New Challenges in Astronomy

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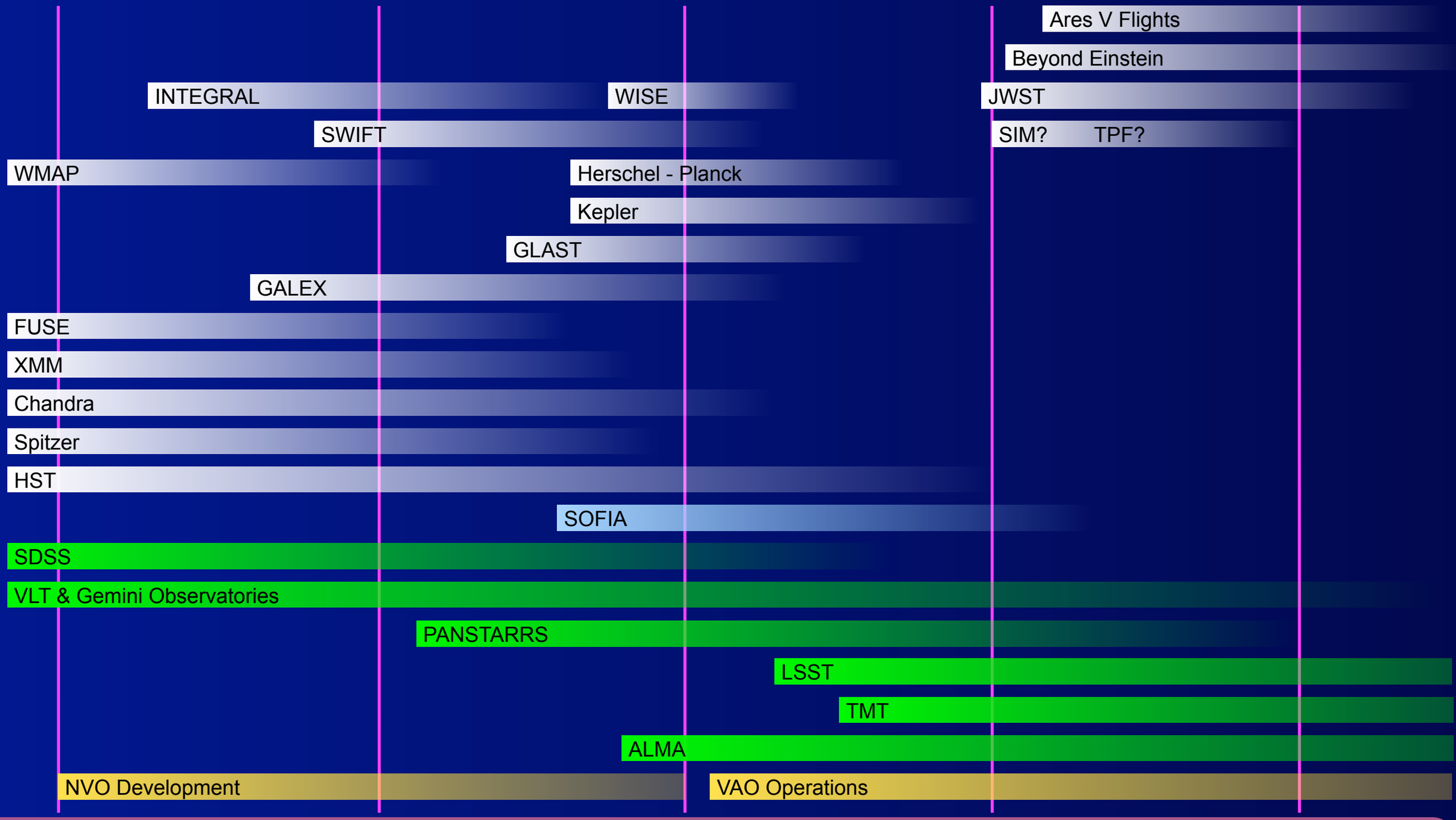
Optical & UV Data Archive

- 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

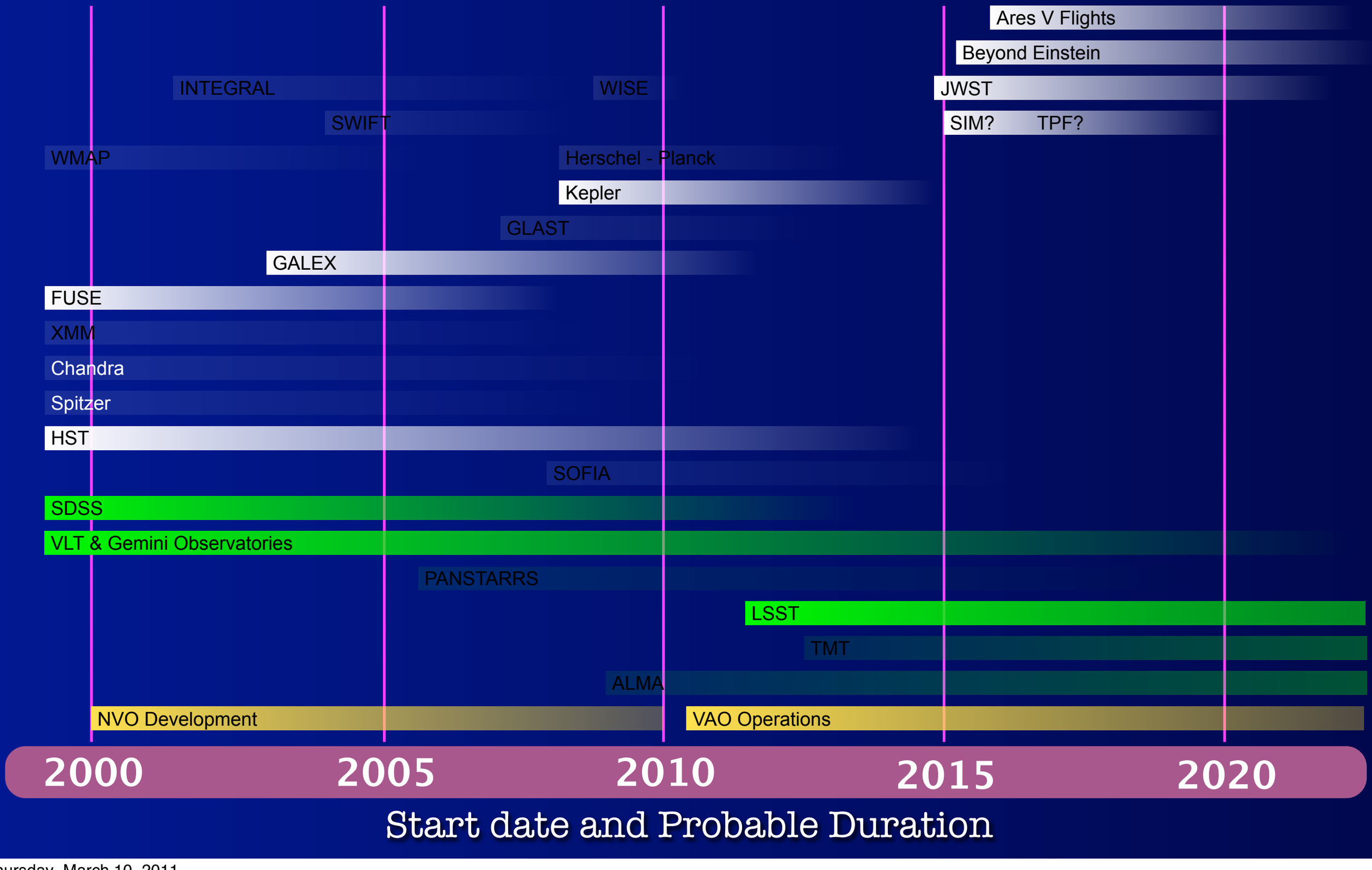
A Partial List of Key Astrophysics Facilities



Start date and Probable Duration

Astronomy Project Timeline

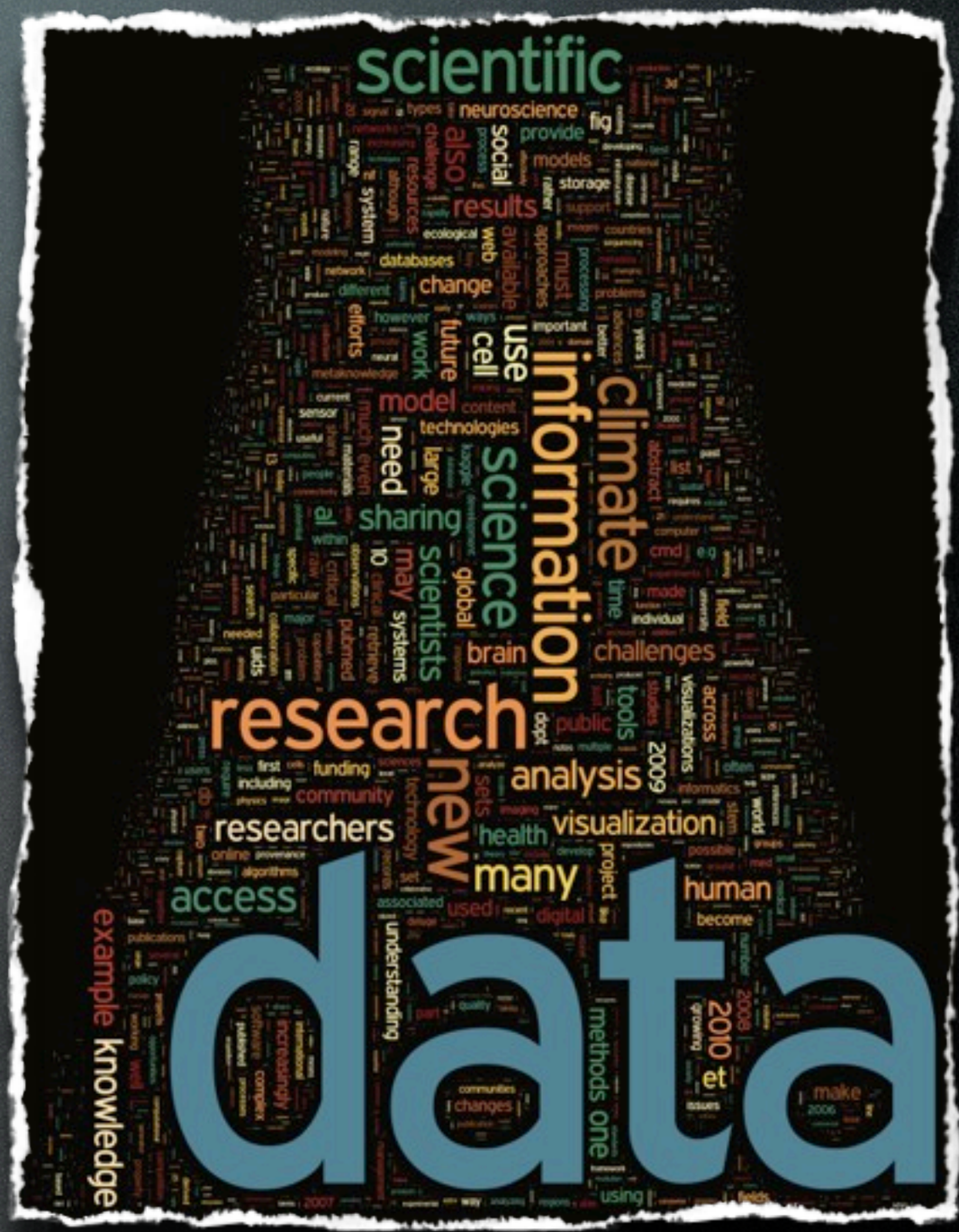
STScI Project and Mission Activity



Start date and Probable Duration

Astronomy is changing

- Growth over 25 years is a factor of 30 in glass, 3000 in pixels
- Detectors follow Moore's Law
- Total data doubles every year



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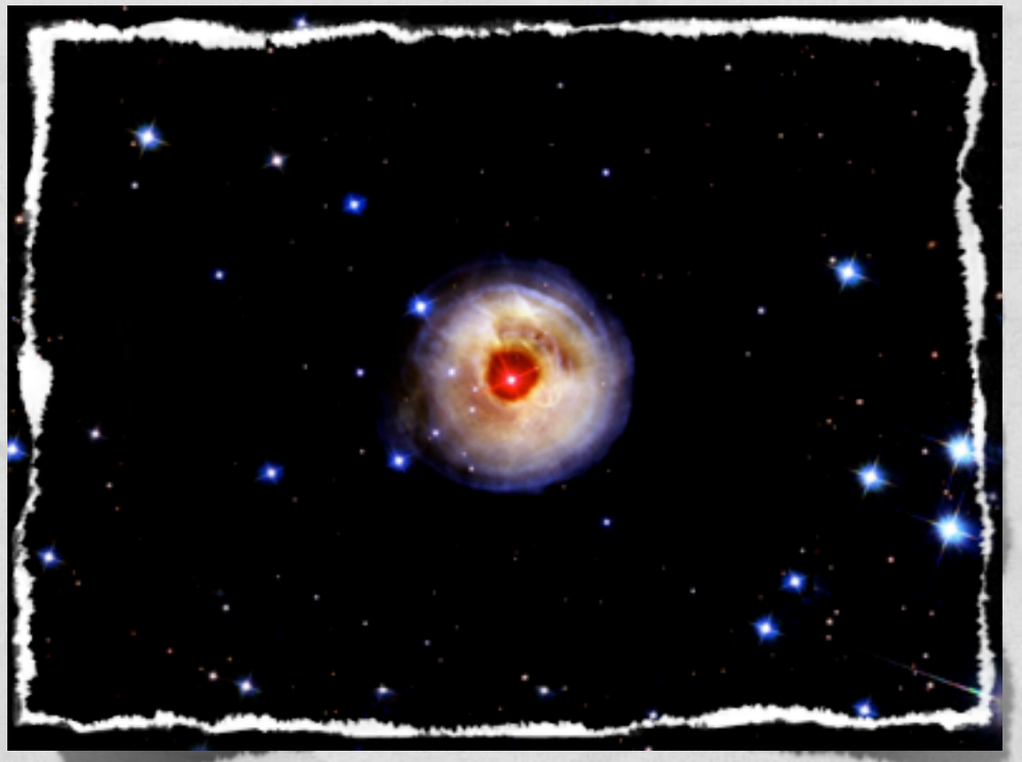
The Fourth Paradigm

Data-Intensive Scientific Discovery

EDITED BY TONY HEY, STEWART TANSLEY, AND KRISTIN TOLLE

ASTRONOMY IS SPECIAL!

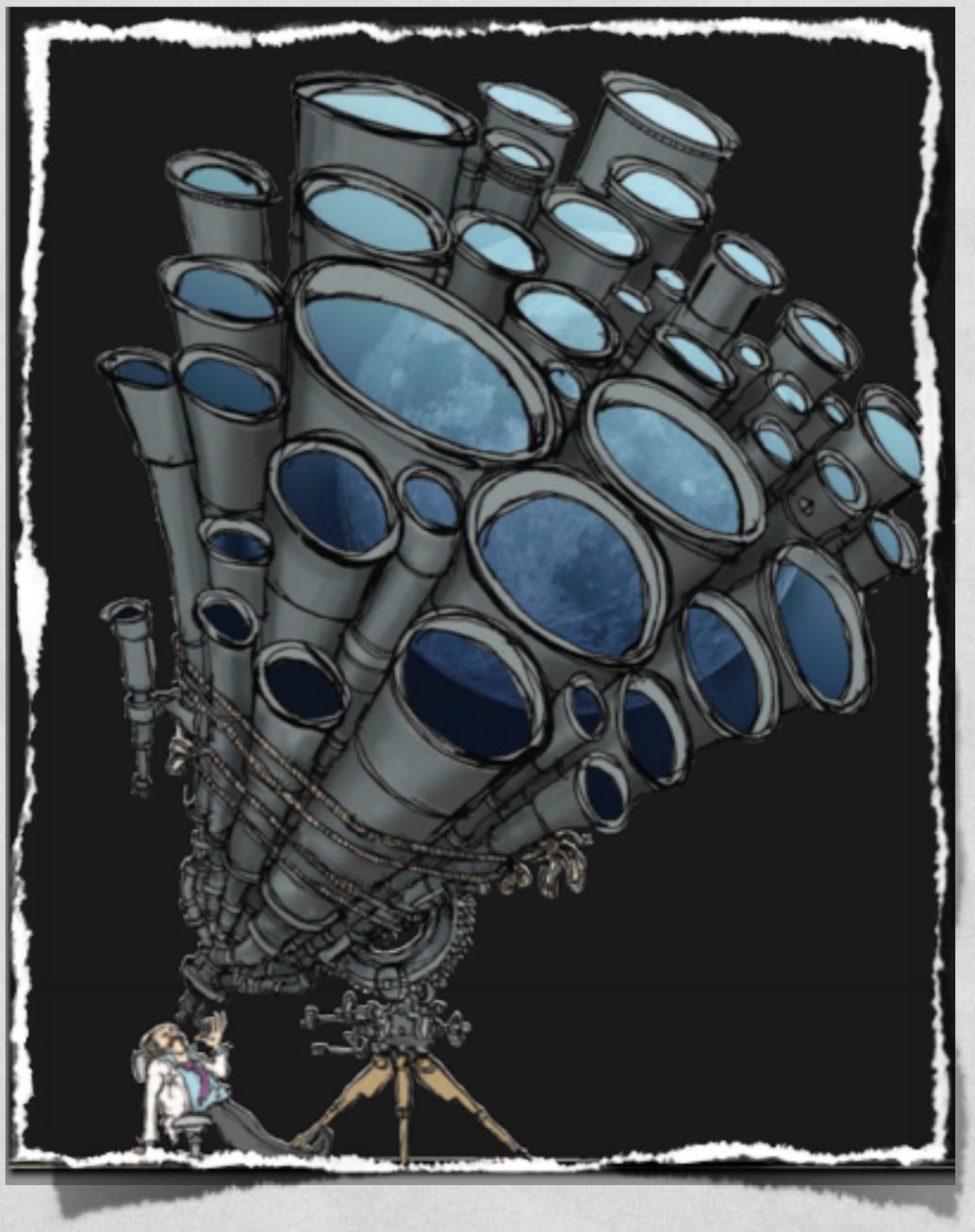
- No commercial value
- Ideal testbed for complex algorithms
- Interesting problems
- Plenty of data, plenty of dimensions!

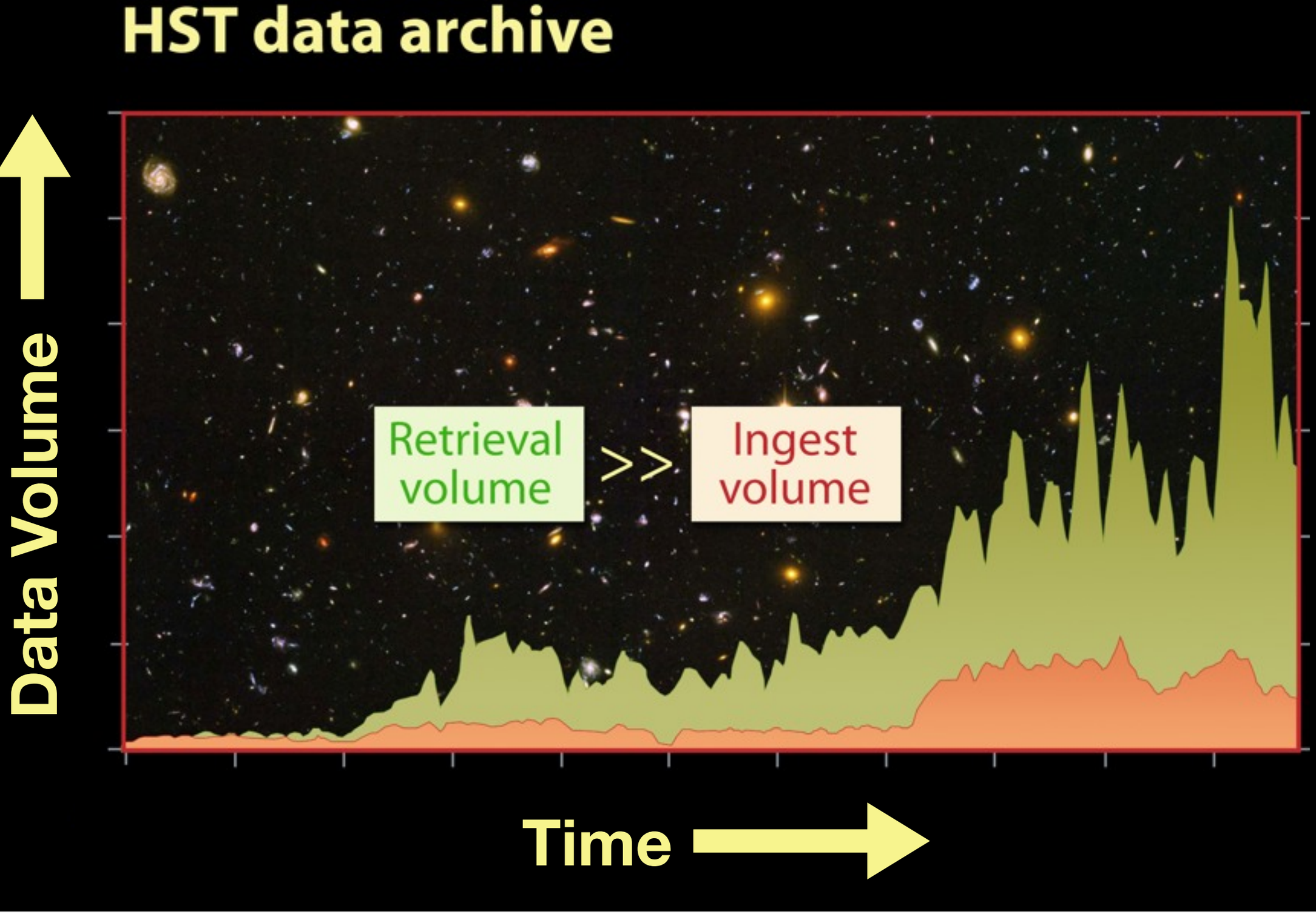


ADAPT OR PERISH

- Terraserver, Google Maps, Google Earth & Microsoft Virtual Earth have revolutionized the way we look at our planet

- Microsoft's World Wide Telescope & GoogleSky are starting to revolutionize the way we look at our universe





New Science Paradigm

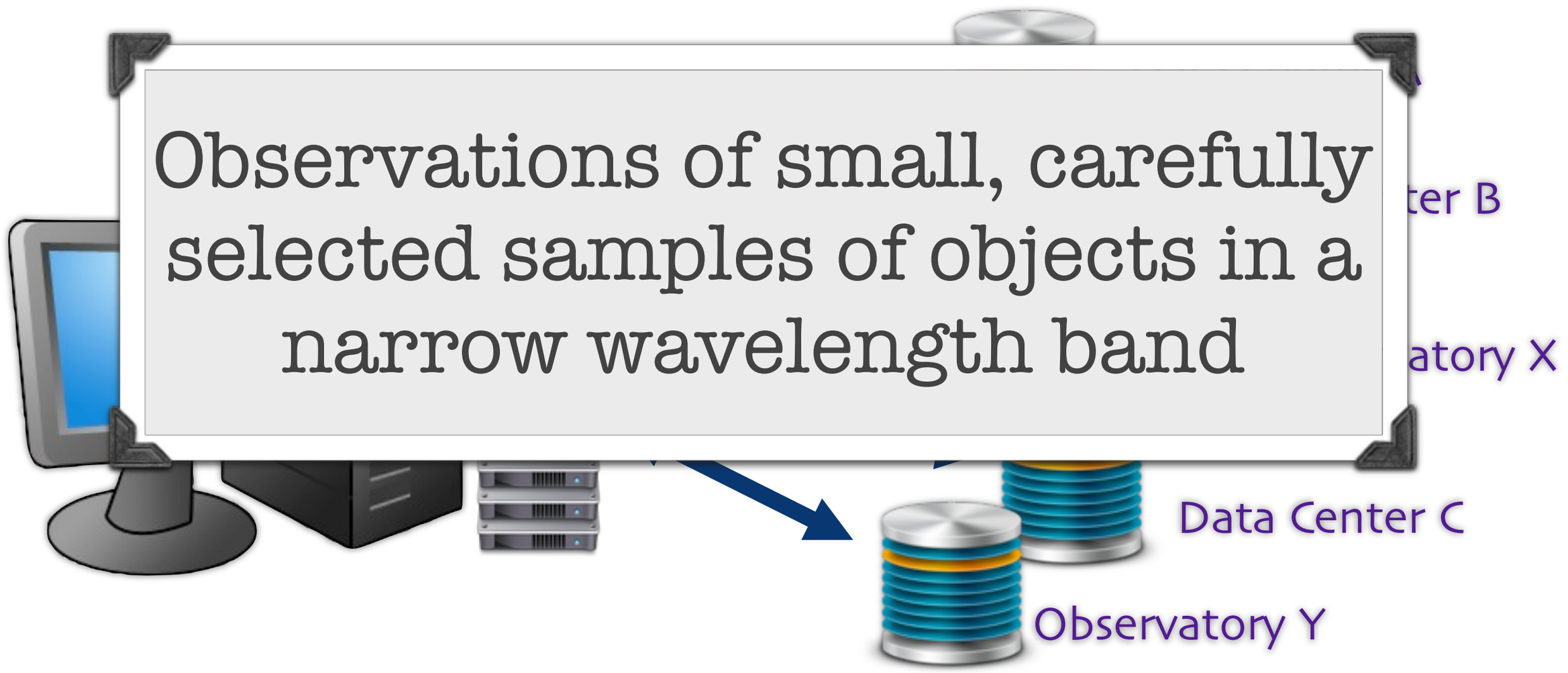
for Astronomy

PAST

New Science Paradigm: First Iteration

★ Few Data Standards, Some Protocols

Observations of small, carefully selected samples of objects in a narrow wavelength band



The Virtual Observatory

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See Also:

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PROGRAM GUIDELINES

Solicitation 08-537

Please be advised that the NSF Proposal & Award Policies & Procedure (PAPPG) includes revised guidelines to implement the mentoring pro the America COMPETES Act (ACA) (Pub. L. No. 110-69, Aug. 9, 2007.) specified in the ACA, each proposal that requests funding to support postdoctoral researchers must include a description of the mentoring that will be provided for such individuals. Proposals that do not com this requirement will be returned without review (see the PAPP Guide Grant Proposal Guide Chapter II for further information about the implementation of this new requirement).

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VIRTUAL ASTRONOMICAL OBSERVATORY

and meanwhile...

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Astro Grid

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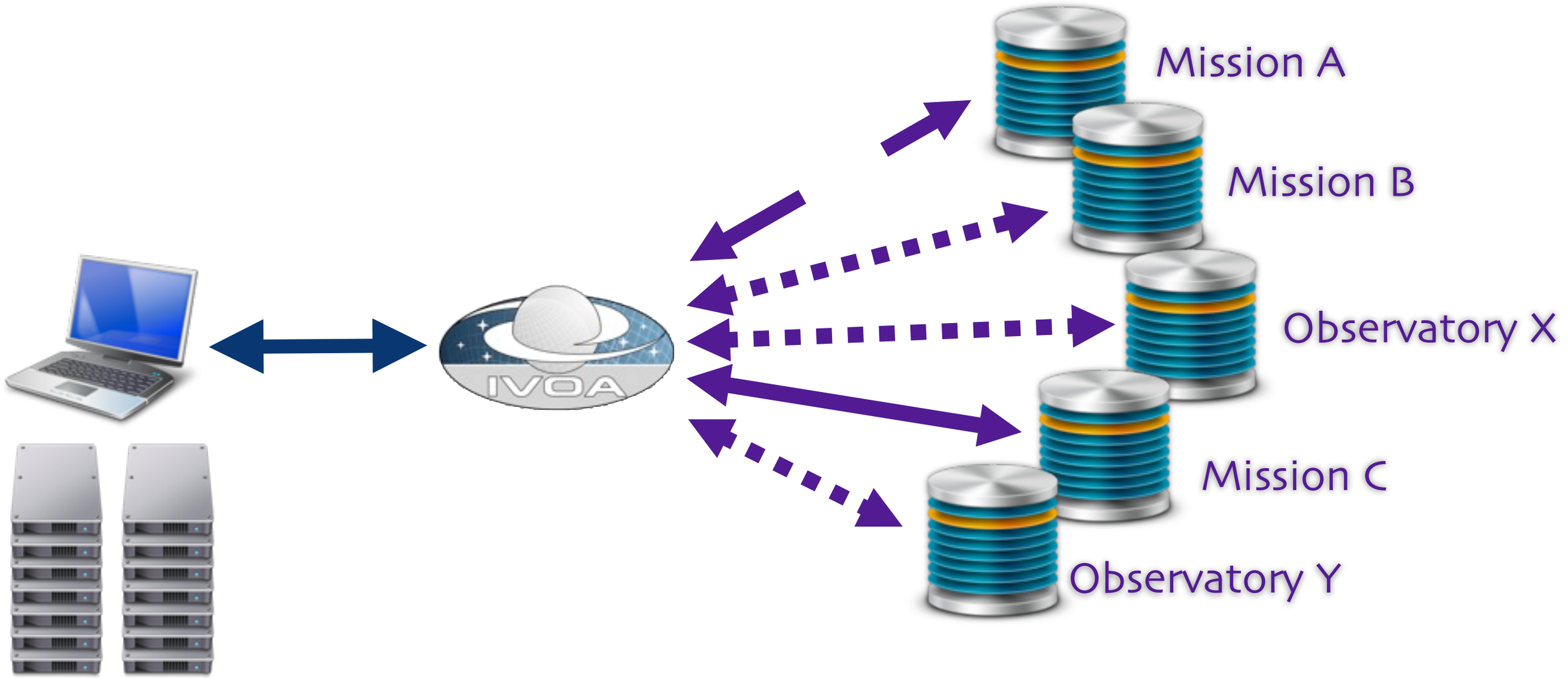
PRESENT

New Science Paradigm: Second Iteration

- Ad-hoc Data Standards, Ad-hoc Protocols
- Simple Mining Tools



PRESENT

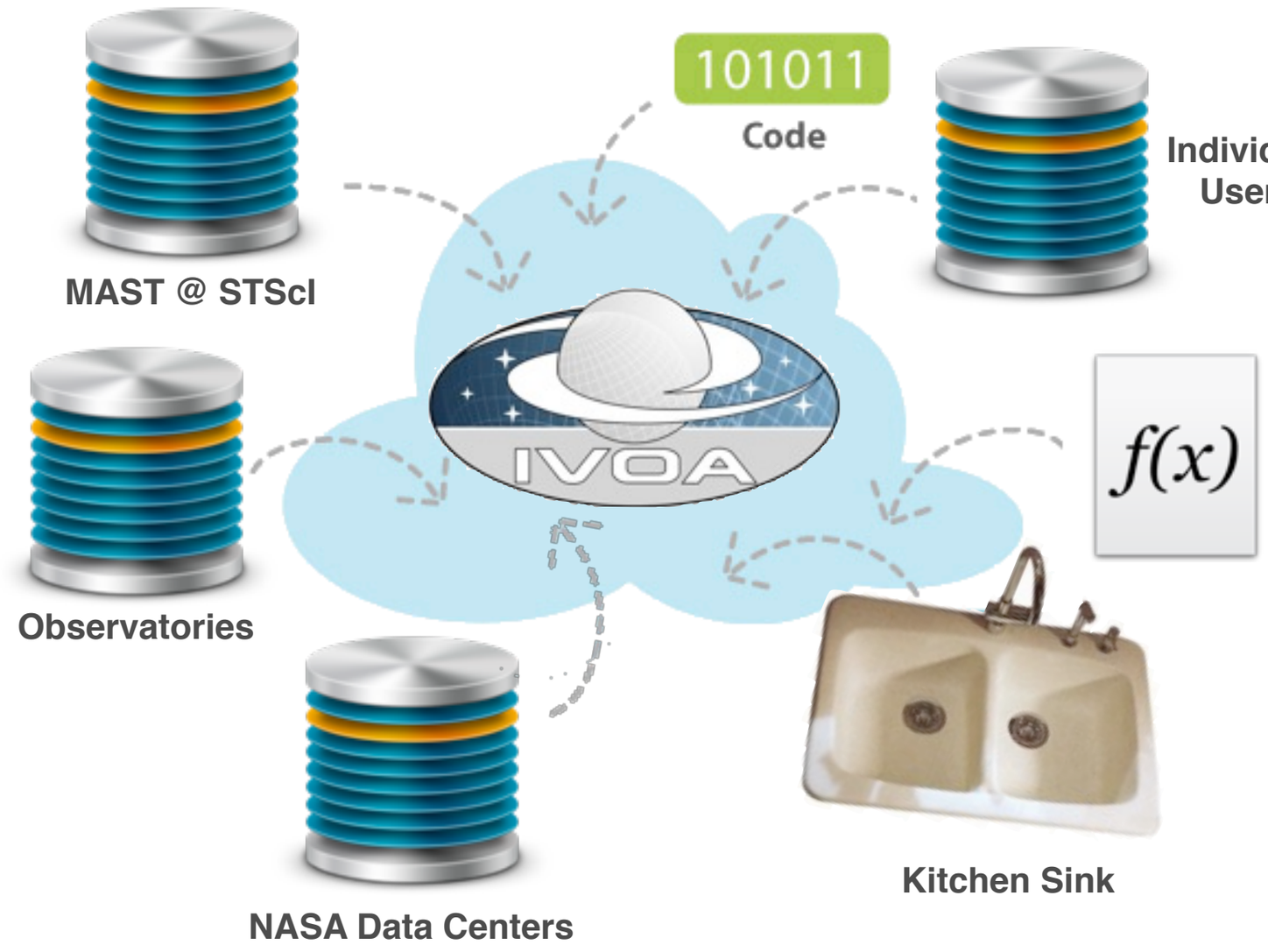
New Science Paradigm: Second Iteration

☑ “Transition may be chaotic”- **Alex Szalay**

❑ “Astronomical data are now accessible uniformly from federated, distributed, heterogeneous sources, i.e the Virtual Observatory.” - **Kirk Borne**

FUTURE?

New Science Paradigm: "Science 2.0"



Standards

Metadata

Data Discovery

Data Association

Data Dissemination

Enable New Science

Global 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

Technological Challenges

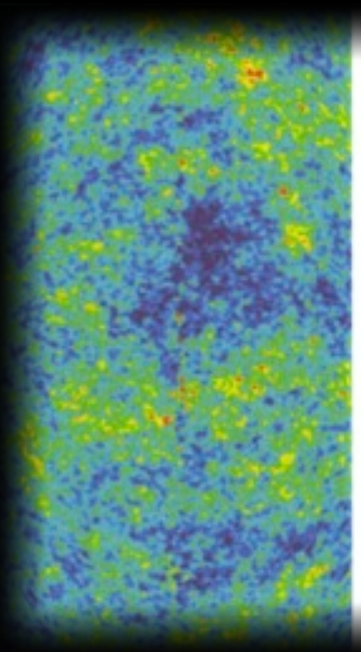
- Infrastructure not available for intensive data mining
- Solutions for handling large datasets are lacking
- Cloud hosting solutions still expensive
  - Hubble Archive on Amazon $500K+/yr
- Unclear which commercial solutions can fit science needs

- We must partner with other academic disciplines: Computer Science, Statistics, Applied Mathematics

- We must leverage partnerships with industry interested in enabling Science 2.0

- We must learn to be humble and ask for help

- We must remember that we have the greatest datasets in the world (universe really!)



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