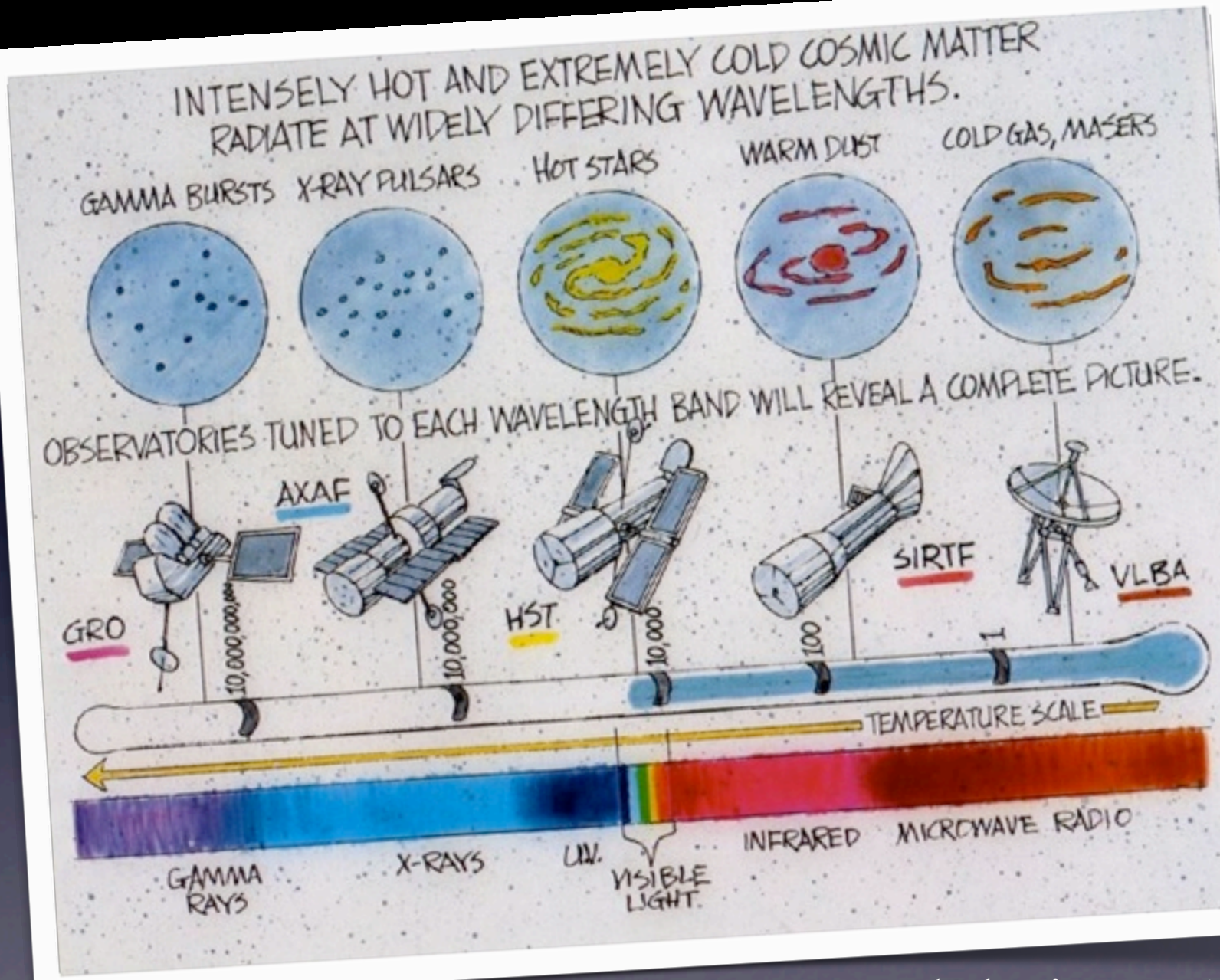
CoPAG - ExoPAG informal meeting

Baltimore
26 April 2011

Matt Mountain
STScI

- A few thoughts...



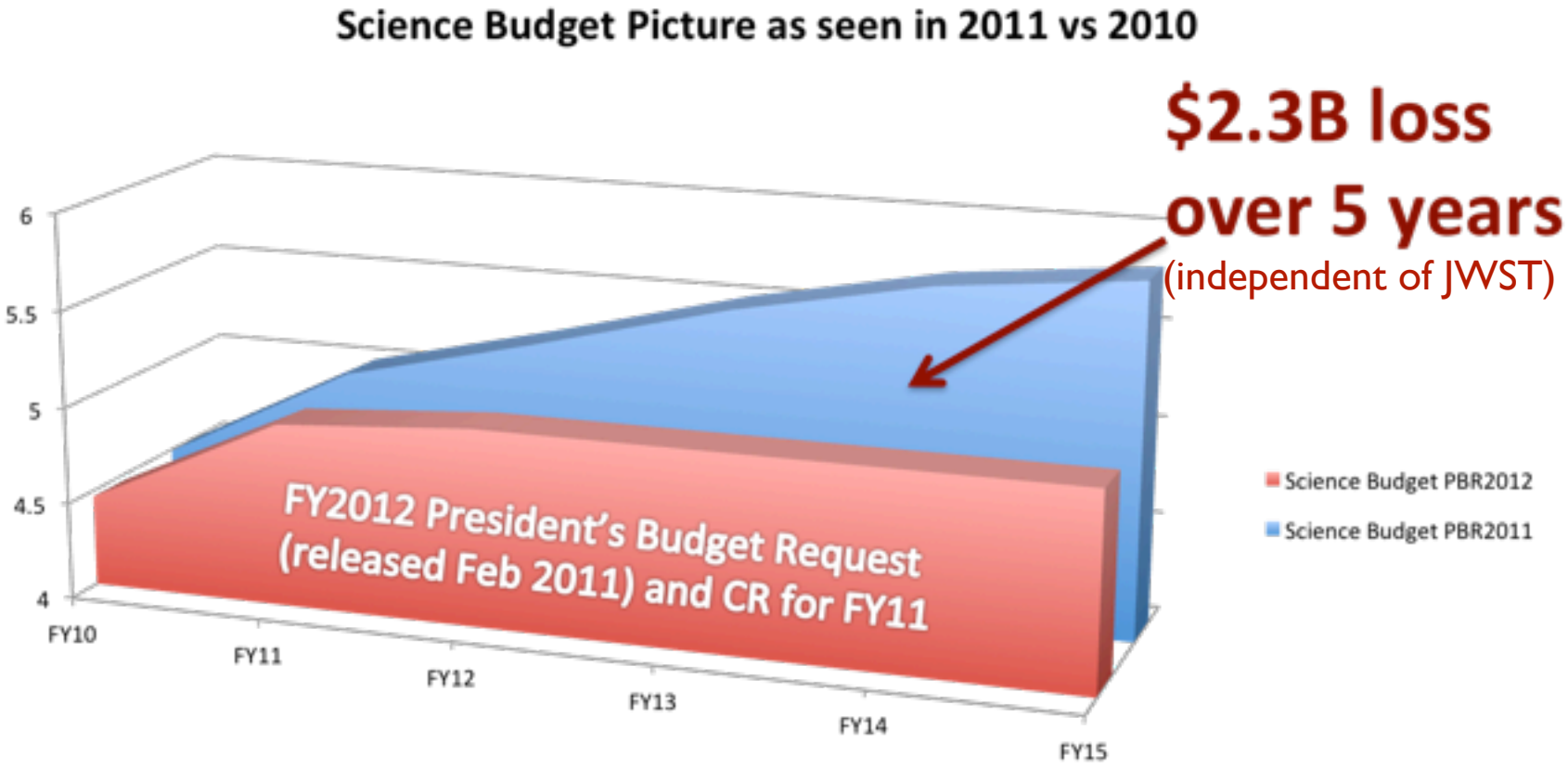
our model circa. 1980

"As civilization's universal state emerges, its people become blinded by 'the mirage of immortality'… the citizens of such universal states [and particularly their astronomers]* in defiance of apparently plain facts…are prone to regard [their situation], not as a night's shelter in the wilderness, but as the Promised Land, the goal of human endeavors."

The Clash of Civilizations and Remaking of World Order, Samuel P. Huntington

* editorial license

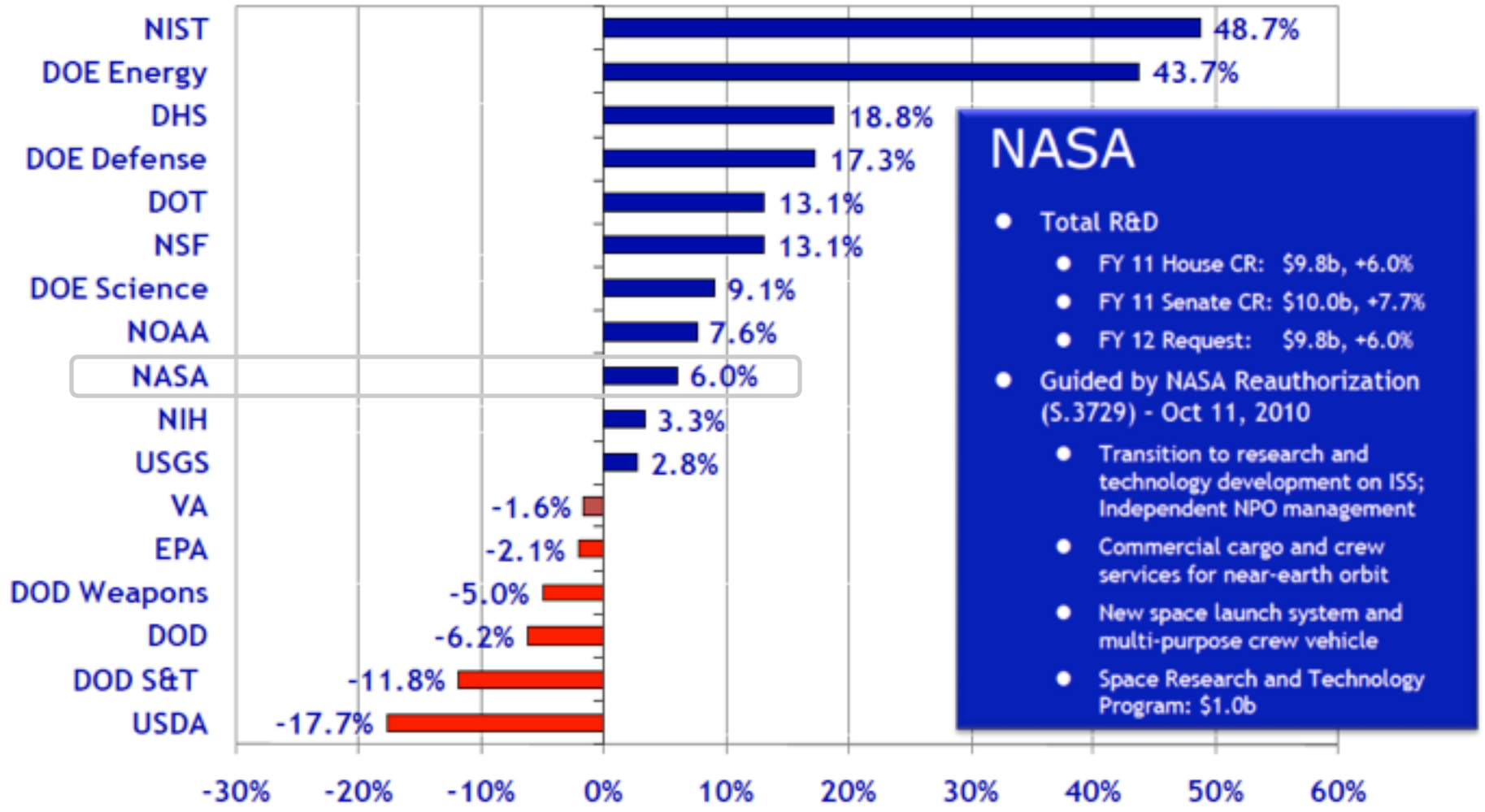
NASA Science shrinks 8% relative to 2011 President's Budget Request



The real crisis is that NASA science Budget is **flat** beginning 2012

R&D in the FY 2012 Budget Request

percent change from FY 2010



NASA

- Total R&D
  - FY 11 House CR: $9.8b, +6.0%
  - FY 11 Senate CR: $10.0b, +7.7%
  - FY 12 Request: $9.8b, +6.0%
- Guided by NASA Reauthorization (S.3729) - Oct 11, 2010
  - Transition to research and technology development on ISS; Independent NPO management
  - Commercial cargo and crew services for near-earth orbit
  - New space launch system and multi-purpose crew vehicle
  - Space Research and Technology Program: $1.0b

OSTP/OMB directed investments in NASA R&D are going up - just not into Science

Source: OMB R&D data, agency budget justifications, and other agency documents.

We need …the right balance between manned space exploration and robotic space exploration. We need to manage the balance between looking up and looking down…

Dr. John Holdren, US Presidential Science Advisor

We need some of the bright people in Particle Physics and Astronomy to move into solving some of the more relevant problems we face..

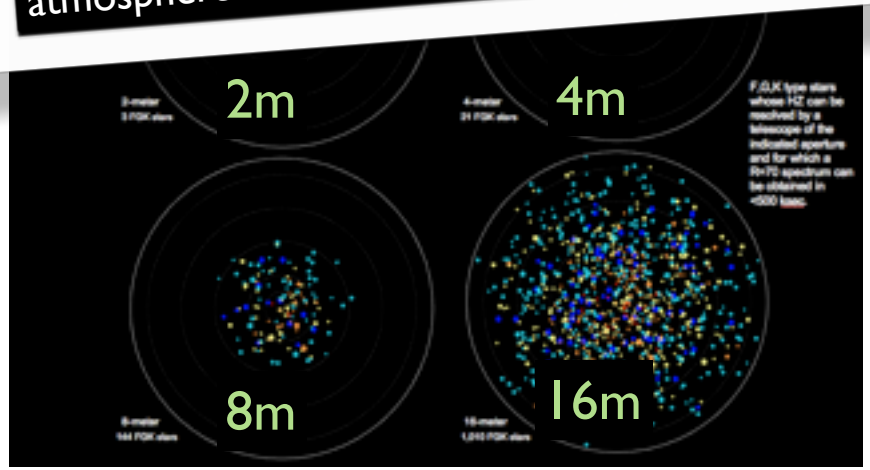
Sir David King , Chief Scientific Adviser to HM Government, 2000 - 2008

Astrophysics we can't do today,

nor will we be able to do in the JWST era

What are the conditions for planet formation and the emergence of life?

Search for planets around starts other than the Sun, looking for biomarkers in their atmospheres and image them



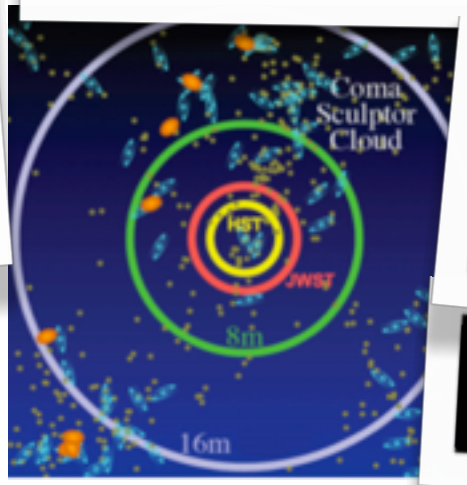
Number of observable candidate stars in our solar neighborhood as a function of telescope diameter

If: $\eta_{Earth} \times f_B \sim 1$ then $D_{Tel} \sim 4m$

$\eta_{Earth} \times f_B < 1$ then $D_{Tel} \sim 8m$

$\eta_{Earth} \times f_B << 1$ then $D_{Tel} \sim 16m$

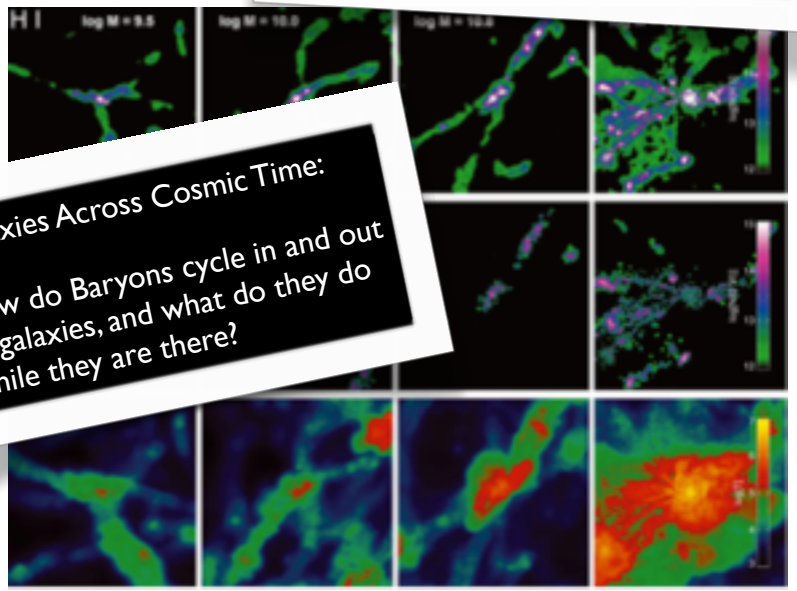
How did the Universe originate and what is its made of?



Galactic Neighborhood:

What is the fossil record of galaxy assembly from the first stars to the present?

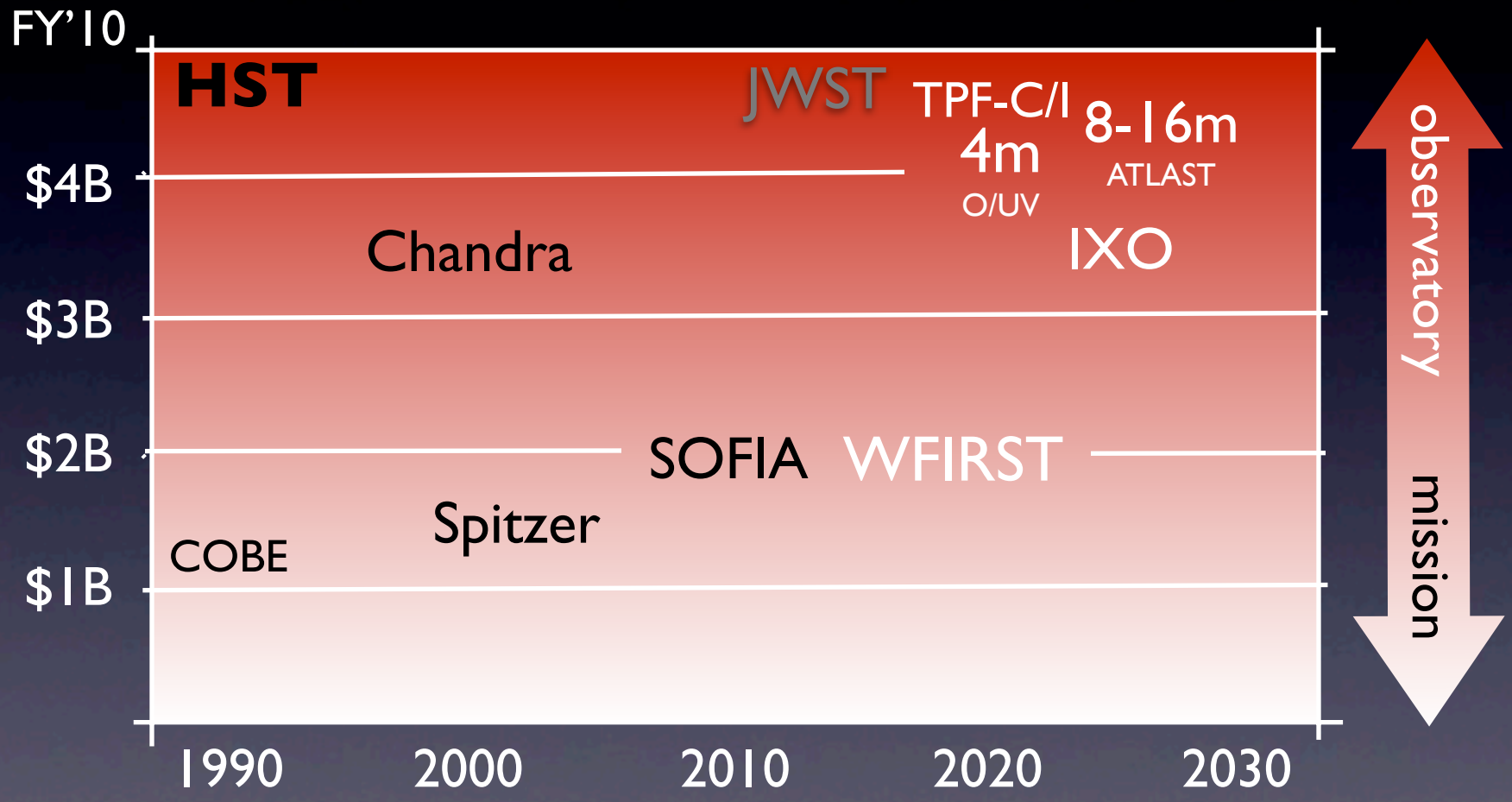
Find the first gravitationally-bound structures - and trace their evolution to the current epoch



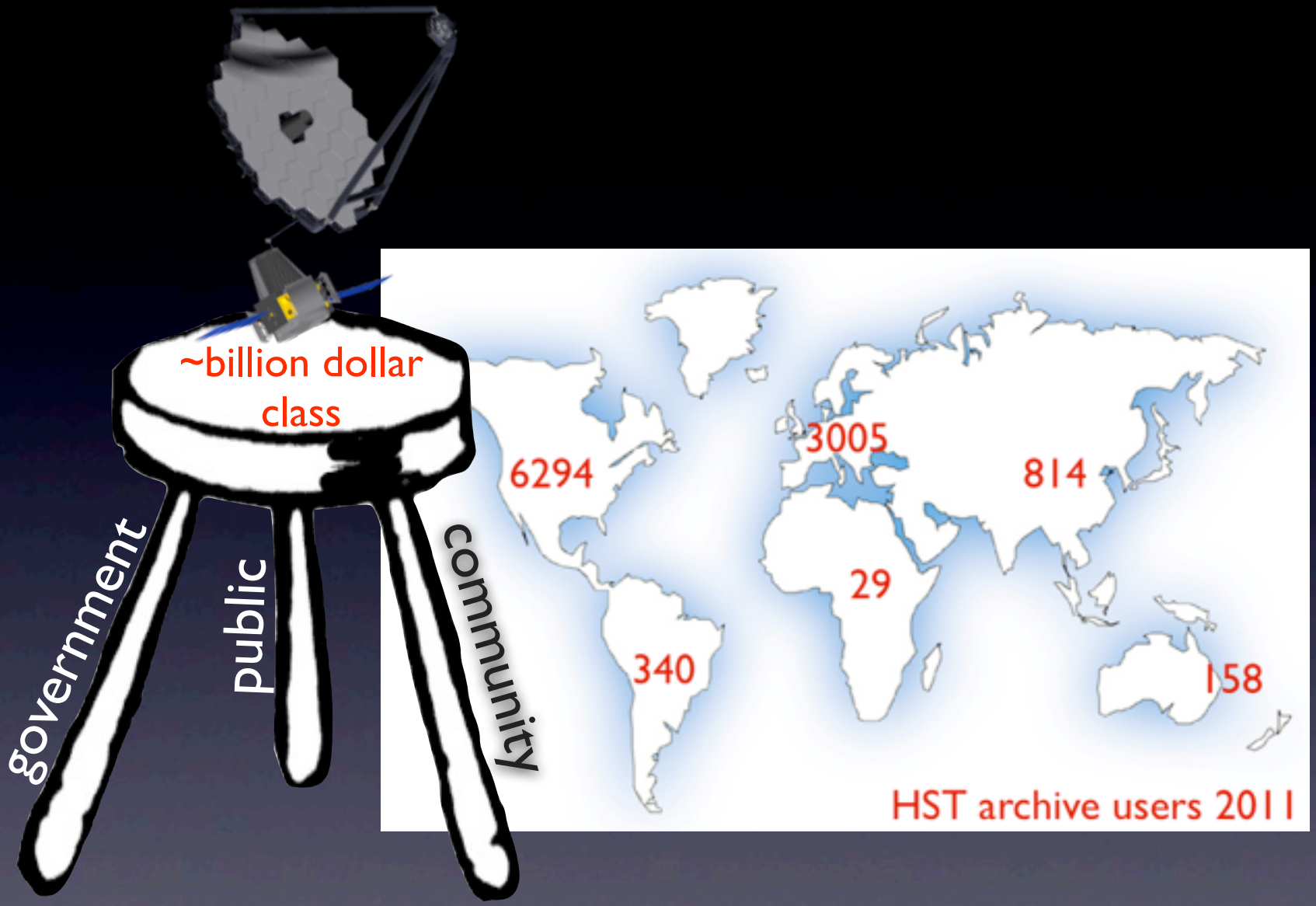
Galaxies Across Cosmic Time:

How do Baryons cycle in and out of galaxies, and what do they do while they are there?

NASA flagship cost and 'expectations'



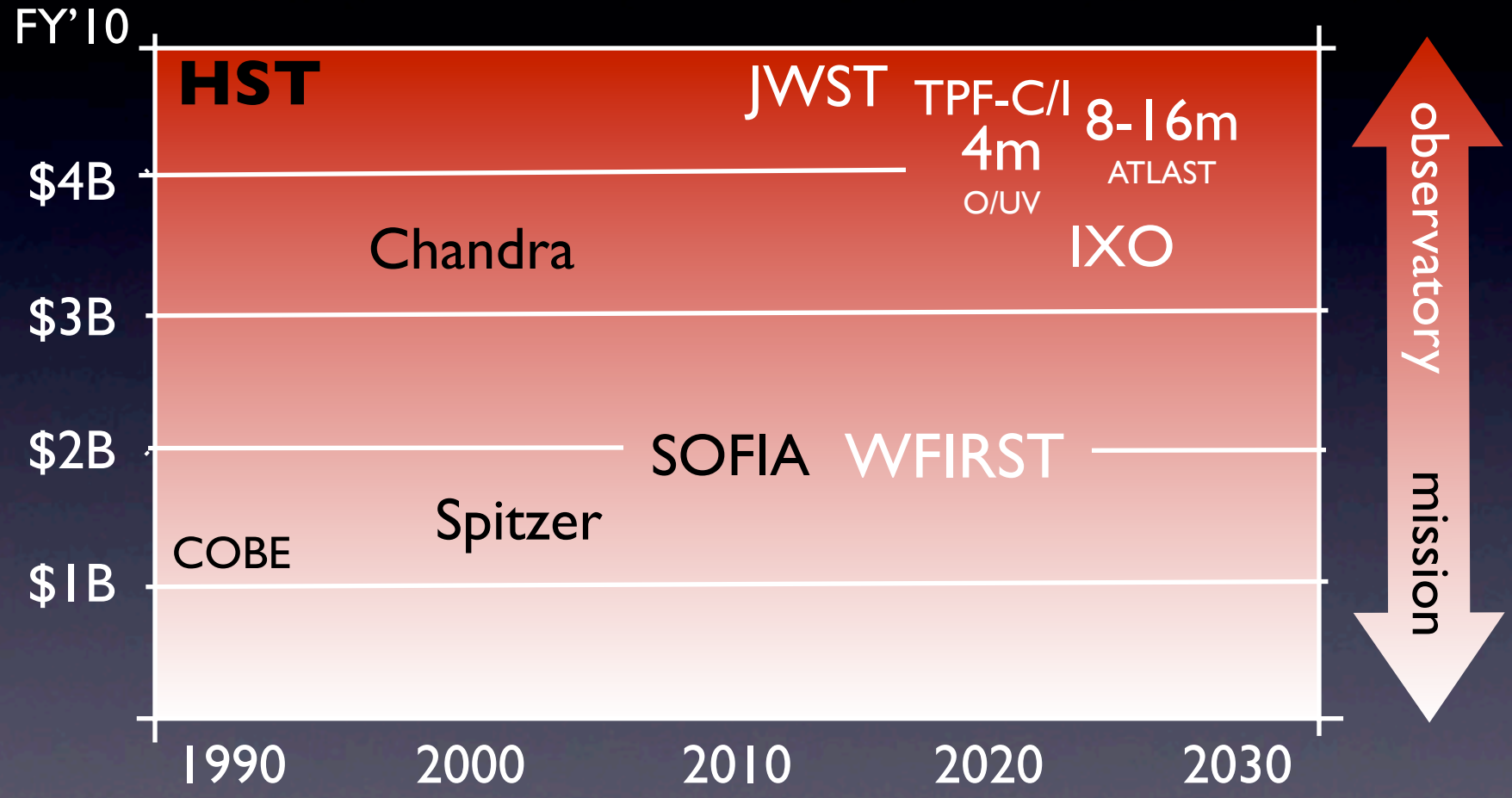
huge competition for the few slots in the top-right corner



Lesson 1: *The truest sign of insanity is doing the same thing again and again expecting different result* - build a broad scientific consensus

Space Telescope costs and 'expectations'

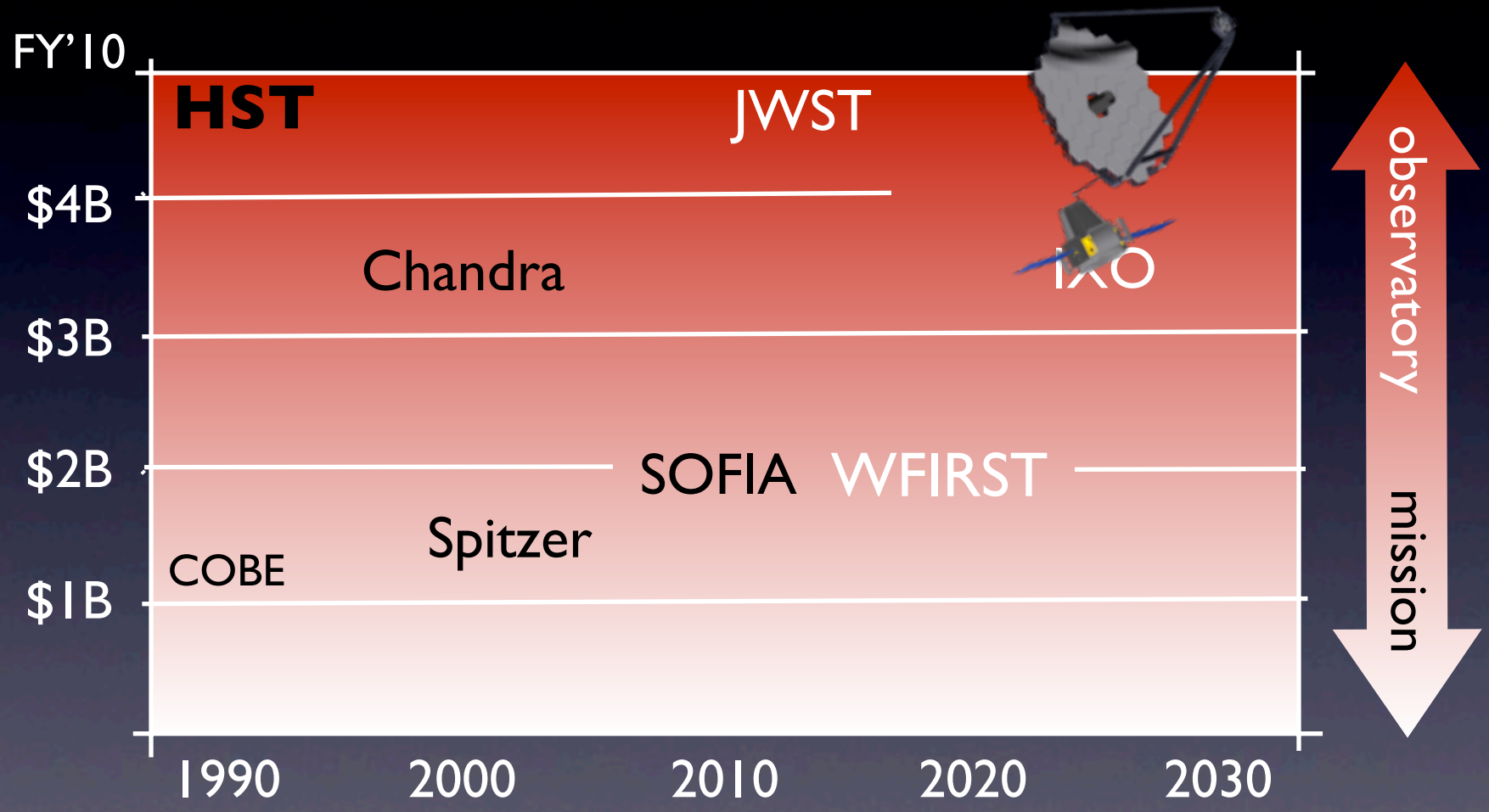
- what's the smart thing to do?



huge competition for the few slots in the top-right corner

Space Telescope costs and 'expectations'

- what's the smart thing to do?



huge competition for the few slots in the top-right corner

Space Science has always built on investments made "elsewhere"

HEADLINE NEWS

Advanced KH-11 Broadens U.S. Recon Capability

One analyst's concept for an advanced KH-11 has 145-50-in. mirror and wing like arrays, in contrast to Hubble like arrays of earliest KH-11s.

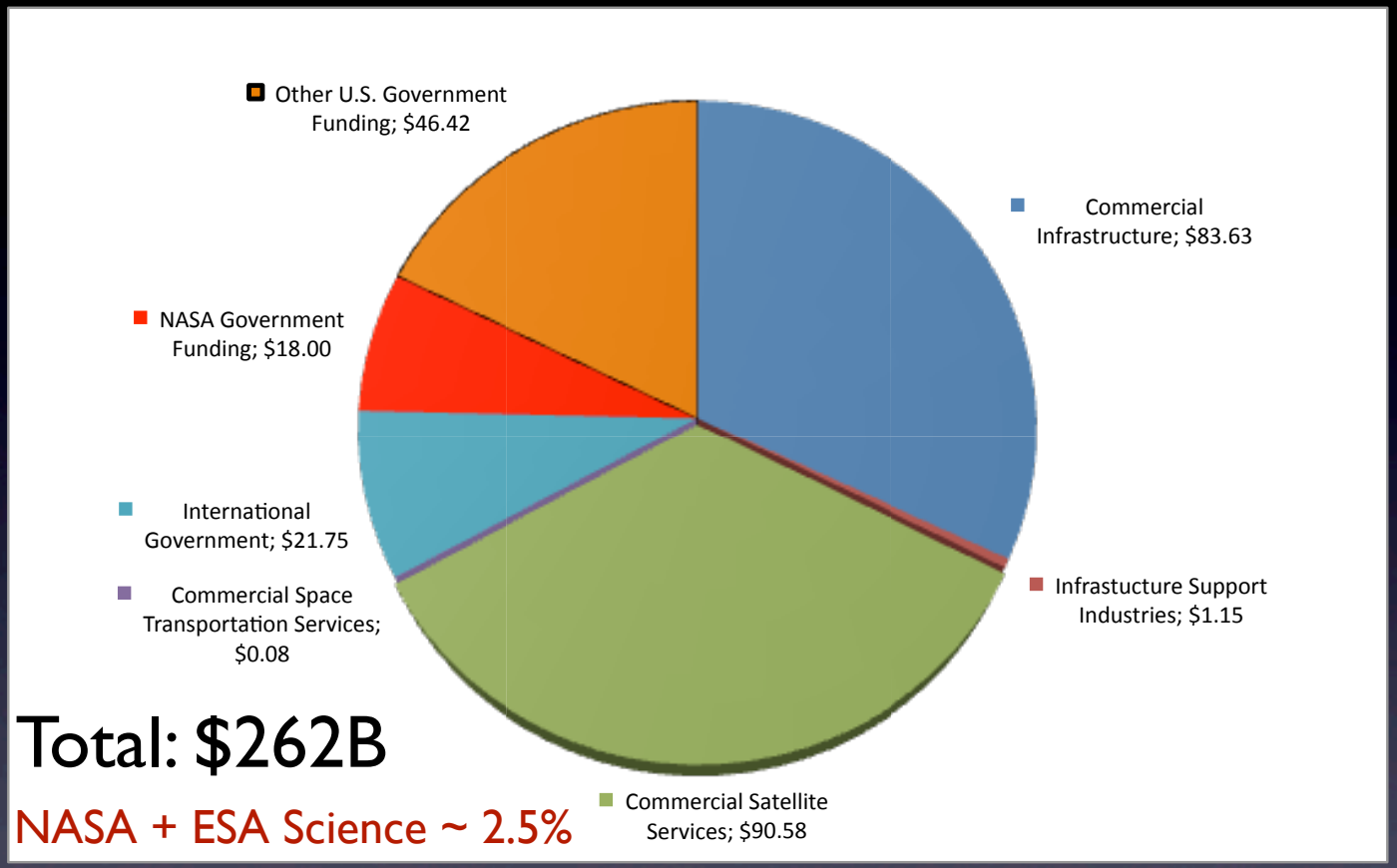
24 AVIATION WEEK & SPACE TECHNOLOGY/JANUARY 6, 1997

"How [have] we in astronomy come so far? … By standing on the shoulders of military/ industrial giants. … These larger scale efforts have been central to our success. … Where military or industrial support did not exist and we had to go ahead on our own, progress has been much slower."

Martin Harwit,
March 1999

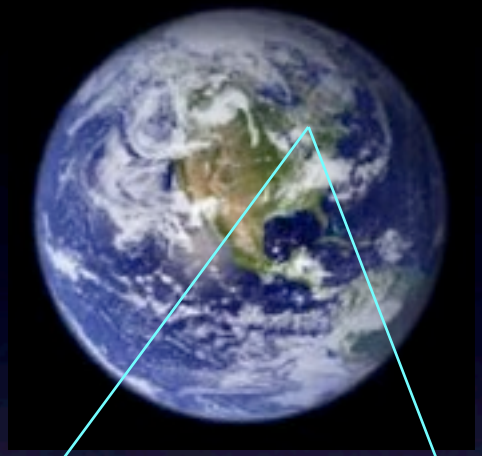
The two main contractors that built the telescope had allegedly extensive experience building this kind of spacecraft - but not much is known publicly about these programs.

Global Space Activity - source Space Foundation



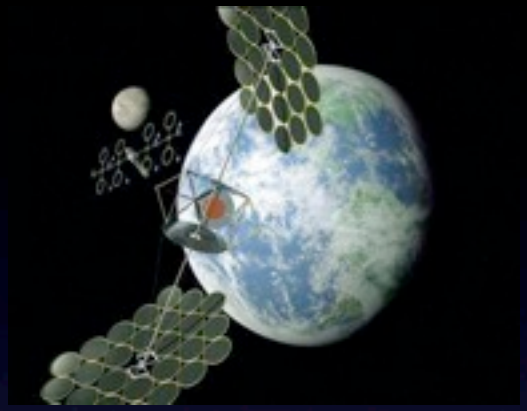
Lesson 2: Space science will not, and perhaps even NASA may not, significantly influence investments in future space infrastructure - so build partnerships

Space Science is probably not the only constituency that wants large space based imaging technologies

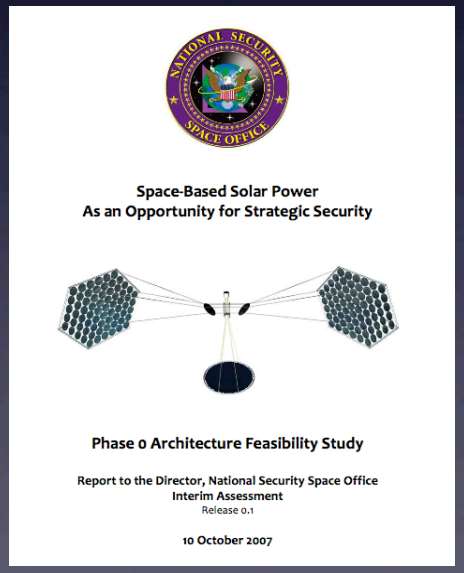


Geostationary orbit
persistent surveillance

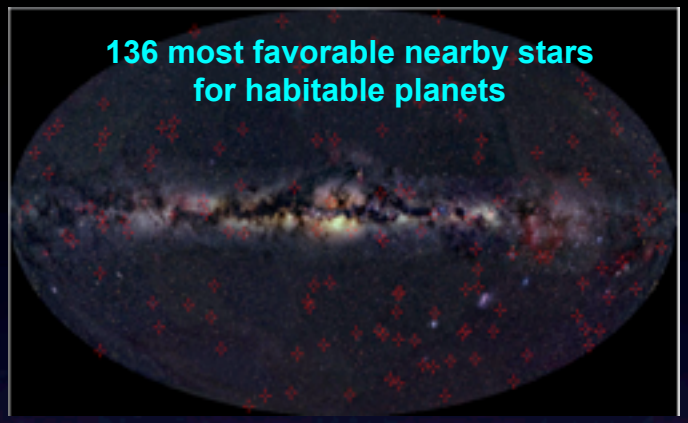
National & Environmental Security



Solar collectors in space



Energy



Can we causally relate the conditions during the Big Bang to the emergence of RNA and DNA?

- how did the Universe originate and what is its made of?

- how unique was our occurrence; are we alone?

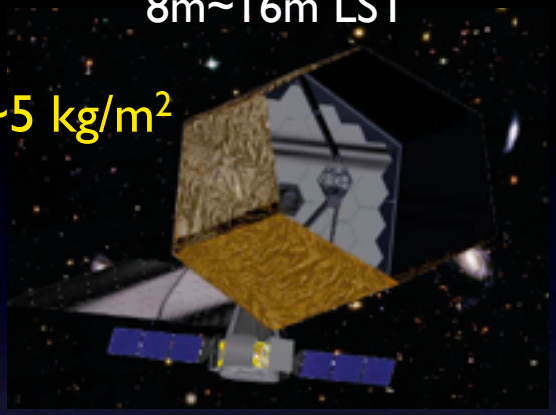
Science

Lesson 3: lead by example

HST 2.4m

JWST 6.5m

8m~16m LST



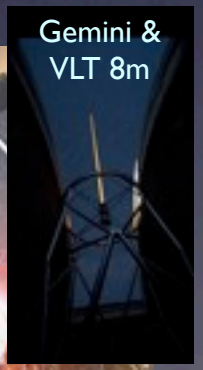
Passive control

Active control

Fully active and adaptive control

Palomar 5m

Keck 10m



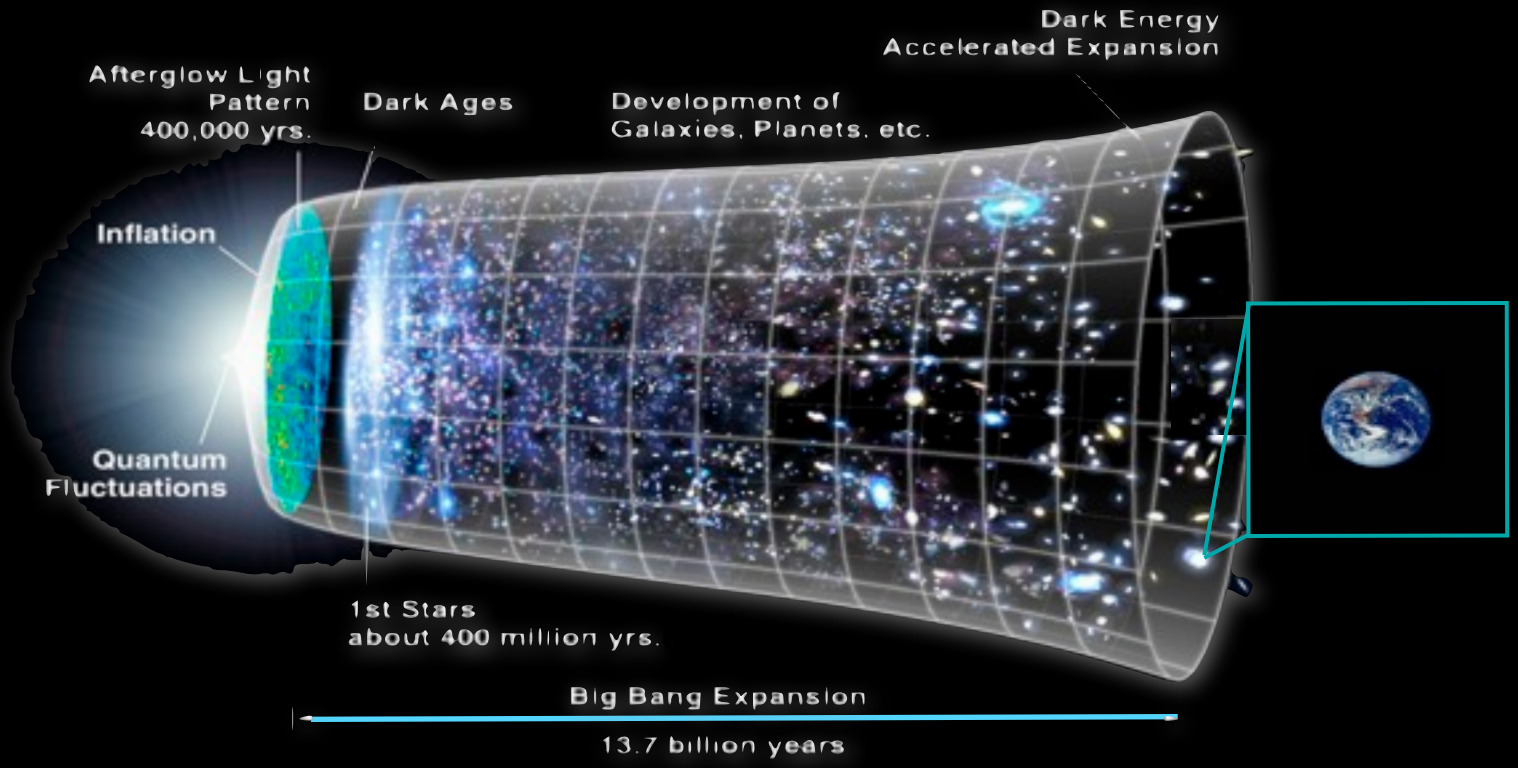
E-ELT/TMT 30m~40m

Do we understand the threats to our national security and global sustainability?

- have we the tools to enable informed and timely decisions?

Can we find common ground, which also inspires a new generation?

- the formation of the Universe and the Search for Life
- science is necessary, but not sufficient - so take a technology leap, but one that mirrors "other interests"
- collaborate rather than compete to enable 21st Century Space Science



We have a great story so far

To continue the new breakthroughs in the study of the Cosmos, and in the search for habitable planets our generation has one shot so can we tell one story propose one facility

The Copernican and Darwinian revolutions suggest that finding life elsewhere will bring about an irreversible change in our worldview.