NASA HQ Update

Paul Hertz
GLAST Program Scientist (Acting)

GLAST LAT Meeting
October 23, 2002

GLAST
SIGNIFICANT ACCOMPLISHMENTS & ISSUES

Significant Accomplishments

- GLAST spacecraft contract was awarded to SpectrumAstro Inc
  - Selection based on "best technical proposal and lowest cost".
  - Technical and management interface meetings have begun.
  - Spacecraft Kickoff Meeting was held at SpectrumAstro Inc.
- Completed LAT (Large Area Telescope instrument) DELTA PDR/Baseline Review was held at SLAC 7/30-8/1; feedback was positive.
- GBM (GLAST Burst Monitor instrument) breadboard detector testing shows performance exceeding requirements and even goals in critical areas.
- Finalizing Ground System and Ops acquisition strategy.
  - Plan to invite external peers to review trade and provide feedback.
- International LOAs: DLR LOA is completed; ASI LOA is in Italy; CNES LOA is at NASA HQ.

Issues

- None.

Astronomy & Physics Division
Office of Space Science

Anne Kinney
Director

Richard Howard
Associate Director

Resource Management
SP/Nancy Hammell
SP/Mark Hill +
SP/Bill Trageser
SP/Craig Tupper

Jane Davis, Lead Secretary
Sheila Gorham, Program Support Specialist
Mary Orebeaux, Program Support Assistant
Shavon Spry, Secretary
Lydia Thompson, Secretary

Division Technologist: Michael Moore
Division E/PO POC: Carl Pilcher

Astronomical Search for Origins

Theme Scientist	Theme Integrator
Philippe Crane *	Lia LaPiana

Program Scientists	Program Executives
Jay Frogel *	George Albright
Hashima Hasan	SE/Steve Brody
Paul Hertz	Richard Kadunc
Carl Pilcher	Michael Moore
Eric Smith	Paul Geithner
	Christopher Savinell *

Structure and Evolution of the Universe

Theme Scientist	Theme Integrator
Paul Hertz	Steve Horowitz

Program Scientists	Program Executives
Philippe Crane *	George Albright
Jeffrey Hayes *	Melvin Montemerlo
Vernon Jones	Christopher Savinell *
Louis Kaluzienski	
Michael Salamon	
Mark Strickman *	

Research and Data Analysis

Division POC: Michael Salamon (acting)

Astrobiology	Carl Pilcher	
Cosmic Ray	Vernon Jones	
Gamma Ray/X-ray	Louis Kaluzienski	Mark Strickman *
Gravity/Theory	Michael Salamon	
Infrared/Submillimeter/Radio	Eric Smith	Jay Frogel *
Optical/Ultraviolet	Philippe Crane *	Hashima Hasan
MO&DA	Jeffrey Hayes *	Paul Hertz
Balloons	Vernon Jones	SS/Glen Mucklow

* Visiting Scientist/Manager (IPA or Detailee)

September 25, 2002

BEYOND EINSTEIN

Find out what powered the Big Bang.

1. Search for gravitational waves from inflation and phase transitions in the Big Bang.
2. Determine the size, shape, and energy content of the Universe.

Observe what black holes do to space, time, and matter.

3. Perform a census of black holes throughout the Universe.
4. Determine how black holes are formed, and how they evolve.
5. Map spacetime throughout the Universe and near the event horizons of black holes.
6. Observe stars and gas plunging into black holes.

Identify the mysterious dark energy pulling the Universe apart.

2. Determine the size, shape, and energy content of the Universe.
7. Determine the cosmic evolution of the dark energy pulling the Universe apart.

CYCLES OF MATTER AND ENERGY

Explore the cycles of matter and energy in the evolving Universe.

8. Explore where and when the chemical elements were made.
9. Understand how matter, energy, and magnetic fields are exchanged between stars and the gas and dust between stars.
10. Discover how gas flows in disks and how cosmic jets are formed.
11. Identify the sources of gamma-ray bursts and cosmic rays.

Understand the development of structure in the Universe.

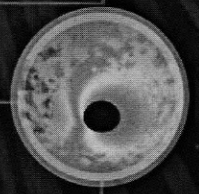
12. Learn what physical process gave rise to galaxies and systems of galaxies.
13. Explore the behavior of matter in extreme astrophysical environments.
2. Determine the size, shape, and energy content of the Universe.
4. Determine how black holes are formed and how they evolve.

structure and evolution of the universe

BEYOND EINSTEIN:

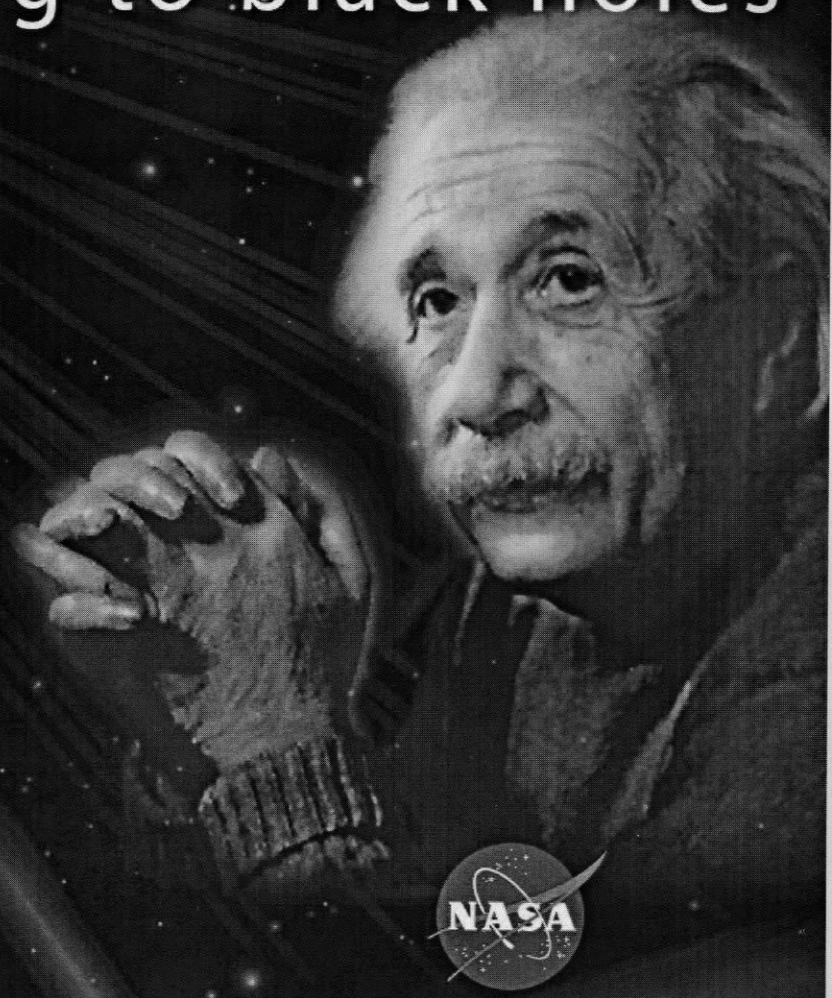
from the big bang to black holes

WHAT POWERED THE BIG BANG?

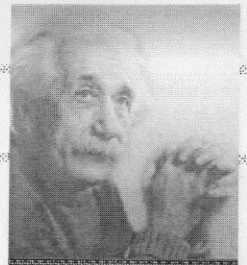


WHAT HAPPENS AT THE EDGE OF A BLACK HOLE?

WHAT IS DARK ENERGY?

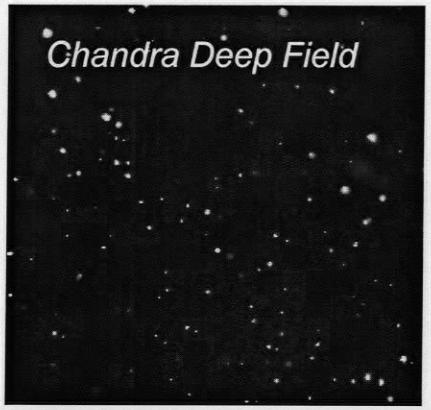


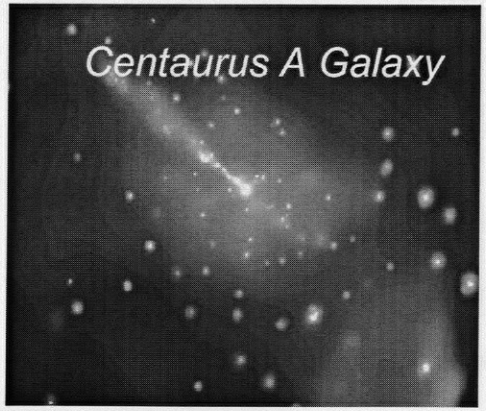
National Aeronautics and Space Administration

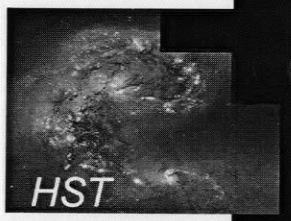


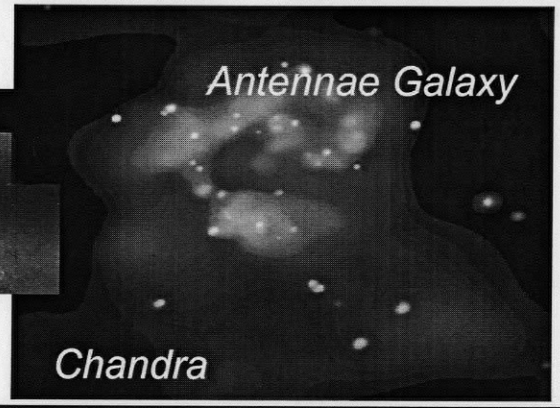
The Excitement of Chandra!

The current state of the art in X-ray astronomy

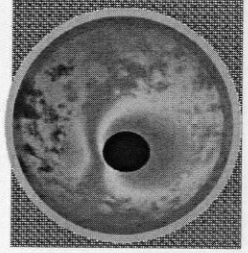






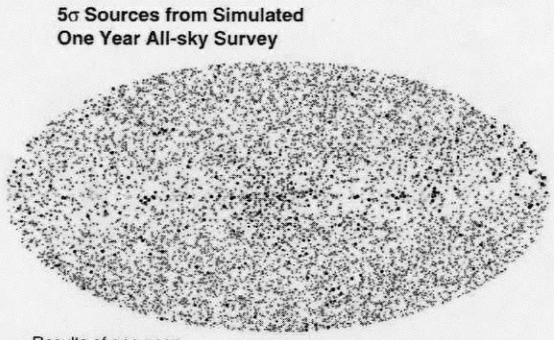


0.5 arc sec resolution



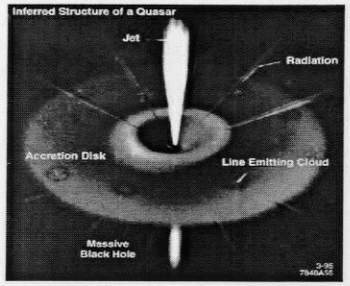
Credit: Chandra X-ray Center

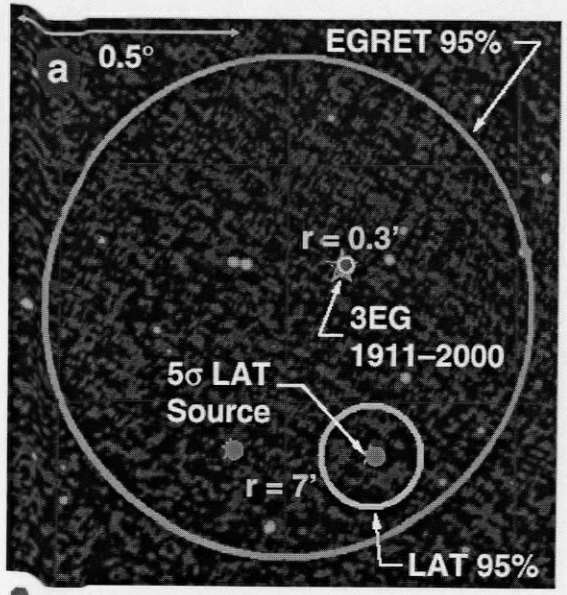
The Promise of GLAST!



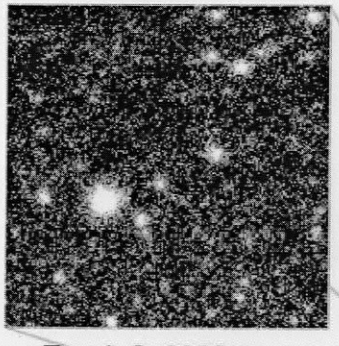
Results of one-year all-sky survey. (Total: 9900 sources)

AGN
3EG Catalog
Galactic Halo
Galactic Plane





Rosat or Einstein X-ray Source
1.4 GHz VLA Radio Source



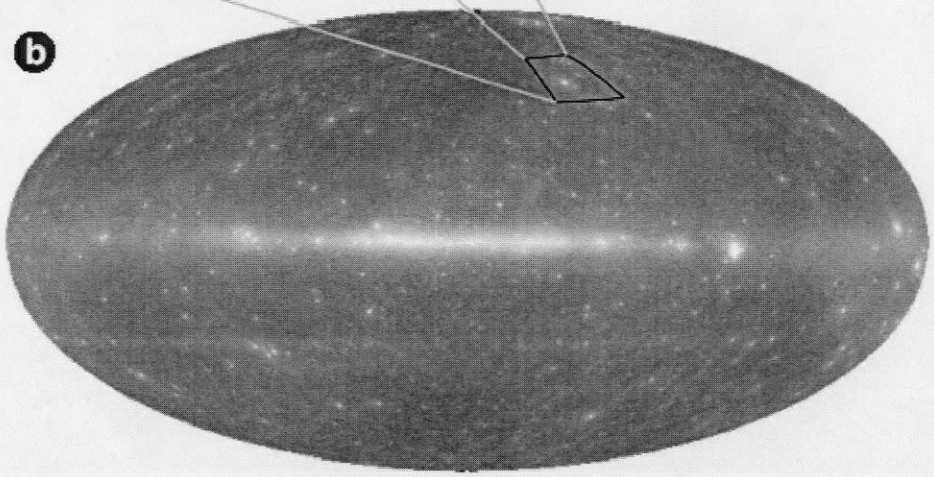
E > 1 GeV Map

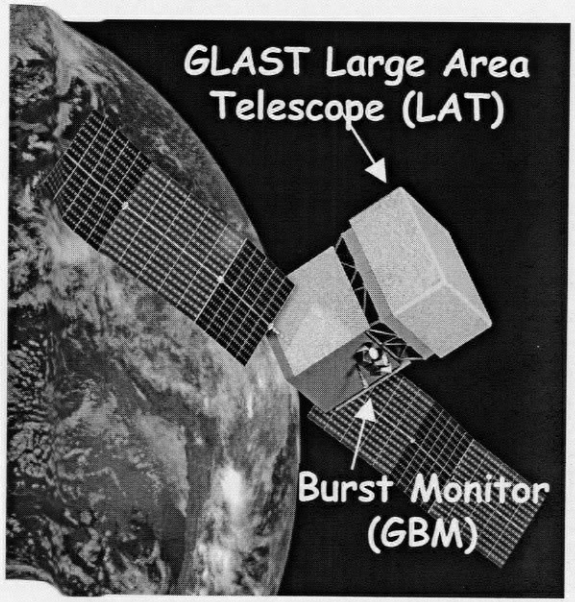
AGN
3EG Catalog
Galactic Halo
Galactic Plane

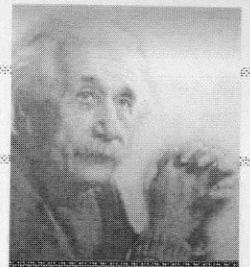
Results of one-year all-sky survey. (Total: 9900 sources)

Simulated LAT One Year All-sky map (E > 100 MeV)

b







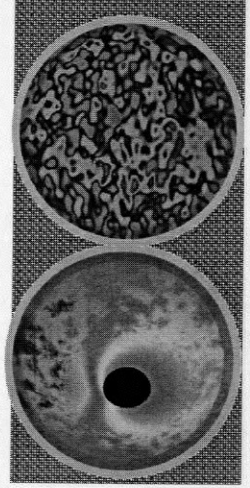
Realizing Science Beyond Einstein

Three inter-linked elements that work together:

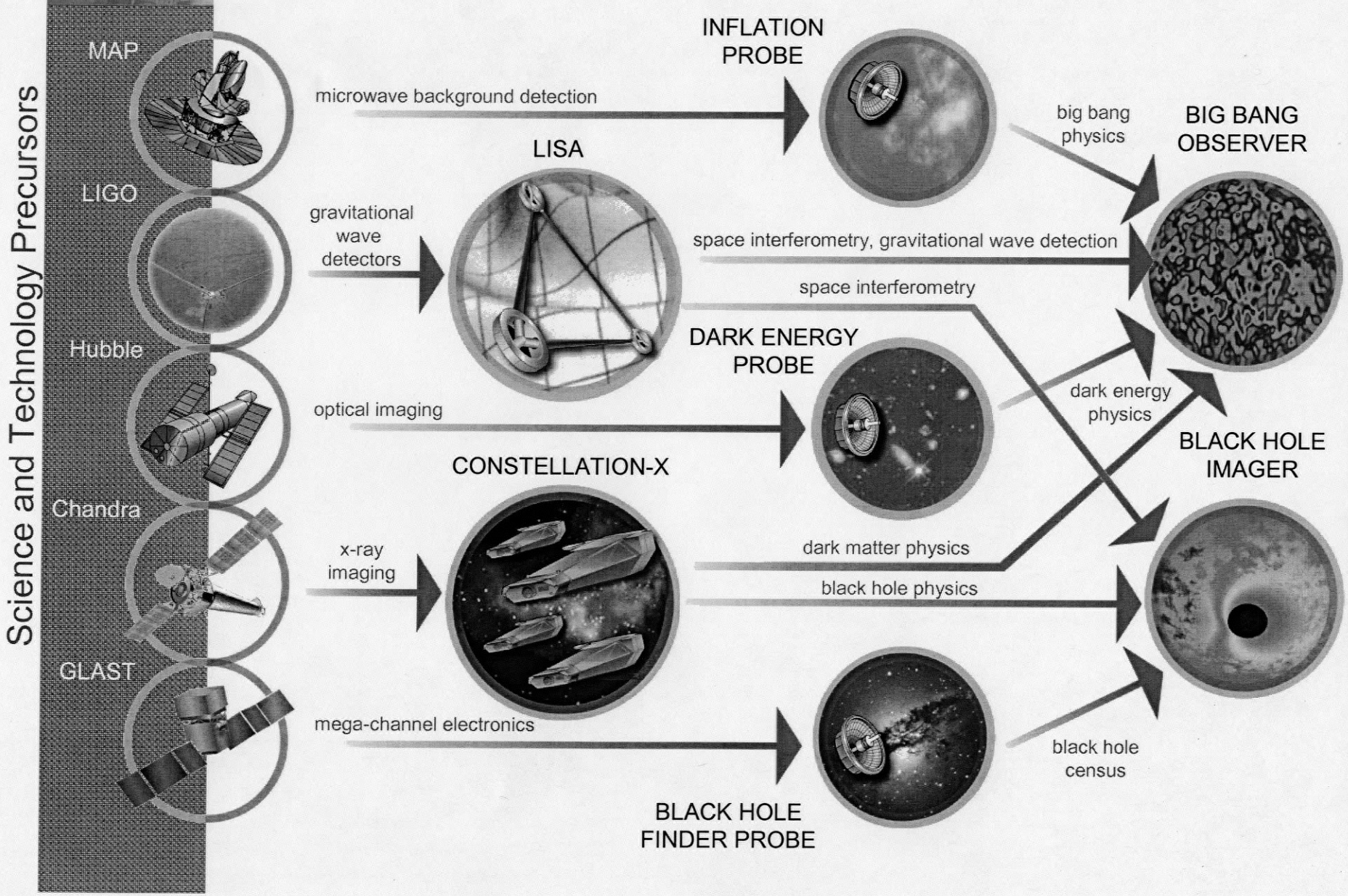
1. Einstein Great Observatories that provide breakthrough increases in capabilities to address all aspects of Beyond Einstein science
   - Constellation-X: Spectroscopy close to the event horizon of black holes and place constraints on the dark side of the universe
   - LISA: Gravitational waves from merging black holes and the early universe

2. Einstein Probes to address focused science objectives:
   - Determine the nature of the Dark Energy
   - Search for the signature of inflation in the microwave background
   - Take a census of Black Holes of all sizes in the local Universe

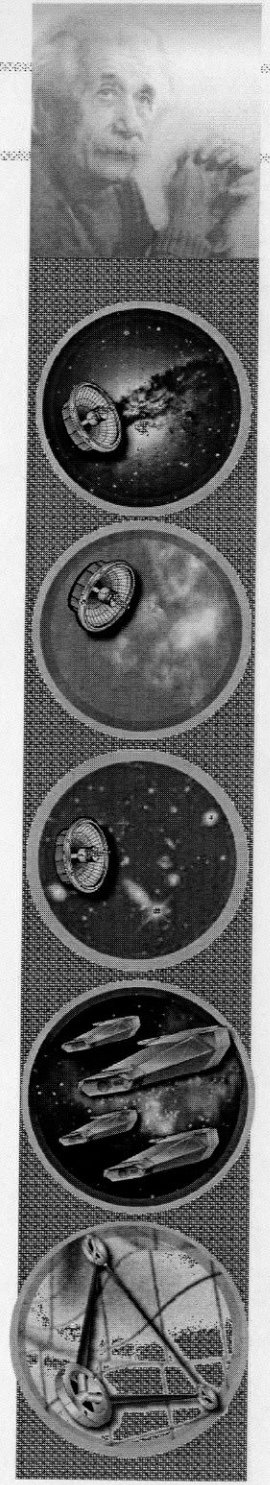
3. A technology, theoretical and education program to inspire scientists and engineers towards the vision:
   - Image and resolve the event horizon of a Black Hole
   - Directly detect the gravitational waves emitted during the Big Bang

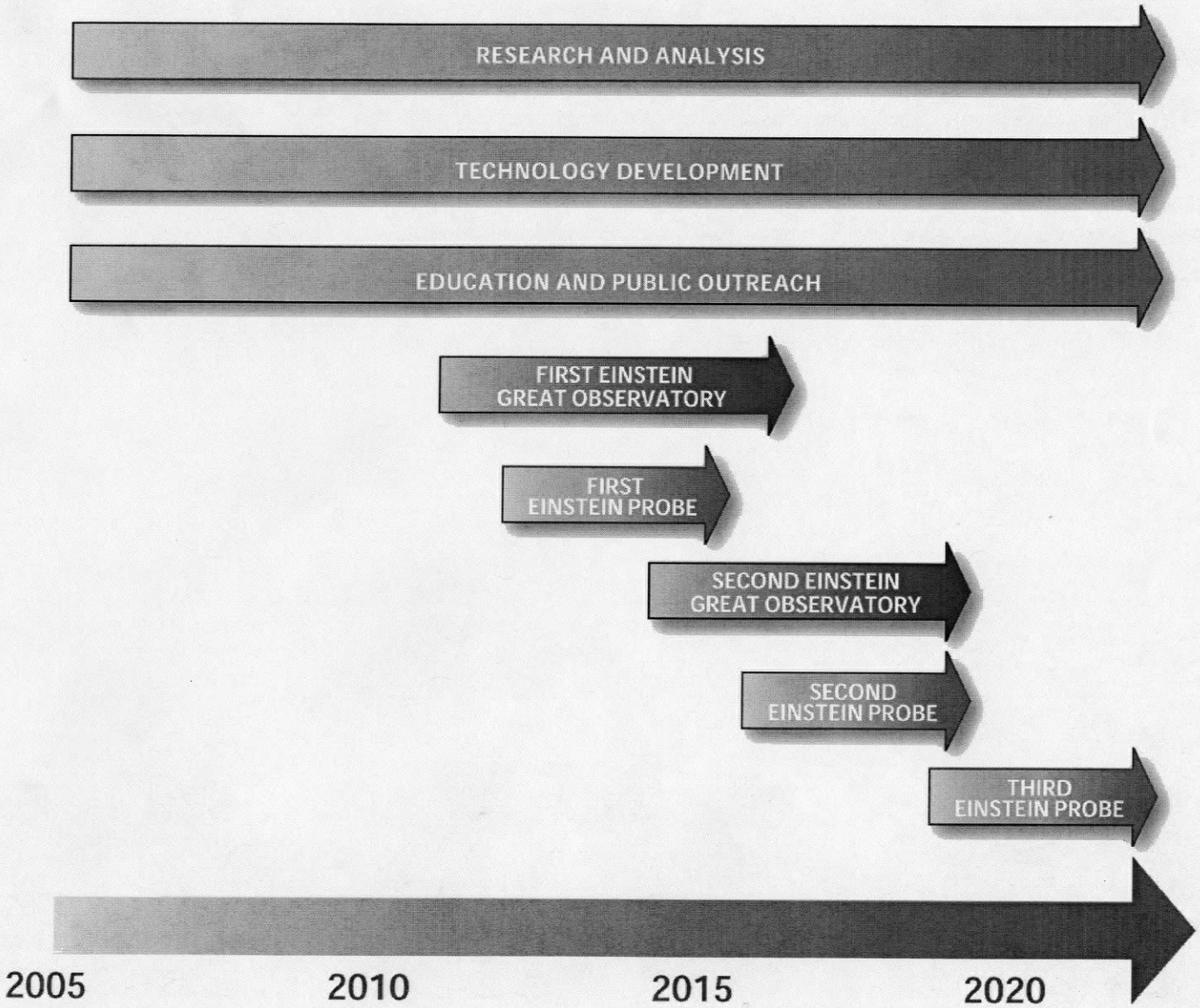


Beyond Einstein Program

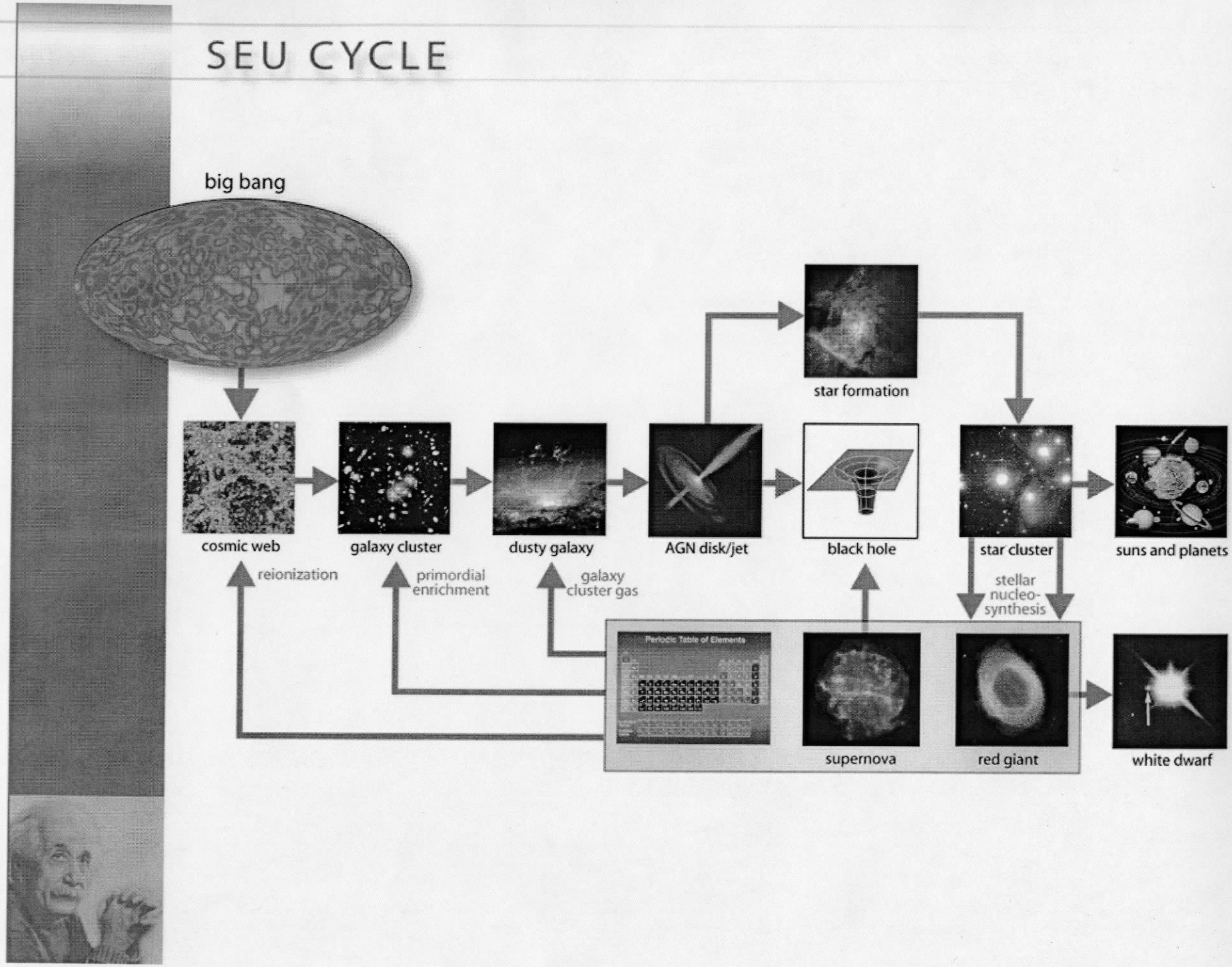


Beyond Einstein Timeline





SEU CYCLE


big bang
cosmic web
galaxy cluster
dusty galaxy
AGN disk/jet
star formation
black hole
star cluster
suns and planets
reionization
primordial enrichment
galaxy cluster gas
stellar nucleo-synthesis
Periodic Table of Elements
supernova
red giant
white dwarf

Toward the 21st Century

How did the universe begin? Does time have a beginning & an end? Does space have edges? The questions are clear and simple. They are as old as human curiosity. But the answers have always seemed beyond the reach of science.

UNTIL NOW.