ORIGINS Roadmap 2003

ORIGINS

Science Summary

Emergence of the Modern Universe

—How did the cosmic web of matter organize into the first stars and planets?

—How do different galactic ecosystems (of stars and gas) form and which can lead to planets and living organisms?

Stars and Planets

—How do gas and dust become stars and planets?

—Are there planetary systems around other stars and how do their architectures and evolution compare with our own solar system?

Habitable Planets and Life

—What are the properties of giant planets orbiting other stars?

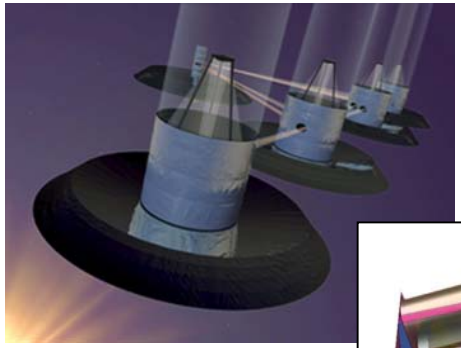
—How common are terrestrial planets? What are their properties? Which of them might be habitable?

—Is there life on planets outside the solar system?

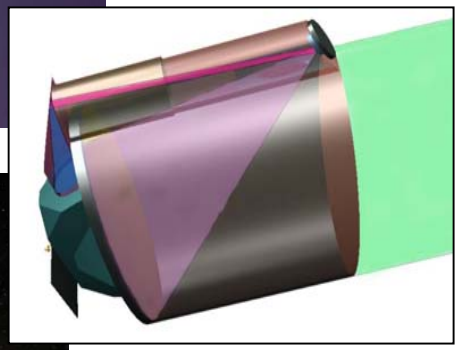
ORIGINS

ORIGINS

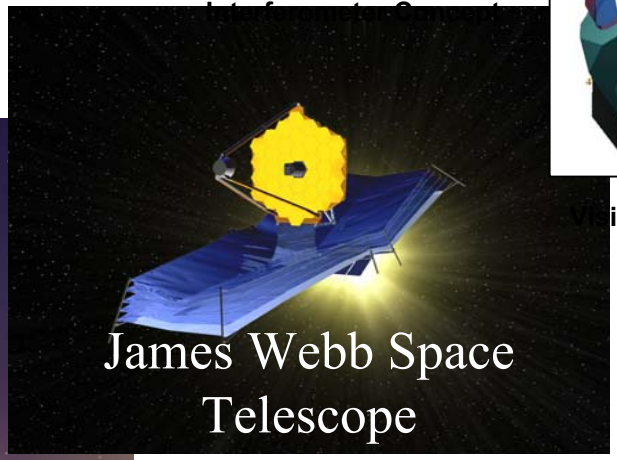
Terrestrial Planet Finder



IR Separated Spacecraft



Visible Coronagraph Concept



James Webb Space Telescope

Space Interferometry Mission

Keck Interferometer

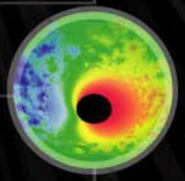
Large Binocular Telescope Initiative

structure and evolution of the universe

BEYOND EINSTEIN:

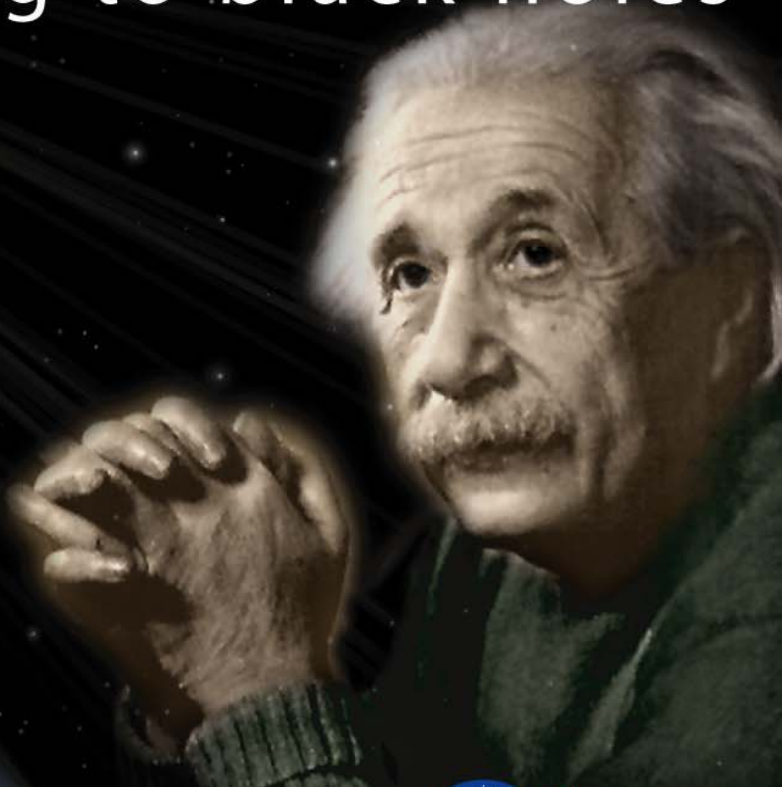
from the big bang to black holes

WHAT POWERED THE BIG BANG?

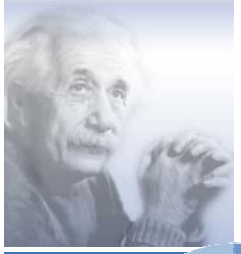


WHAT HAPPENS AT THE EDGE OF A BLACK HOLE?

WHAT IS DARK ENERGY?



National Aeronautics and Space Administration



Beyond Einstein Program

Science and Technology Precursors

MAP

LIGO

Hubble

Chandra

GLAST

microwave background detection

gravitational wave detectors

optical imaging

x-ray imaging

hard x-ray detectors

INFLATION PROBE

LISA

DARK ENERGY PROBE

CONSTELLATION-X

BLACK HOLE FINDER PROBE

big bang physics

space interferometry, gravitational wave detection

space interferometry

dark energy physics

dark matter physics

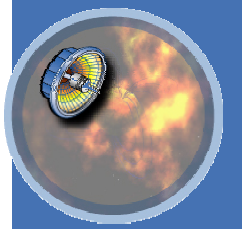
black hole physics

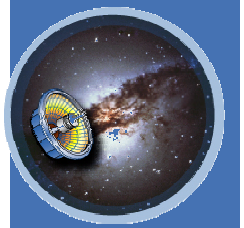
black hole census

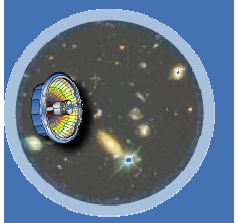
BIG BANG OBSERVER

BLACK HOLE IMAGER

Einstein Probes

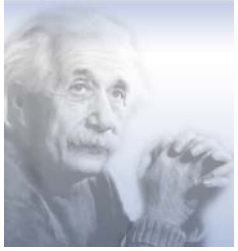




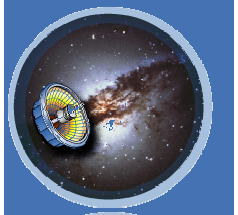


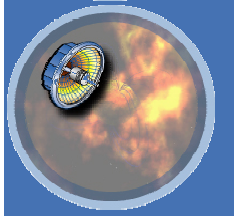
Three focused missions, each designed to address a single high priority science question

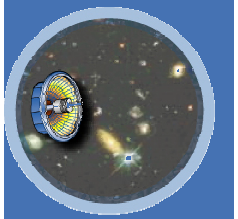
- Priority and science topic determined via NASA strategic planning process, using National Academy recommendations
  - Dark Energy Probe
  - Inflation Probe
  - Black Hole Finder Probe
- Competed Principle Investigator missions
  - Implementation approach determined by peer review
  - Launched every 3-4 years
  - $350-500M class missions

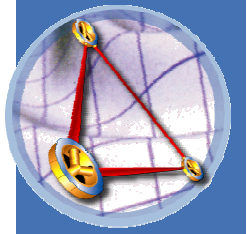


Beyond Einstein Timeline









RESEARCH AND ANALYSIS

TECHNOLOGY DEVELOPMENT

EDUCATION AND PUBLIC OUTREACH

FIRST EINSTEIN GREAT OBSERVATORY

FIRST EINSTEIN PROBE

SECOND EINSTEIN GREAT OBSERVATORY

SECOND EINSTEIN PROBE

THIRD EINSTEIN PROBE

2005 2010 2015 2020

Beyond Einstein Activities

- Community outreach
- Con-X and LISA Technology Program
- Con-X and LISA "Technology Readiness and Implementation Plan" (TRIP) Review
  - Reports due Feb 3, Results to HQ approx May
- Einstein Probe Mission Concept Study
  - On hold pending resolution of NASA FY03 budget

- Space Science Themes
- http://spacescience.nasa.gov/ "Administration"

- Origins Roadmap
- http://origins.jpl.nasa.gov/

- SEU Roadmap
- http://universe.nasa.gov/

2003 OSS Launch Schedule

Jan 11	CHIPS	Jun 1	Mars Exp*
Jan 12	Rosetta*	Jun 27	MER-B
Mar 21	GALEX	Jul 1	TWINS*
Apr 15	SIRTF	TBD	GP-B
May 30	MER-A	Nov 30	CINDI*
		Dec 5	Swift

A&P SEC SSE

* non-OSS mission

Upcoming A&P Solicitations

- SMEX
  - planned release Feb 3, proposals due May 2
- ROSS-03 – release in late January
  - APRA: all A&P SR&T grants, approx April 18
  - ADP/LTSA: approx July 11
  - ATP: approx July 16
  - FUSE, RXTE, Swift GO: Oct, Nov, Dec
- Great Observatories
  - Hubble: January 24
  - Chandra: March 14
  - SIRTF: approx June
- Einstein Probes Mission Concepts – on hold

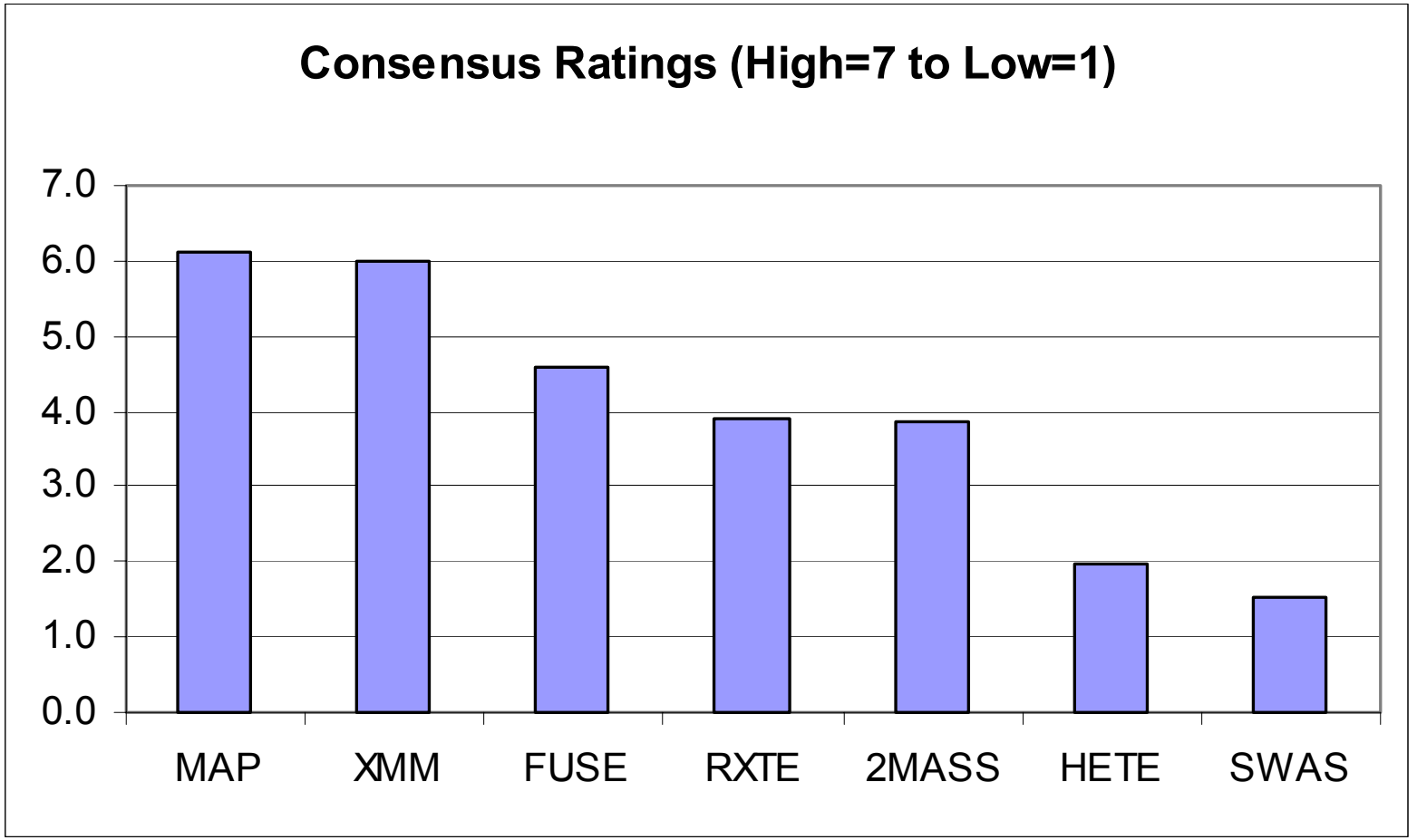
The NASA Exploration Team (NEXT): Human/Robotic Exploration Beyond LEO

- Spring 1999, OSS and OSF led a small NASA team to consider alternatives and options for use of humans/robots to achieve long range science priority goals.
  - Key role in NASA's new In-Space Propulsion and Nuclear Systems programs.
- Enlarged in 2001, chartered to develop mission concepts for 2010+ time period and necessary technology investments
  - Under leadership of Gary Martin, NASA Space Architect
- Under the Space Architect, NEXT will
  - Study alternative mission concepts to achieve long-range science goals.
  - Evaluate the optimum use of Humans/robotic systems for post-JWST space observatories.
  - Coordinate with astronomy community via external reviews, working groups, opportunities to compete for mission concept and technology funding.
- OSS Representative/NEXT Lead Scientist: Harley Thronson
- A&P Team: Paul Hertz, Phil Crane, Michael Moore

http://next.nasa.gov/

Senior Review Findings

A&P MO&DA Senior Review met June 11-13, 2002

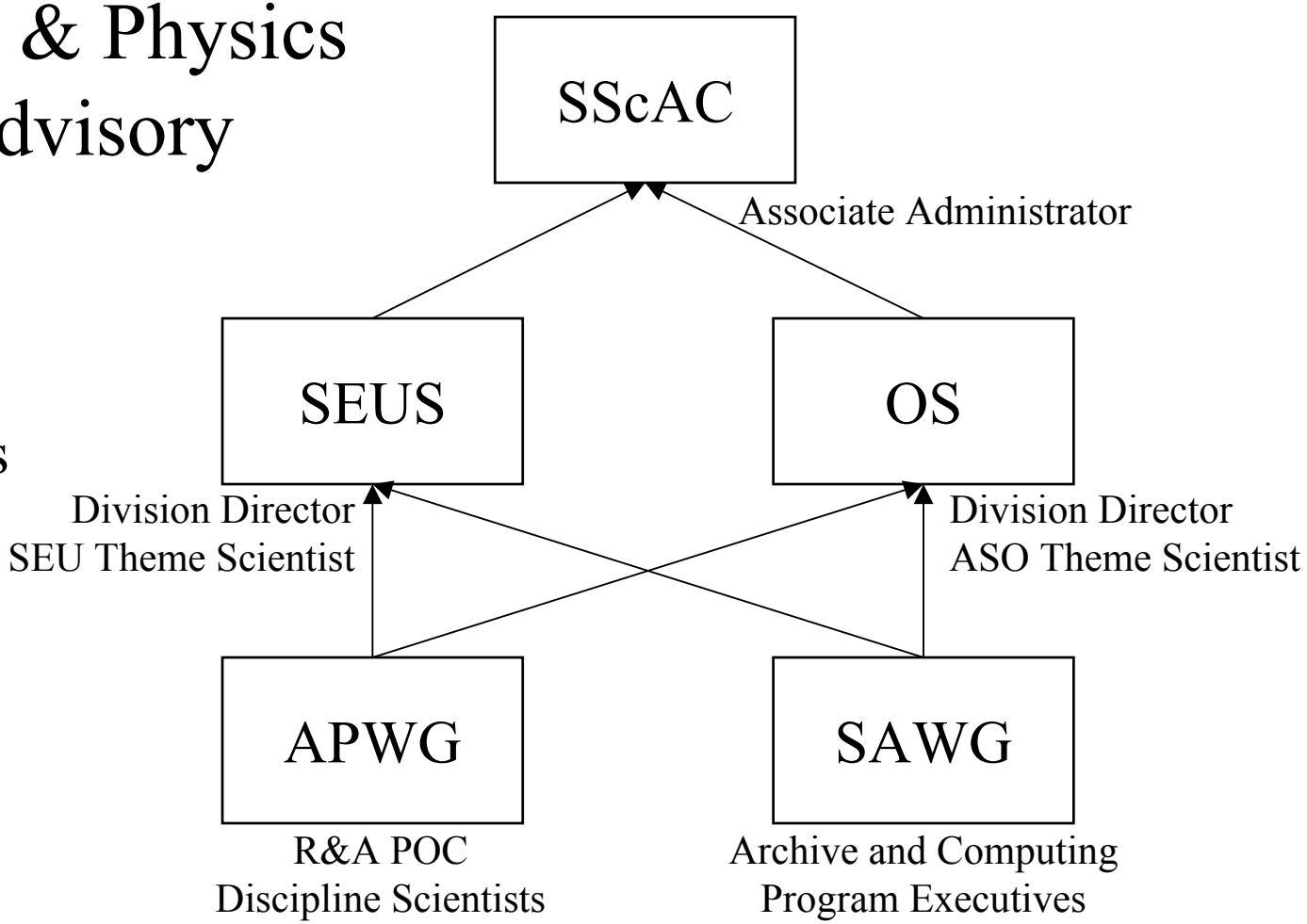


http://spacescience.nasa.gov/ "Administration" (A&P homepage)

Senior Review Decisions

- 2MASS: Deliver additional data products by FY04, then terminate project.
- FUSE: Approve extended mission through FY04, guidelines for reduced ops costs through FY06, revisit cost guidelines at 2004 Senior Review.
- HETE-2: Terminate mission in FY04 after Swift launch.
- MAP: Approve extended mission for two years, revisit further extensions at 2004 Senior Review.
- RXTE: Approve extended mission through FY04, guidelines for reduced ops through FY05, termination decision at 2004 Senior Review.
- SWAS: Terminate mission after FY03.
- XMM: Confirm funding level for US participation.

Astronomy & Physics Division Advisory Structure



FACA Subcommittees

HQ Working Groups

Project Working or User Groups

Project Scientist
Program Scientist

Space Telescope Users Committee
LISA International Science Team
NGST Interim Science Working Group
SOFIA Science Steering Committee
RXTE Users Group
Chandra Users Committee
Balloon Working Group
Etc.

- FACA Subcommittees
  - http://spacescience.nasa.gov/ "Committees"
  - SEUS: Rocky Kolb, Fermilab
  - OS: Alan Dressler, Carnegie Observatories
- Working Groups
  - http://spacescience.nasa.gov/ "Administration"
  - SAWG: Joel Bregman, U. Michigan
  - APWG: Doug Richstone, U. Michigan