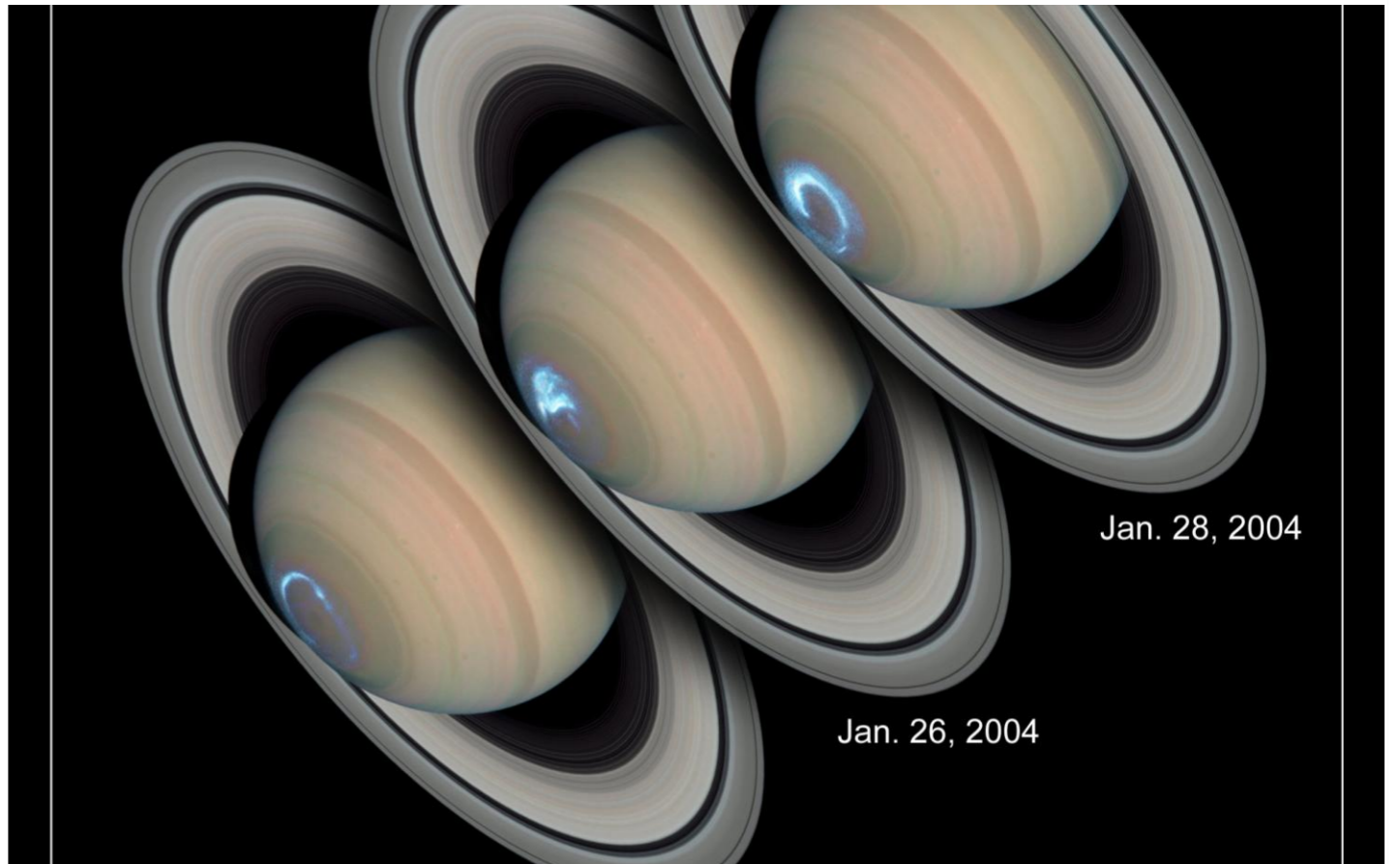
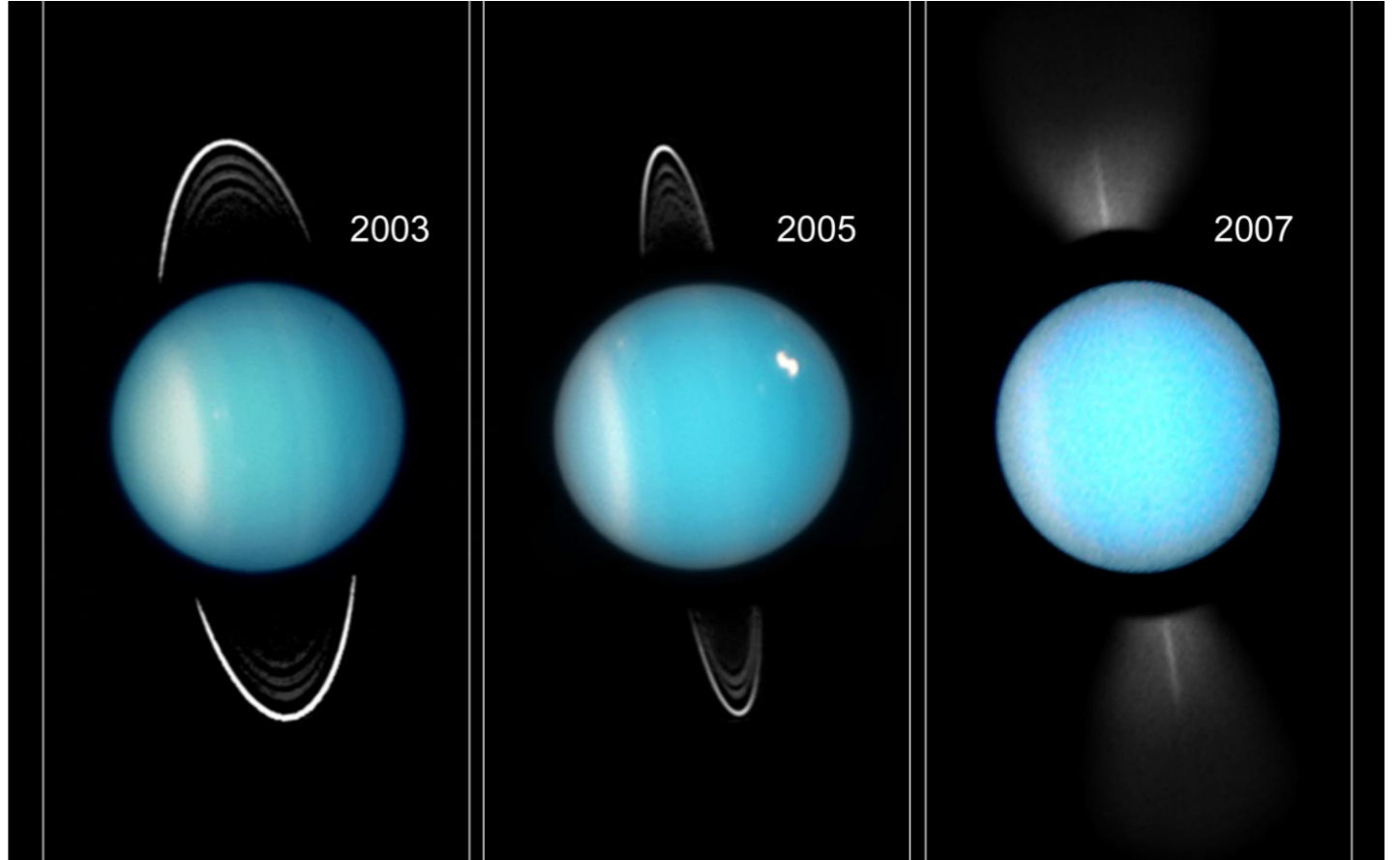
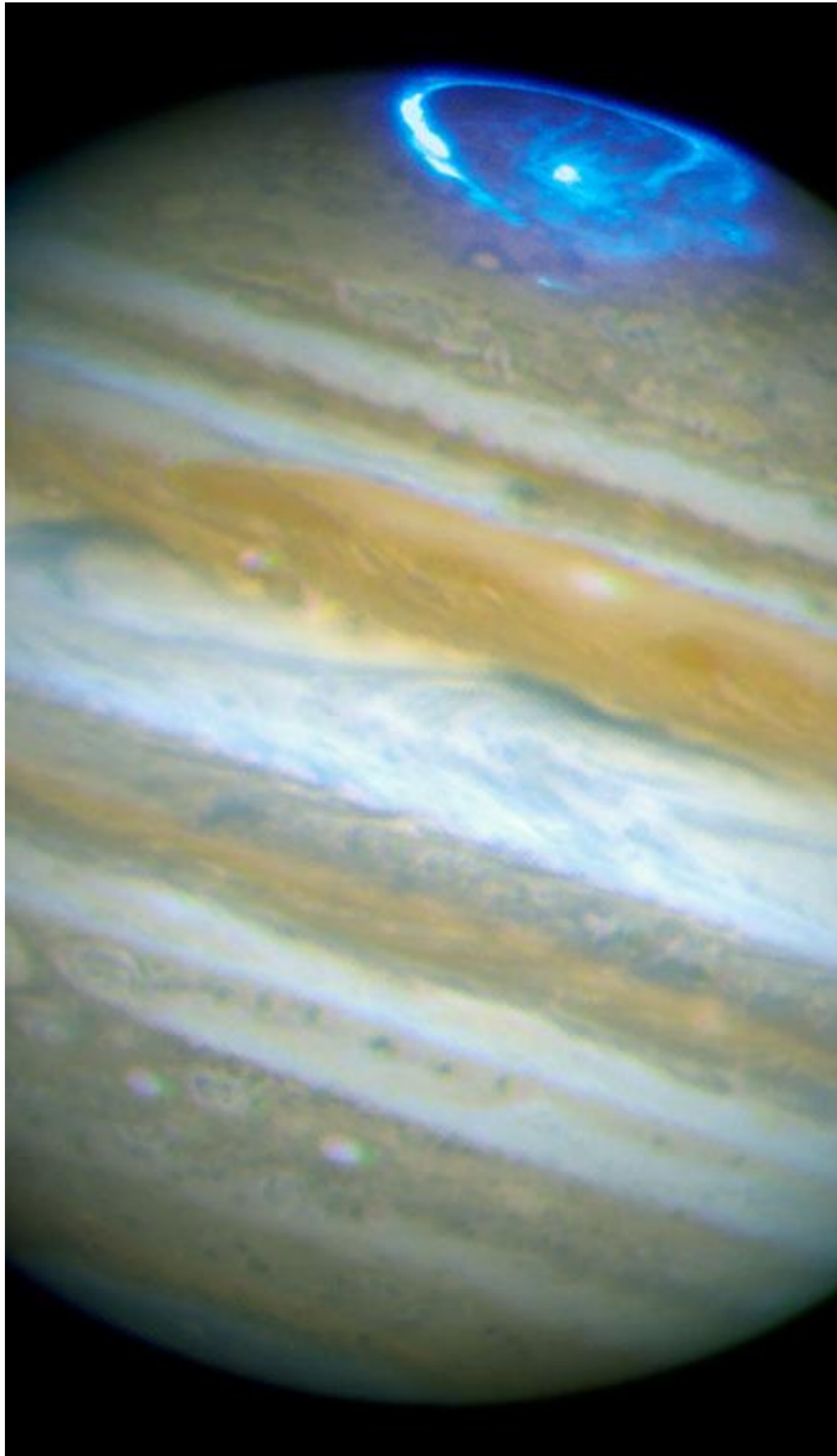
## STScI Project and Mission Activity

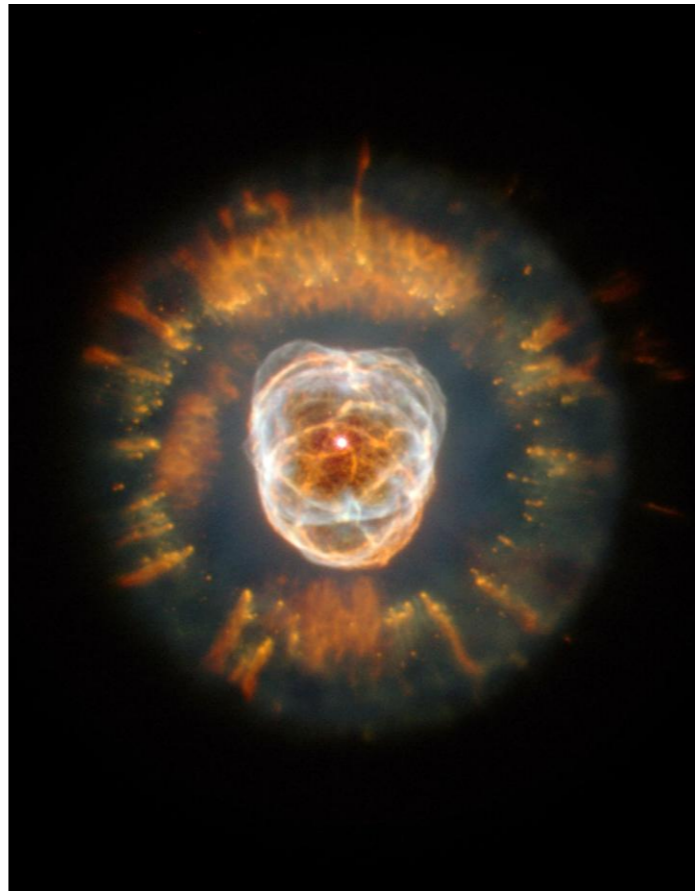
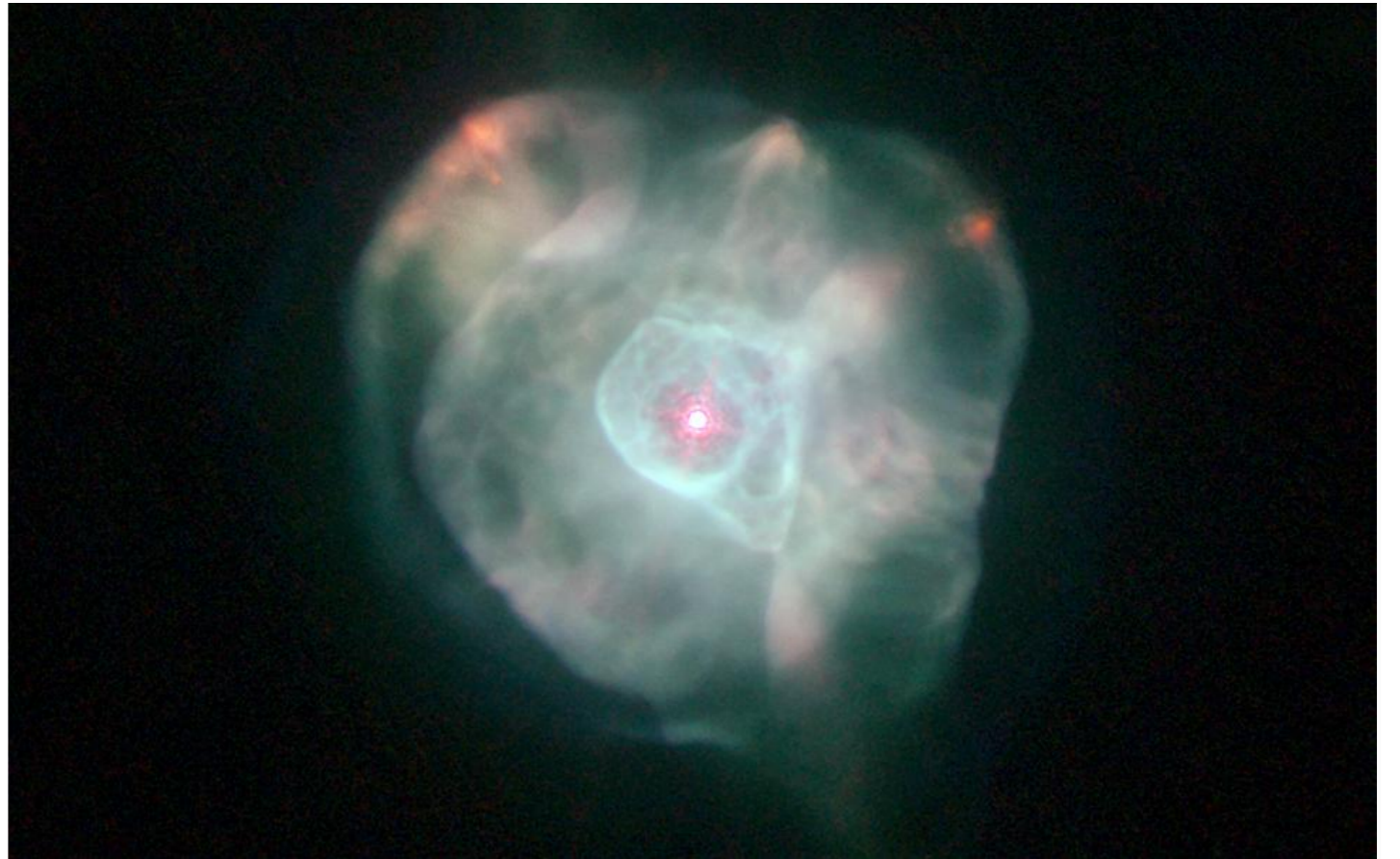


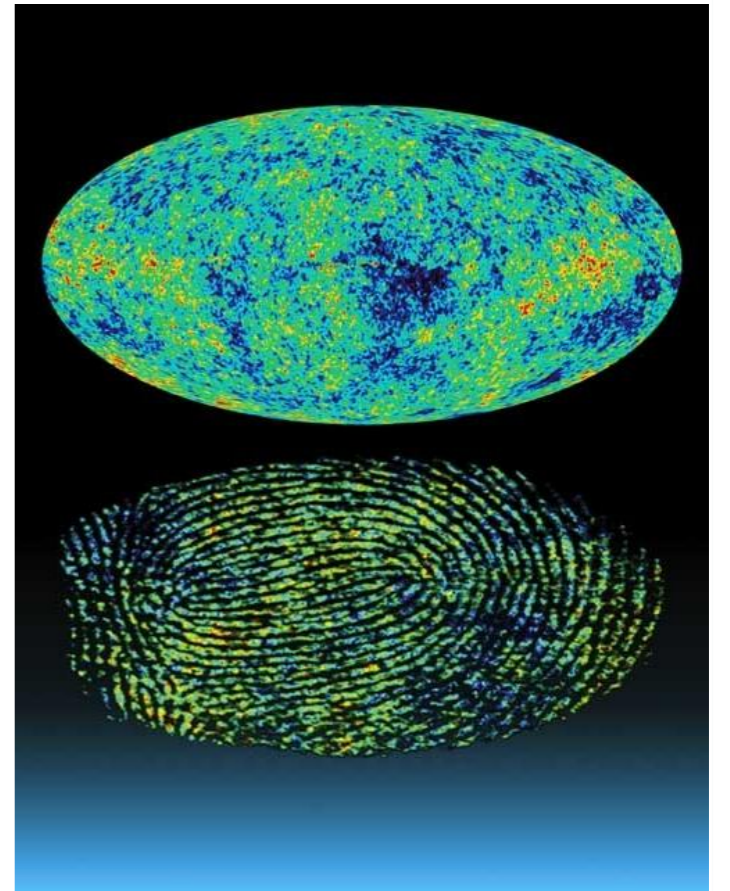
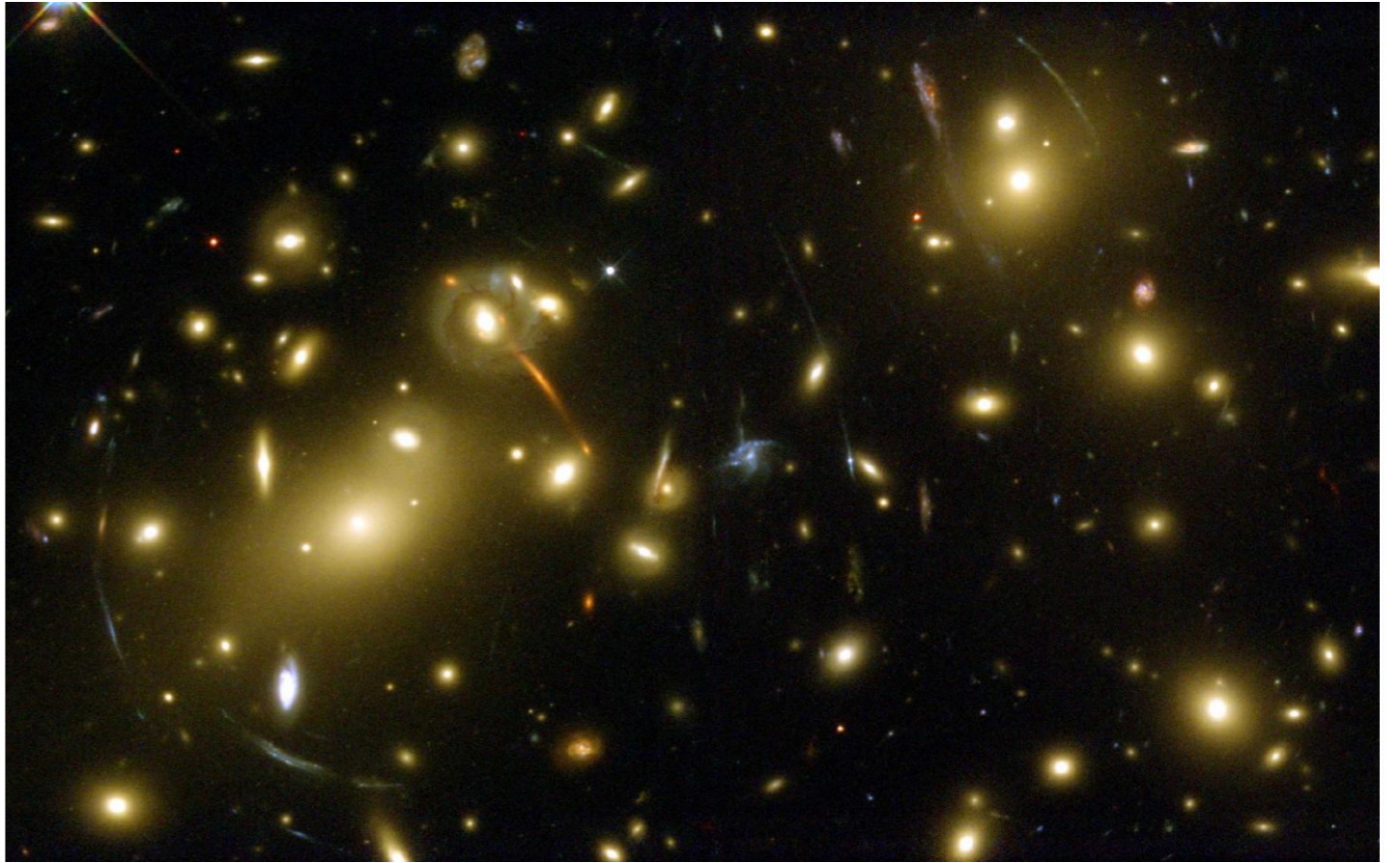
Start date and Probable Duration



# Community Missions









A blue background with a grid of white lines and the words "COMPUTER SCIENCE" repeated in a circular pattern.

Computer  
Science

A blue background with a molecular model of a protein structure made of red, green, and white spheres.

Biology

A close-up of several US dollar bills, showing the number "200" and the word "BANK".

Economics

A close-up of a red pill bottle, a white pill bottle, and several white pills on a wooden surface.

Medicine

A photograph of the United States Capitol building in Washington, D.C., with a clear blue sky.

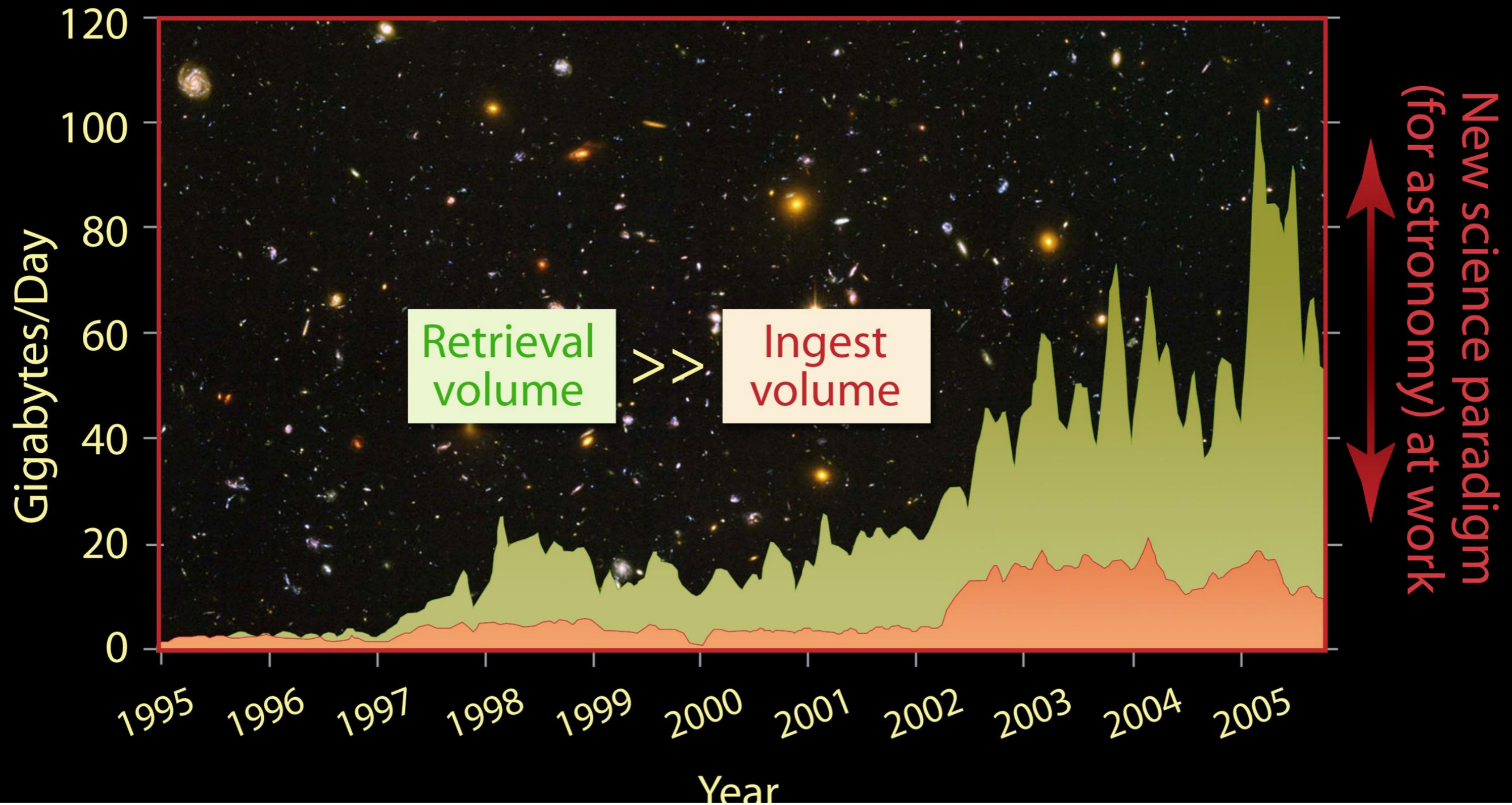
Government

A photograph of a starry night sky with many bright stars and a few faint galaxies.

Astronomy

Massive amounts of  
information

# HST data archive

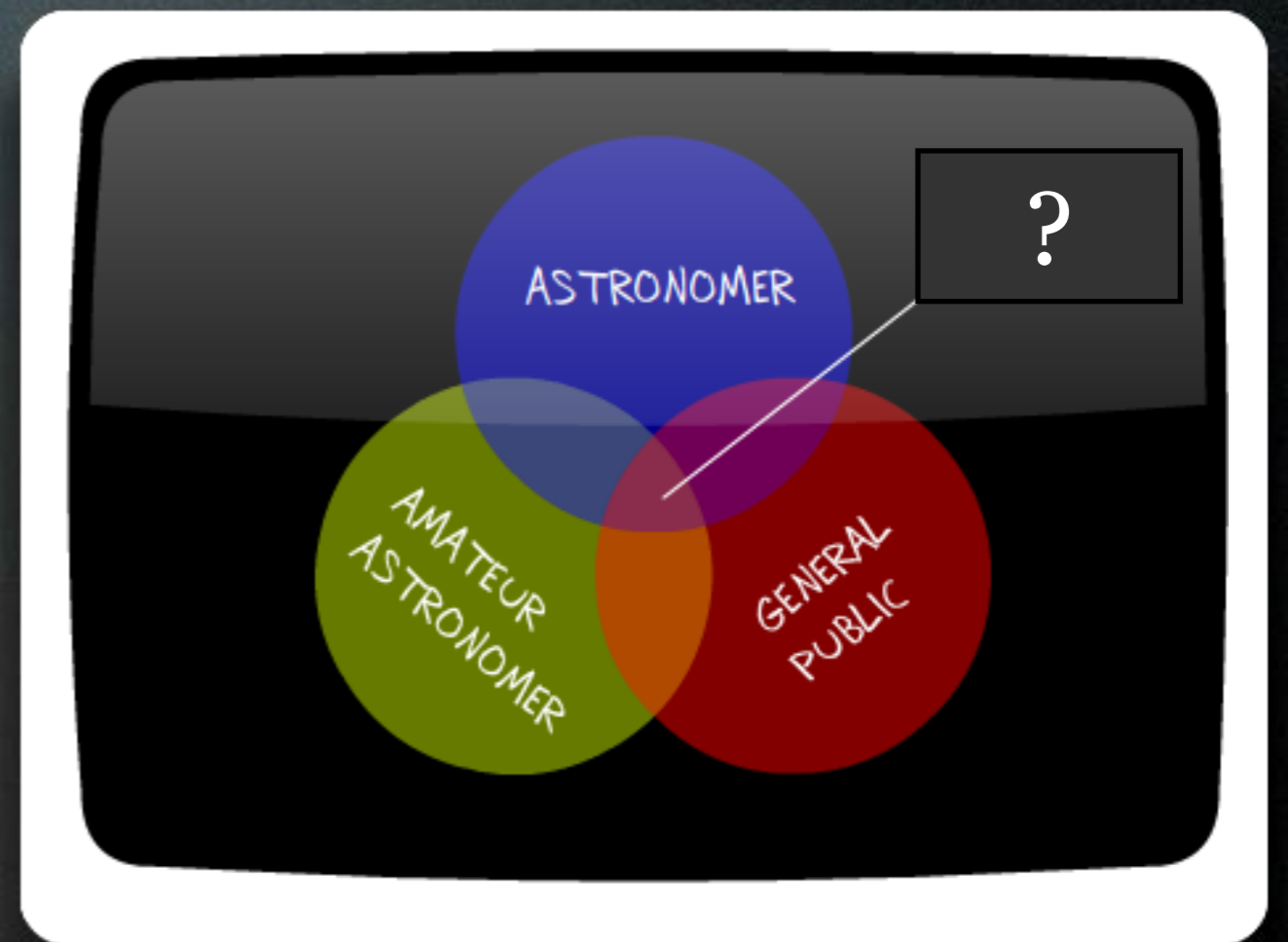


**New Science Paradigm**

for Astronomy

# Astronomy is changing

- Old days: photographic plates
- 1960: astronomical goes digital
- Instruments collect 100 GB/night
- Detectors follow Moore's Law
- Total data doubles every 2 years
- Growth over 25 years is a factor of 30 in glass, 3000 in pixels



Challenge: 100 Petabytes  
Monochrome is 4 terabytes

New analysis & visualization tools are required

the 2020 million literature  
5% of that on browser  
Library of Congress

**Challenges**

for the Future

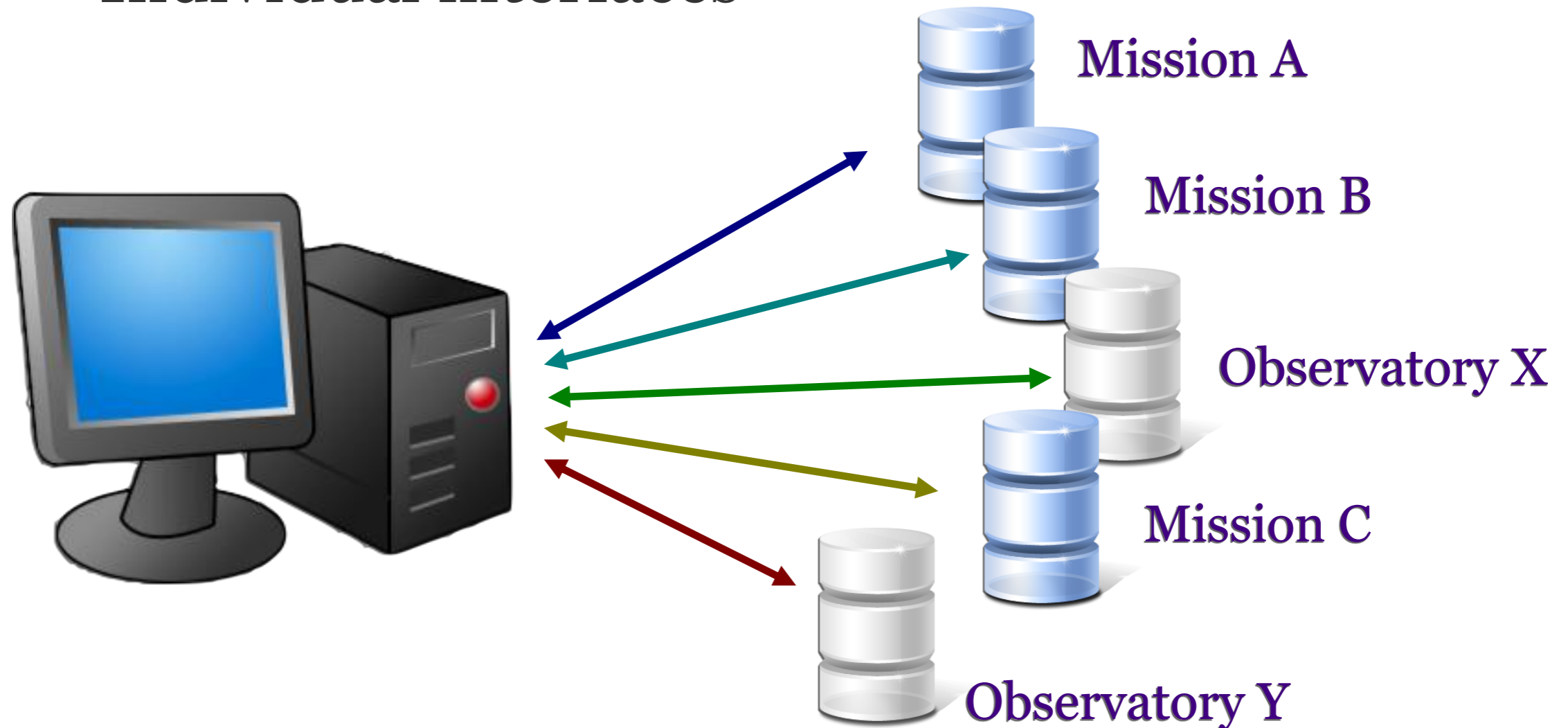
# Adapt or Perish

- Google Earth, Microsoft Virtual Earth have revolutionized the way we look at our planet.
- We proposed a new synergistic approach to the challenge of bringing the universe to our desktops



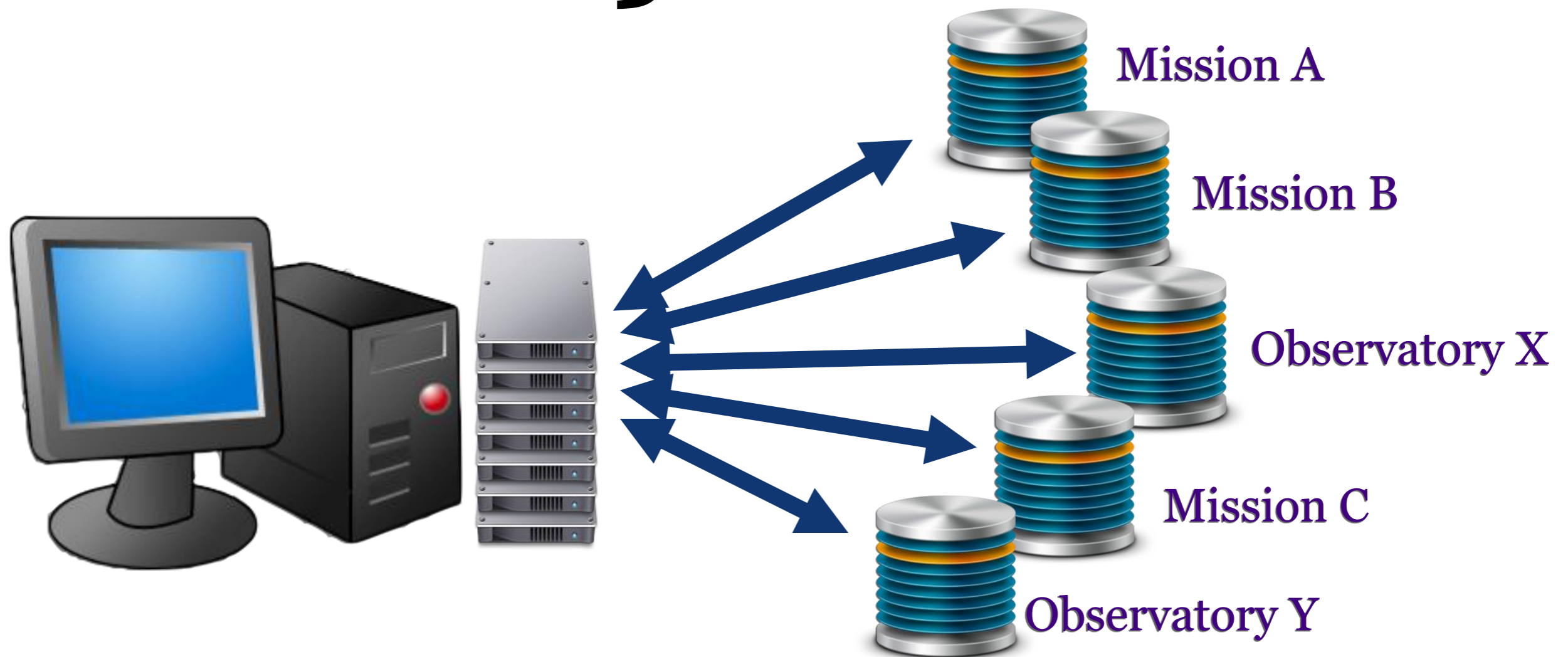
# Old Public Data Access

- Many observatories
- Individual interfaces



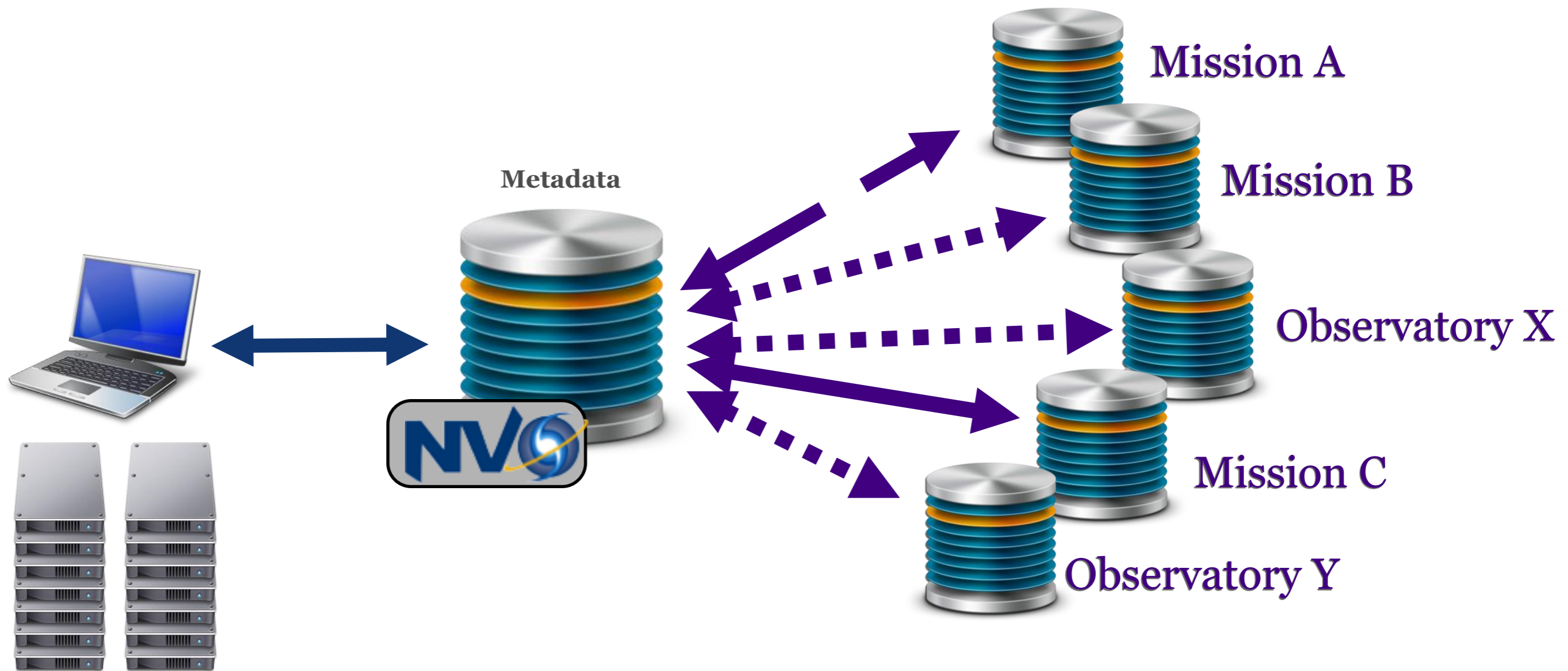
# New Science Paradigm: First Iteration

- Data Standards
- Protocols



# New Science Paradigm: Second Iteration

- Data Standards, Protocols, **Mining Tools**





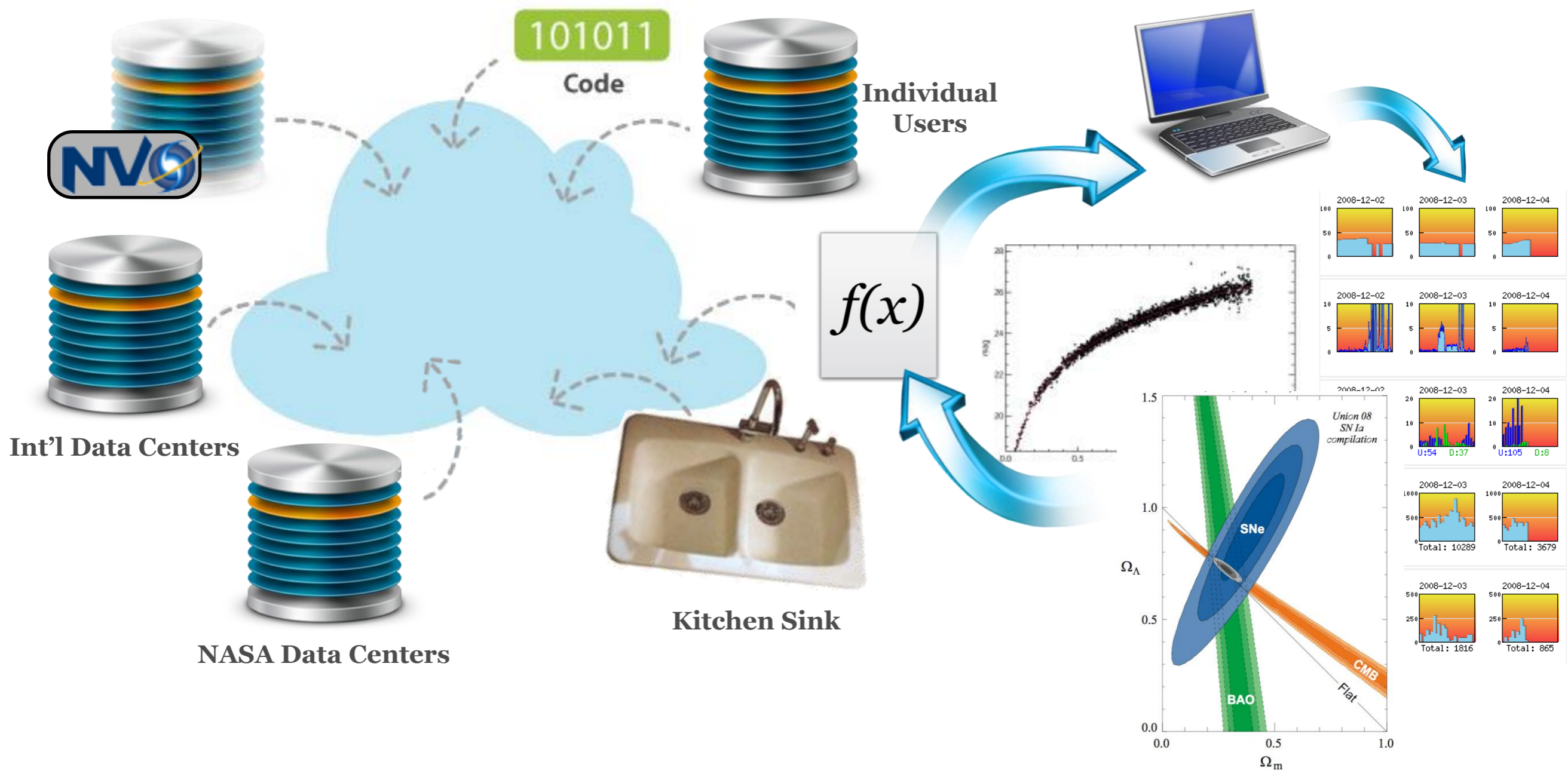
# New Science Paradigm Problems

- Technology is trumping science
- Many distributed services are unreliable
- Little idea of what users are doing and why
- Complex, difficult to use
- Moving data around is hard
- Hard for user to publish their own data

# Challenges

- Reduce obstacles to **Capturing, Organizing, Summarizing, Analyzing, Visualizing, and Curating**
- Consider data and algorithms as “the product”
- Adopt semantic technologies to enable automated metadata tagging, clustering and mining
- Transition to the new astronomy
  - Sociological issues

# New Science Paradigm: Science 2.0



- We must partner with other academic disciplines: Computer Science, Statistics, ...
- We must leverage partnerships with industry interested in enabling Science 2.0
- We must remember that we have the coolest datasets in the world (universe really)

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