Update from NASA Astrobiology Program

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CAPS, Washington, DC
March 6, 2013

National Aeronautics and Space Administration

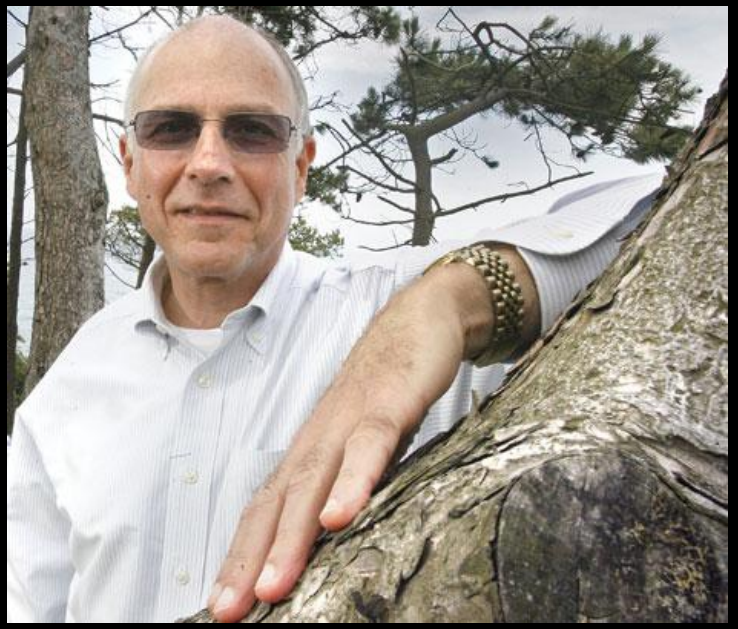
Carl Pilcher

In honor of your retirement with enduring gratitude for your leadership and service to NASA's Astrobiology Program.

After a certain high level of technical skill is achieved, science and art tend to coalesce in esthetics, plasticity, and form. The greatest scientists are always artists as well.

—Albert Einstein

Carl Pilcher Retires



CAN-6 Selections
(43 Proposals- 5 selected)

P.I.	Institution	Title
Amend, Jan	University of Southern California	Life Underground
Goldenfeld, Nigel	University of Illinois at Urbana-Champaign	Towards Universal Biology: Constraints from Early and Continuing Evolutionary Dynamics of Life on Earth
Johnson, Clark	University of Wisconsin	Habitability, Life Detection, and the Signatures of Life on the terrestrial Planets
Meadows, Victoria	University of Washington	The Virtual Planetary Laboratory
Summons, Roger	Massachusetts Institute of Technology	Foundations of Complex Life: Evolution, Preservation and Detection on Earth and Beyond

NASA and Library of Congress First Astrobiology Chair

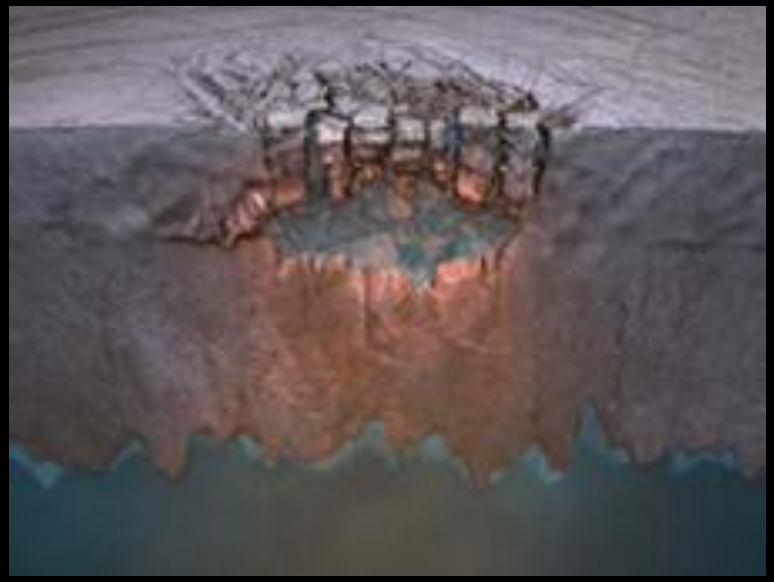
David Grinspoon, Department of Space Sciences at the Denver Museum of Nature and Science.

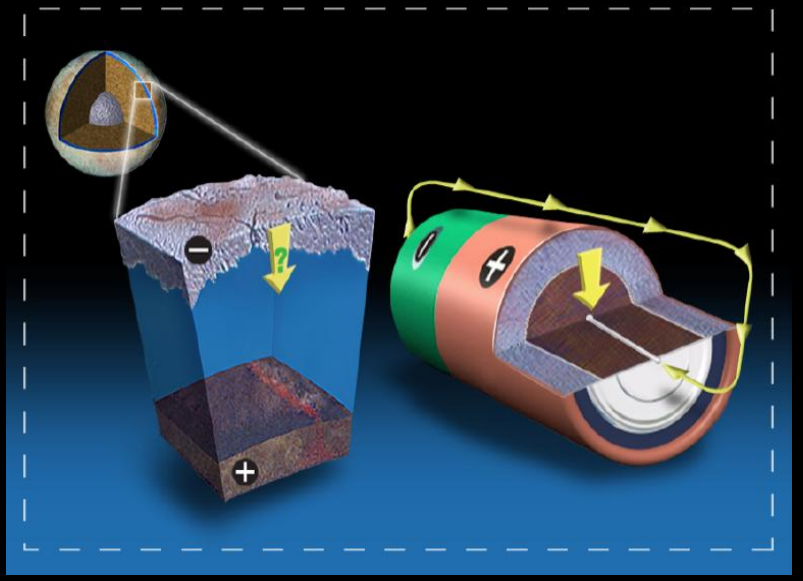
Grinspoon will examine choices facing humanity as we enter the Anthropocene Era, the epoch when human activities are becoming a defining characteristic of the physical nature and functioning of Earth.

ASTEP 2011 RESULTS

ASTEP ROSES-2011 (4%)

- 28 proposals submitted
- 1 selected (Schmidt)
- 1 descoped
- 2 walking dead





Exobiology 2011 Results

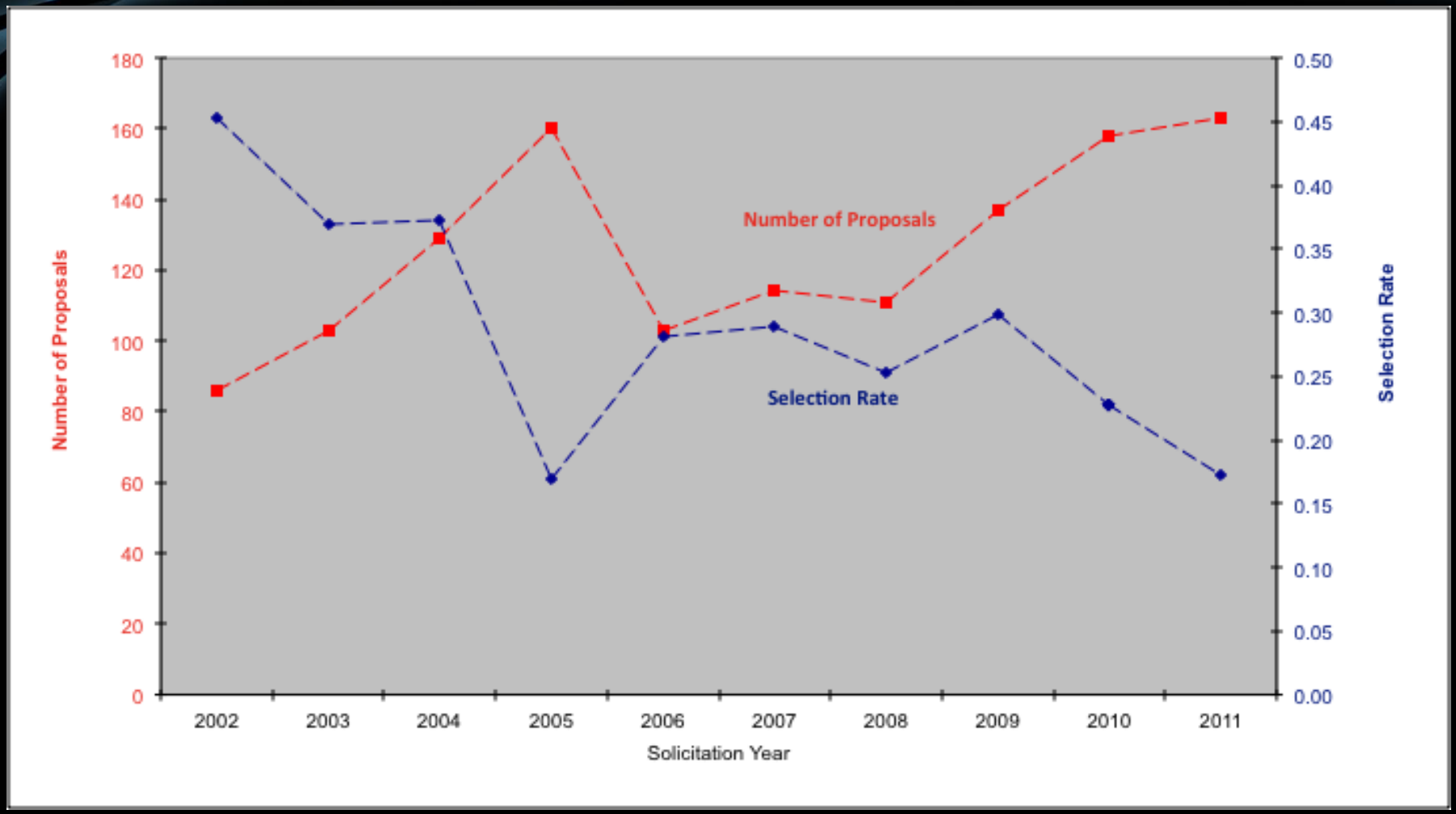
162 proposals submitted(!)

30 proposals were selected for funding

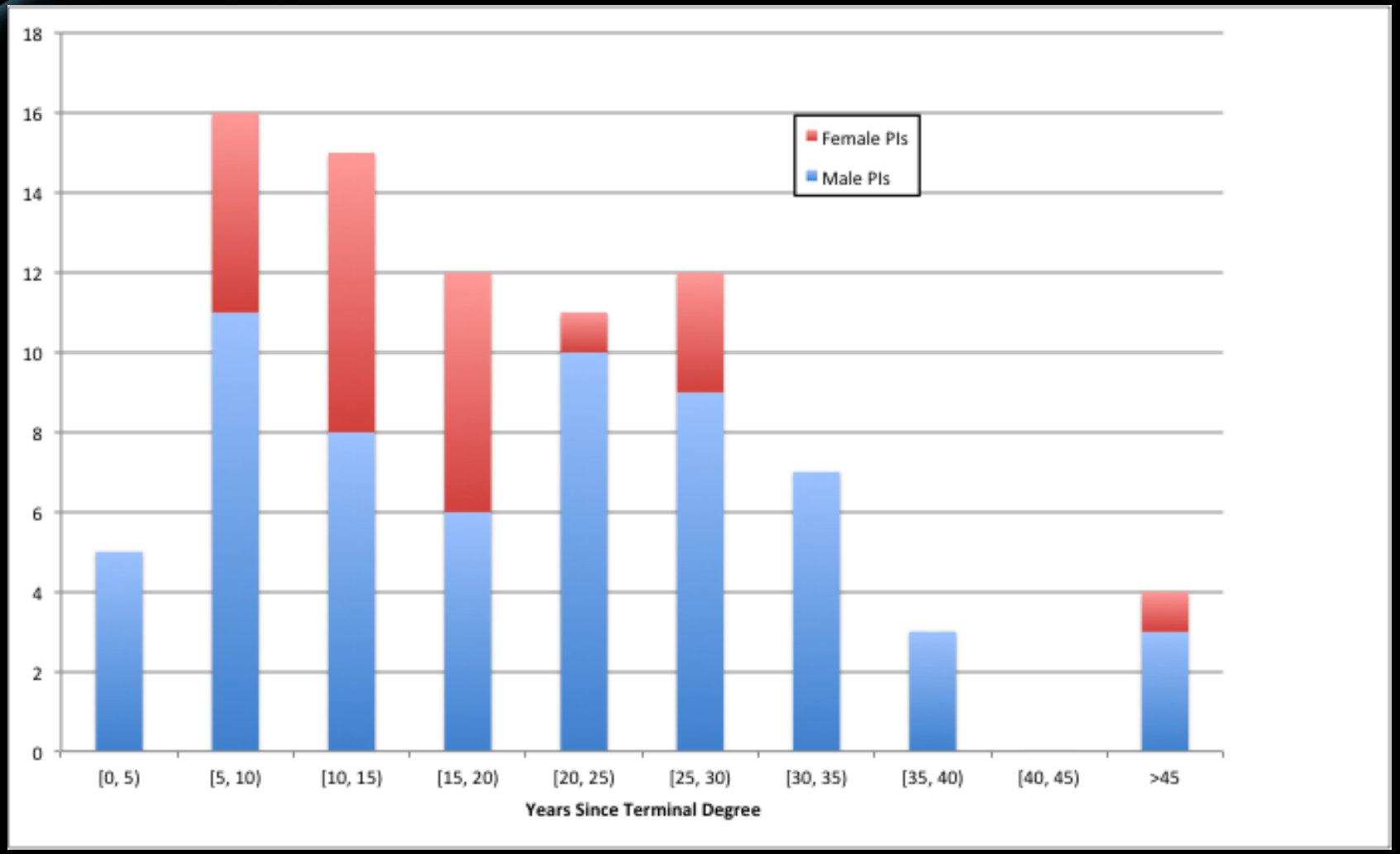
- 20 fully selected
- 2 partially selected (descoped)
- 4 selected for 1-year pilot studies
- 1 is co-funded with the Mars Program
- 1 is fully funded by the Mars Program
- 2 will be funded by the ASTEP program

Selection rate is therefore 18.5%

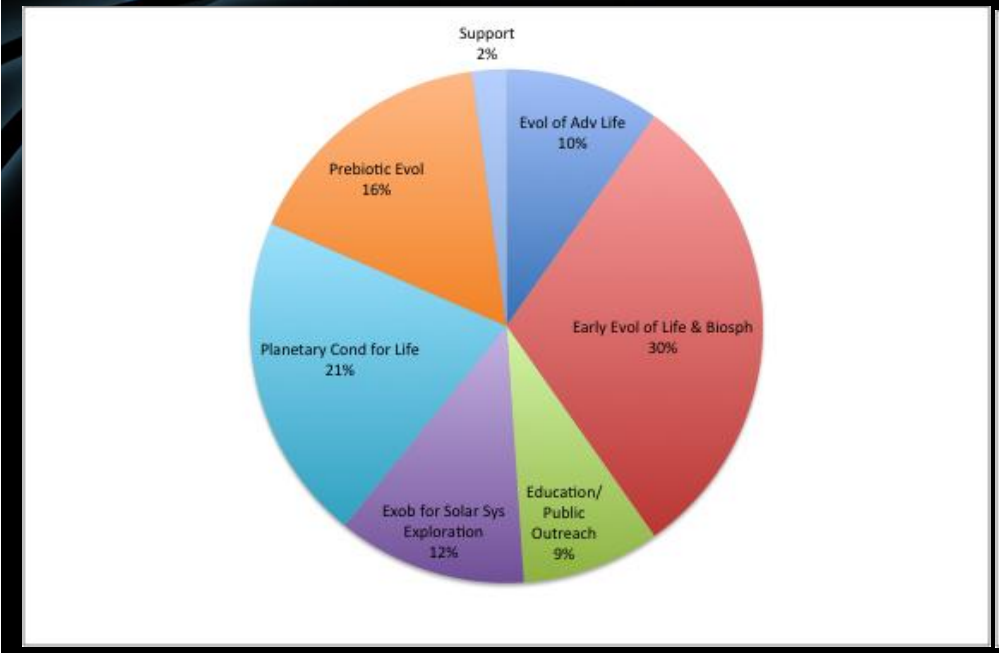
History of Exobiology NRAs



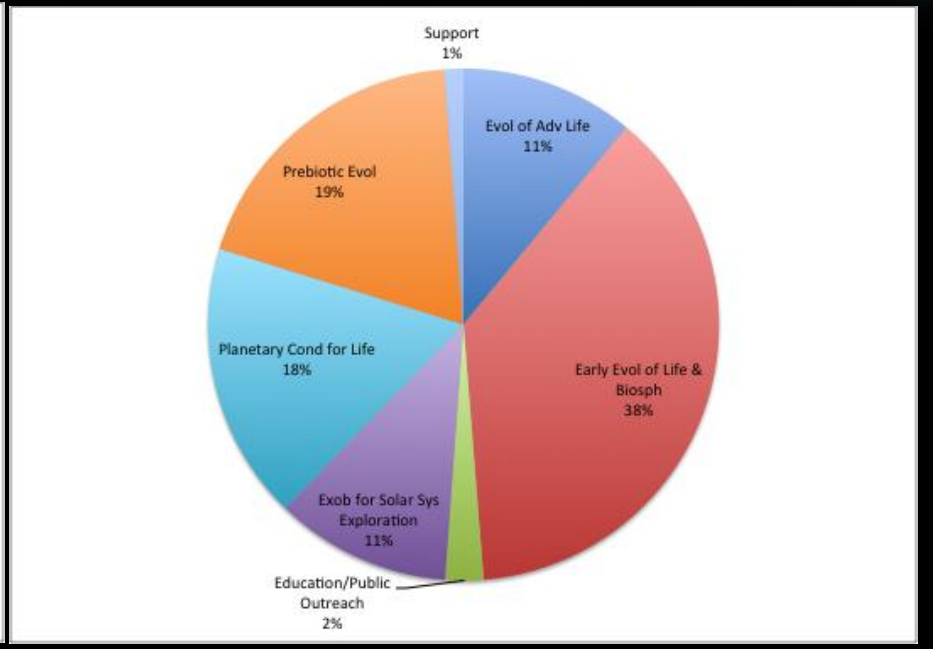
Demographics of Current Grantees



Distribution of FY13 Funded Tasks



By number of activities



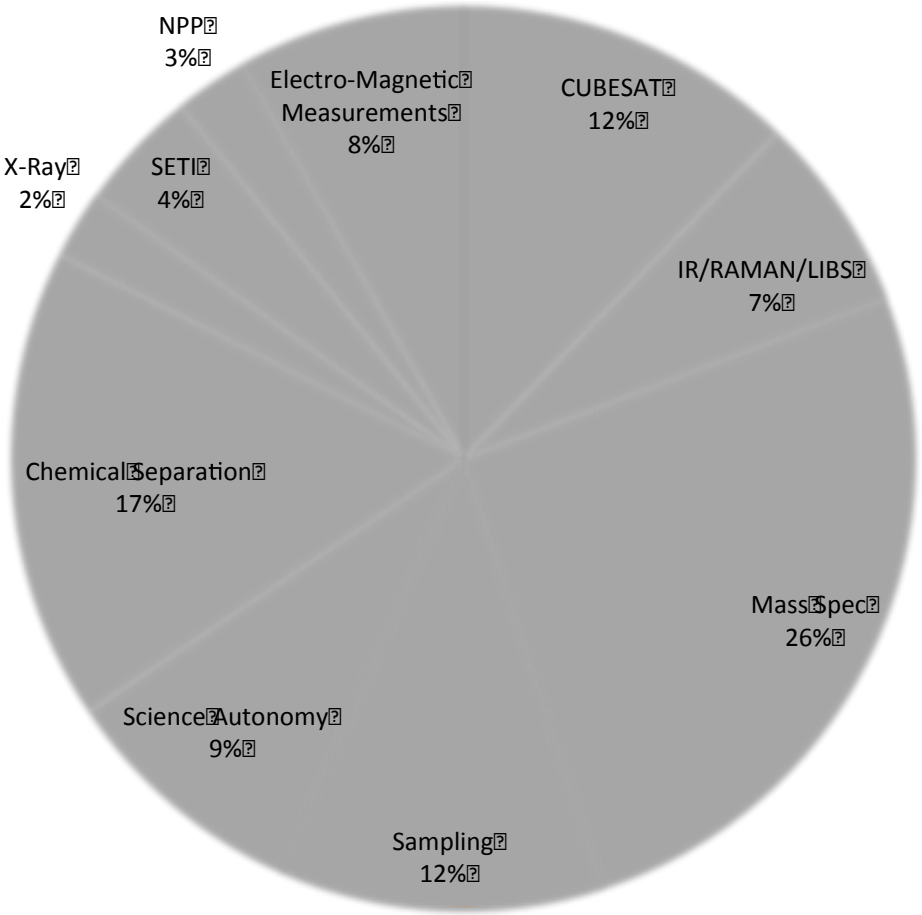
By FY13 funding

- Program currently funds 7 NESSFs
- Program currently supports 7 Early Career Fellows, 2 of whom have received start-up funding.

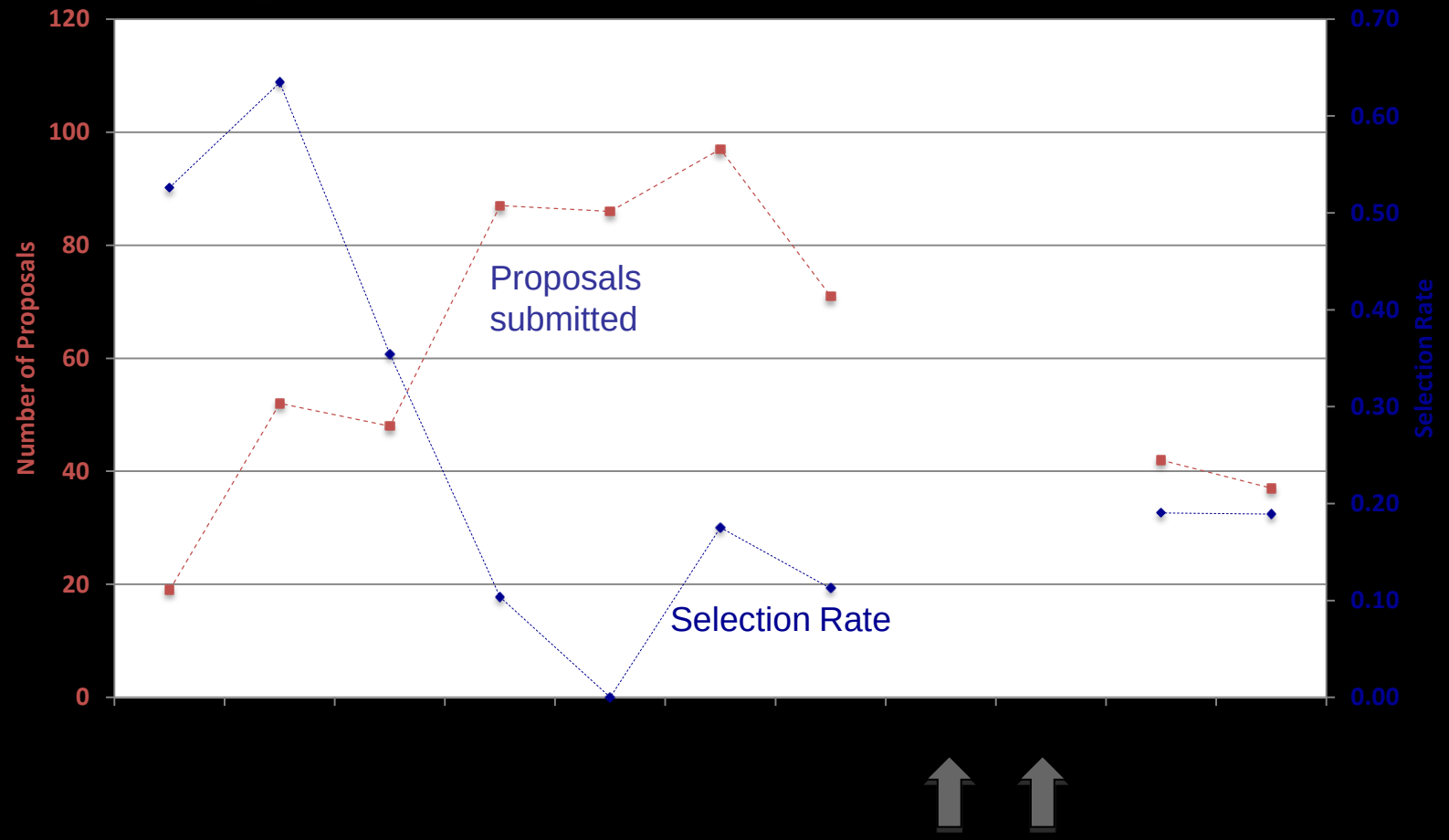
ASTID 2011 Results

- Co-reviewed proposals with PIDDP 2011 proposals
  - Worked wonderfully!
- ASTID received 41 proposals, 5 of which were late. One of the late proposals was accepted due to *force majeure* while the other four were returned without review. 37 proposals were reviewed
  - 6 proposals fully selected
  - 1 proposal partially selected (descoped)

Distribution of FY13 Funded Tasks



History of ASTID NRAs



R&A Calls Are Evolving

Solicitations very broad with significant overlap.

- Proposals submitted to multiple calls or submitted to less-than-optimal calls were handled by informal discussions between DSs.

Budget pressures leading to more focused calls.

- For example, EXOB-13 states: "Proposals in the focus area 'Exobiology for Solar System Exploration' are not solicited at this time. Proposals that would normally be submitted to this solicitation focusing on the habitability of Mars should be submitted to C.13, the Mars Fundamental Research Program; proposals focusing on the habitability of moons in the outer Solar System should be submitted to C.7, the Outer Planets Research Program."

Upcoming Solicitations

MatISSE proposals under review. Strong & diverse pool of proposals (30). Select 1-3

ROSES-13 released in February.

- EXOB proposals due 14 June 2013
- ASTEP is TBD; We are evaluating potential changes to the solicitation in light of Mars-2020 and previous plans…
- PICASSO will be offered for 1st time.

CAN 7 CAN release Fall 2013, due Early 2014

The Upcoming CAN-7

Working on a new process for CAN-7 (see next slide).

One long-term goal is to balance the odd- and even-numbered CANs

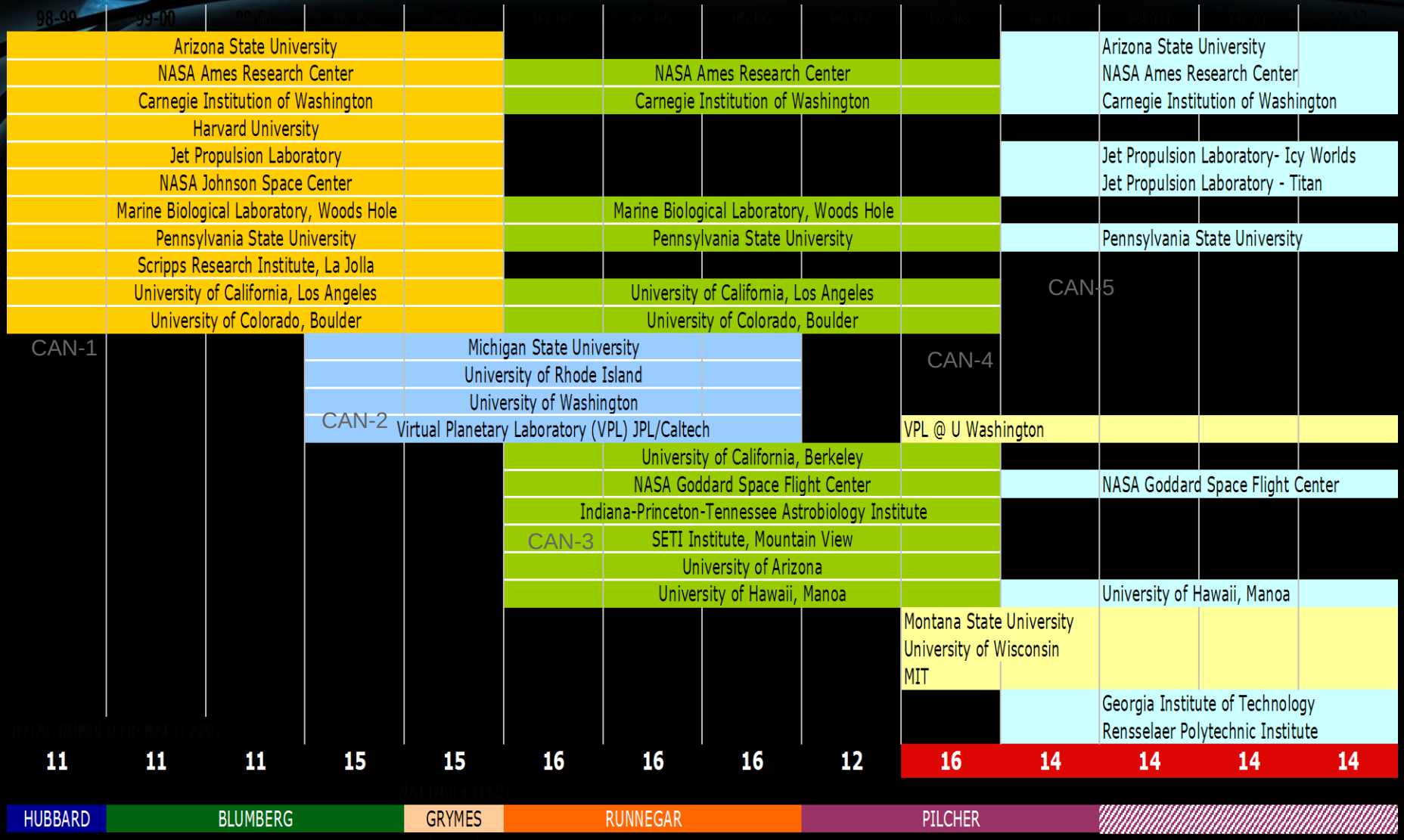
- CAN-1 selected 11 teams; CAN-2 selected 4 teams. This dichotomy continues.

CAN-6 selected 5 teams.

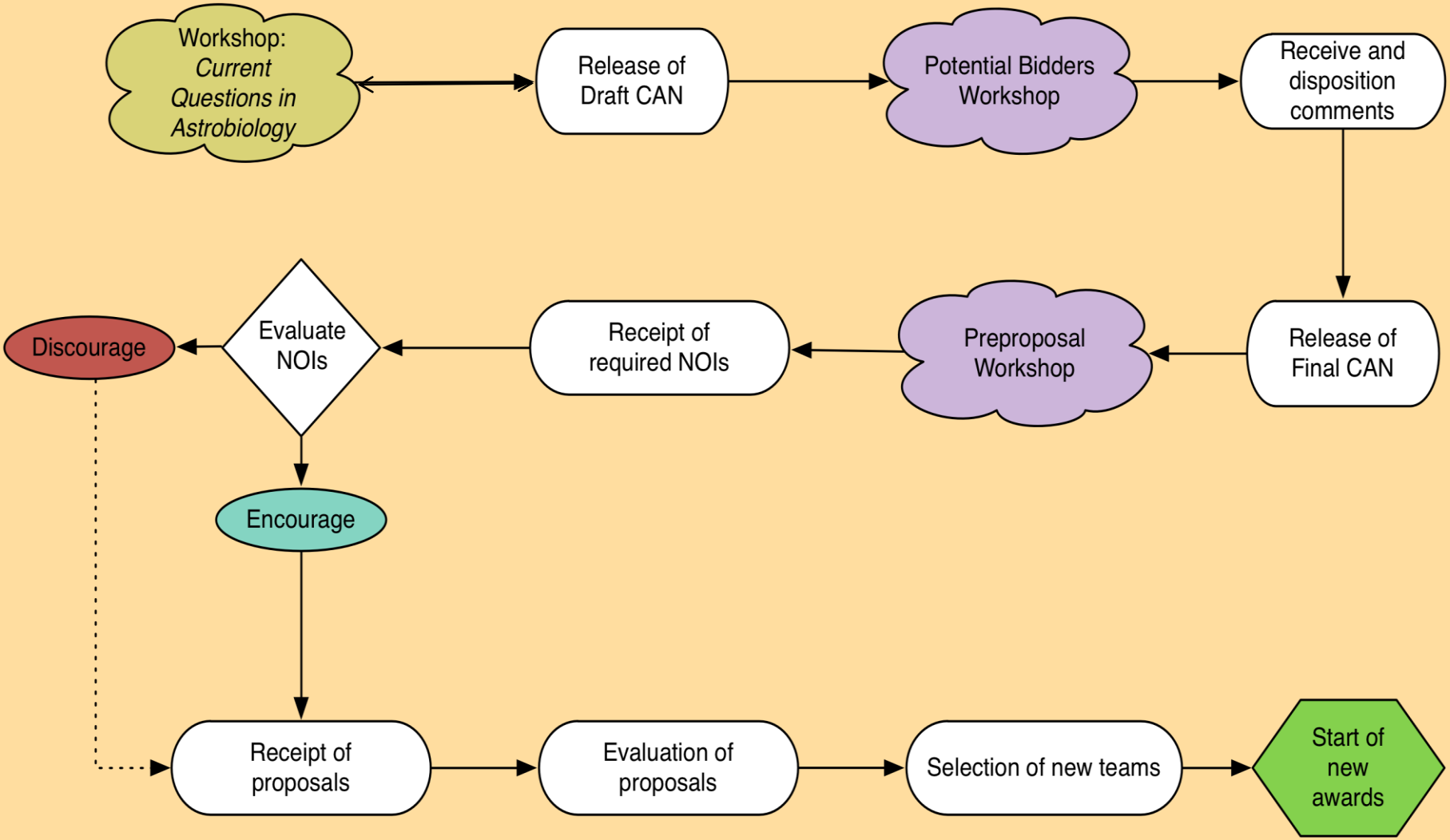
Plan on selecting no more that 6 teams from CAN-7.

Any changes will maintain a multi-disciplinary institute but we want more focused, inter-disciplinary teams.

NAI's History



Proposed CAN-7 Process

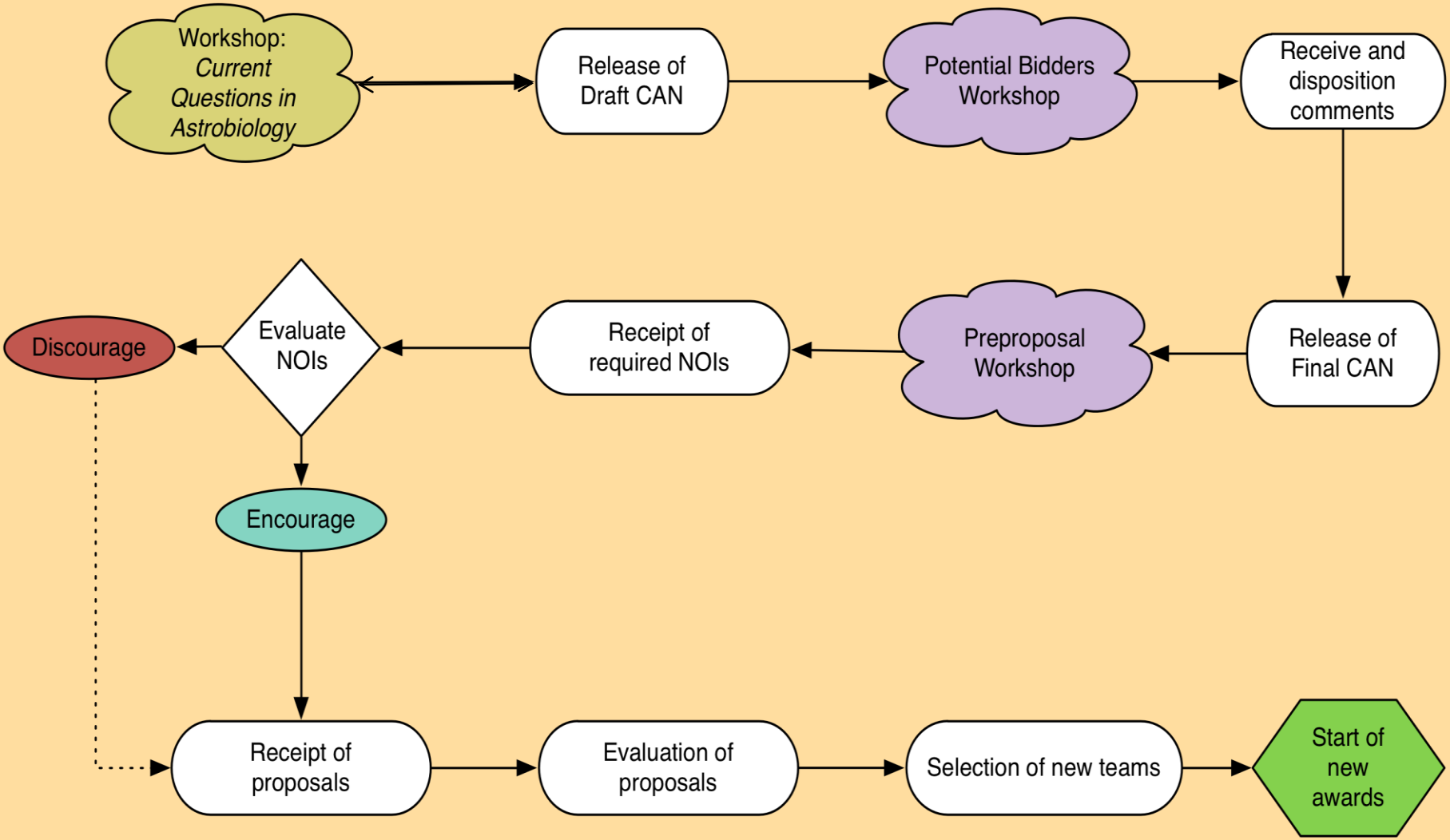


Astrobiology is guided by a Roadmap (1963-2008)

There are 7 goals, each multi-decadal in scope:

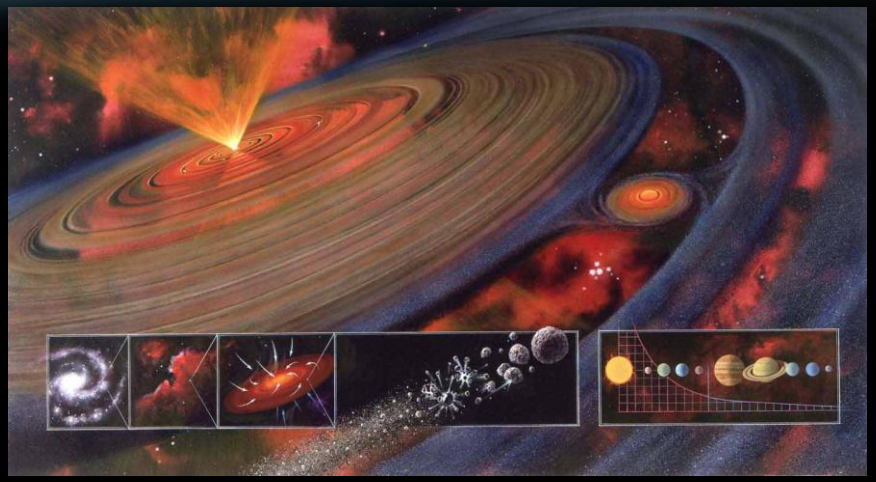
- Habitable Planets
- Life in our Solar System
- Origins of Life
- Earth's Early Biosphere and its Environment
- Evolution, Environment and the Limits of Life
- Life's Future on Earth and Beyond
- Signatures of Life

Proposed CAN-7 Process



Astrobiology Unites Disciplines to Study Life in the Universe

Origins and distribution of habitable planets

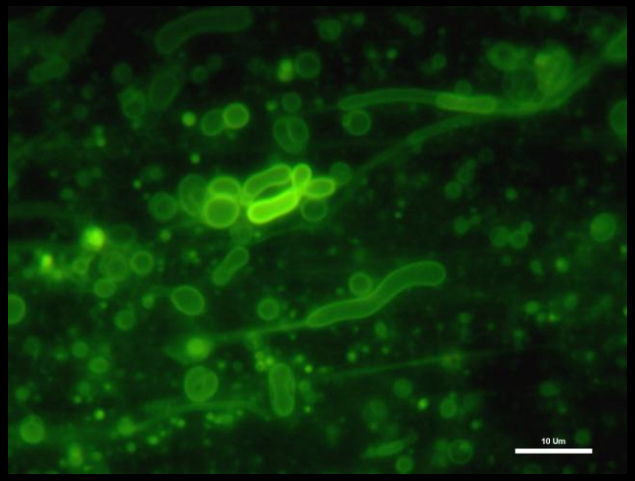


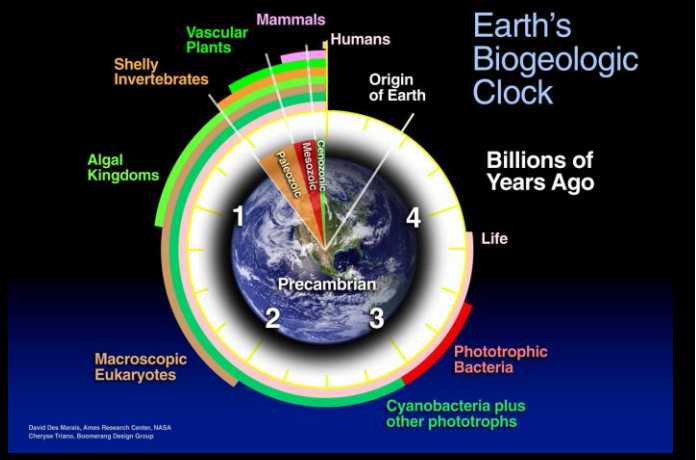
Chemistry of prebiotic environments

Prebiotic evolution and origins of life

Evolution of biospheres and their biosignatures

Origins, Evolution & Distribution of Life





Attributes of living systems

More focused? Inter-disciplinary?

These terms will be clearly defined in the CAN.

One selection goal will be to try to avoid replicating the strengths of the continuing teams.

“Inter-disciplinary = a fruit smoothie, multi-disciplinary = fruit salad”

Do we need curated cultures?

There exist at least 2 orphan collections of cultures of organisms that are potentially important to the astrobiology community

- Imre Friedmann's
- Dick Castenholz's

Sherry Cady at EMSL/PNNL is interested in maintaining these collections.

Should the Astrobiology Program or the Planetary Science Division take on the perpetual commitment to maintaining these collections and perhaps expanding them?

Other activities in Astrobiology

Workshops
E/PO
Communication

ASTROBIOLOGY WORKSHOPS

Analog Sites

Co-sponsored JPL and CSA (March 2011)

- Special Issue ICARUS

Part 2

Matching potential sites with mission and early earth science (July 2013)

Mass Independent Fractionation of Sulfur

- Co-sponsored with NSF (June 2011)
- Report printed- http://is.gd/s_mif

Alternative Chemistries of Life

- Co-sponsored with NSF-CCI (Feb 2012)
- Report in Prep

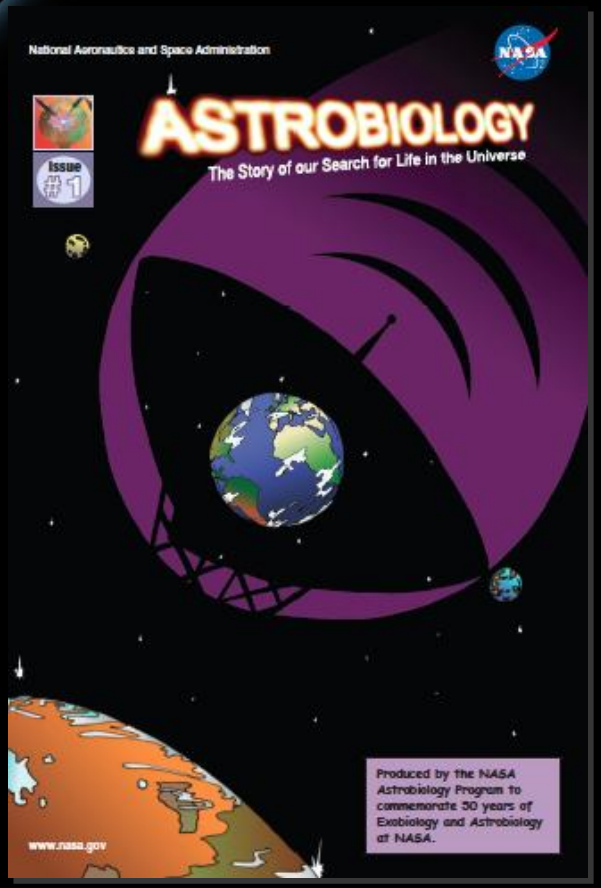
Life Detection Workshop

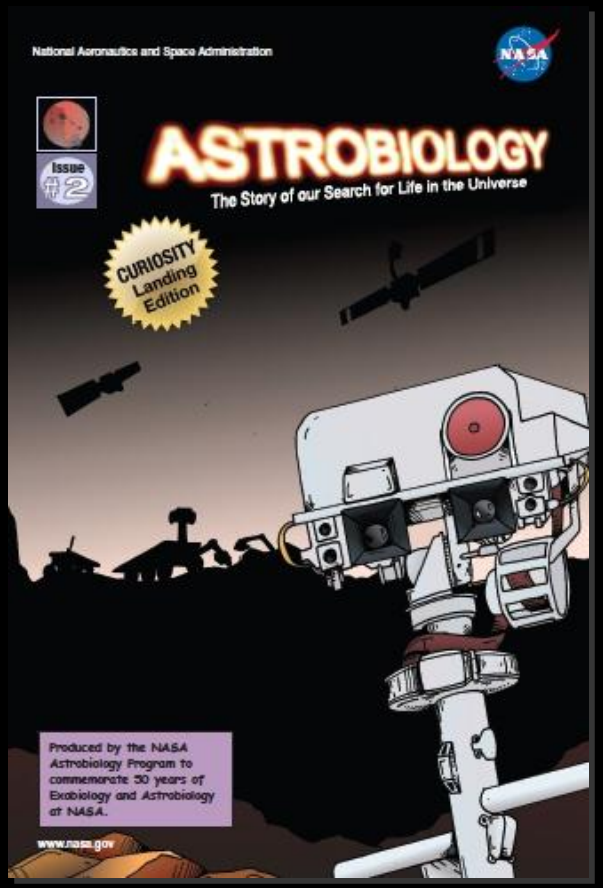
- Co-sponsored with PPP and MEP (Feb 2012)
- Report in Prep

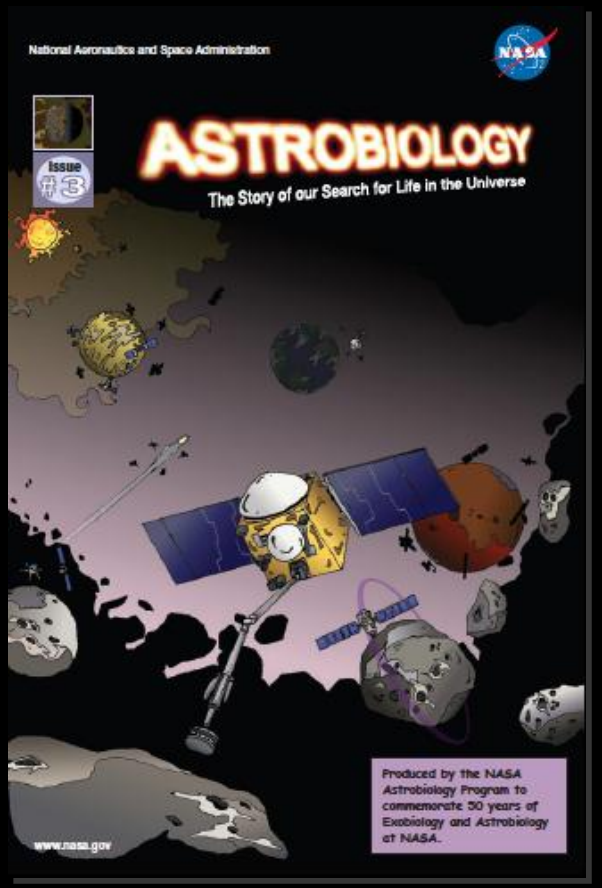
Workshop on Planetary Drilling

- High priority applications(AGs)
- Practitioners fill in rubric (June 2013)

Astrobiology Graphic History







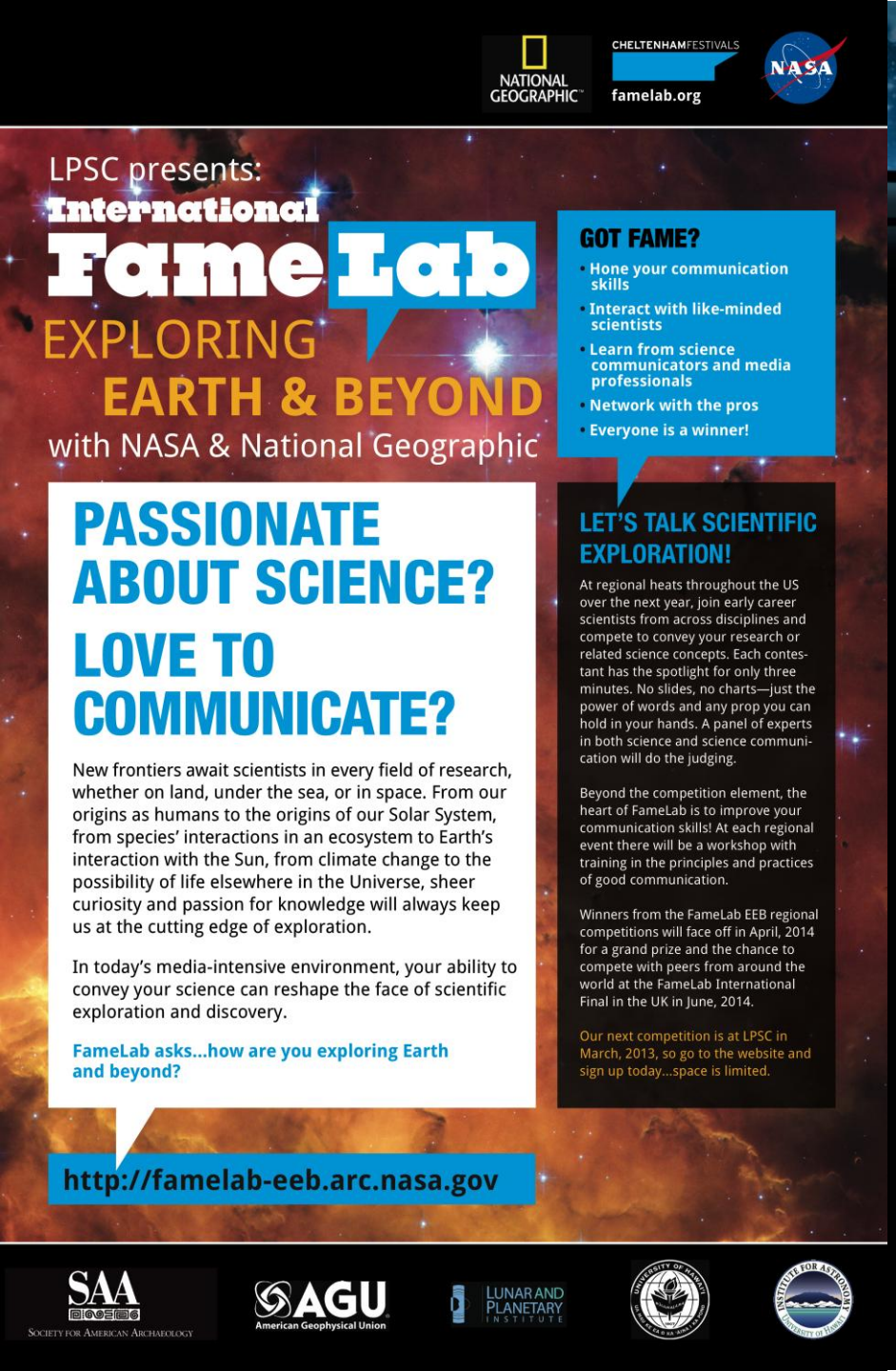
Teacher Tools in Development

FameLab Update

NASA is partnering with National Geographic and collaborating with science society meetings for “prelims”

FameLab Alums help the program and NASA

Awarded an HQ Honors Award for External Collaborations for FameLab!



Prelims
AGU,
LPSC, March 17 and March 20
Society of American Archaeology,
National Geographic Explorers,
AAS,
AAAS (in discussions),
AbSciCon,
AGU (again) or GSA,
YouTube

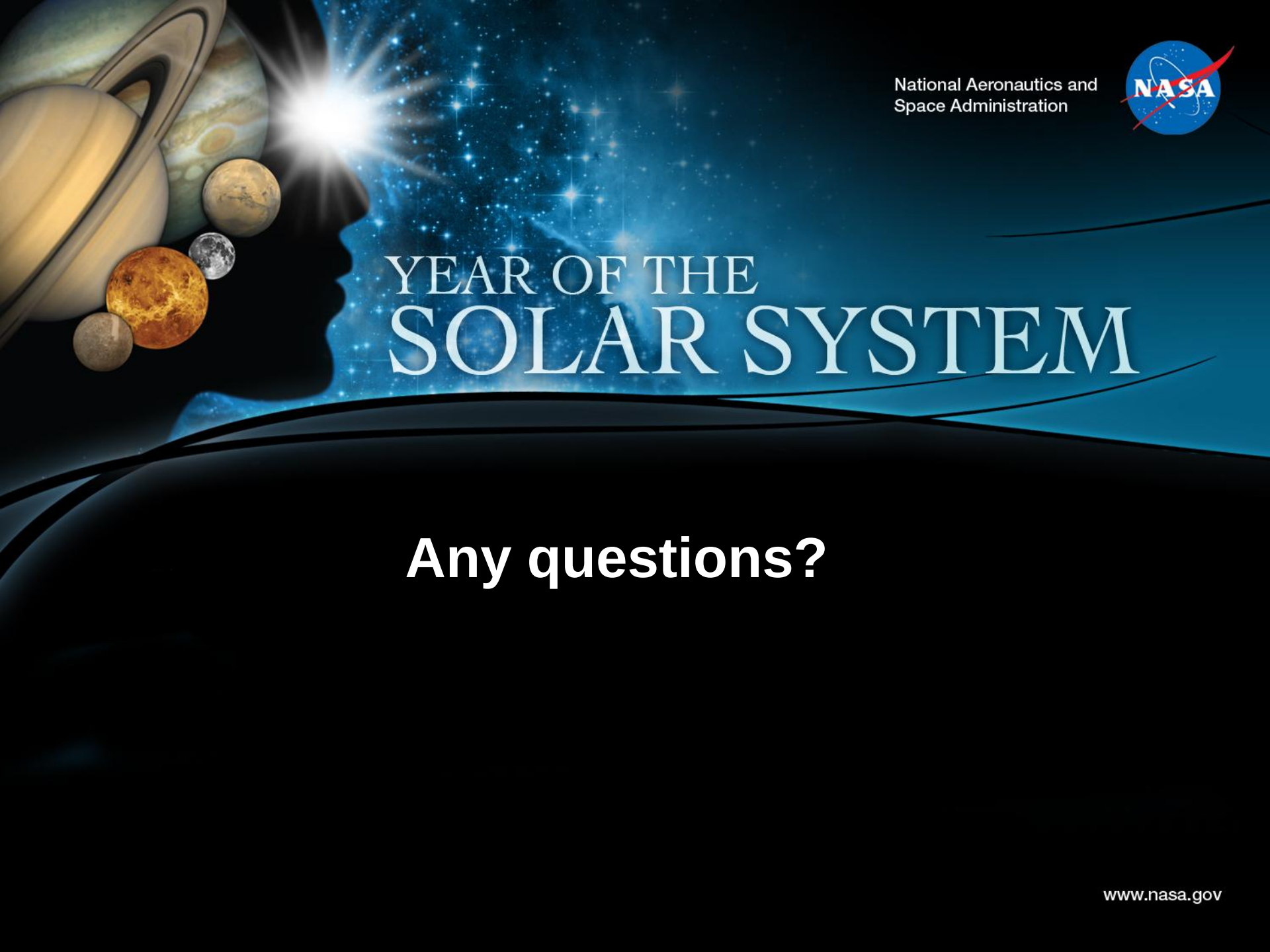
Finals in DC at Nat Geo in May 2014

AbSciCon Update

No location or schedule chosen yet.

We are working the issues associated with recent rules limiting NASA's ability to support conferences.

- We're monitoring what's going on with LPSC-2013 as a model for what we'll have to do with AbSciCon


National Aeronautics and
Space Administration
NASA
YEAR OF THE
SOLAR SYSTEM
Any questions?
www.nasa.gov

Exobiology 2011 Analysis

Selection rate is far below notional target (25-33%)!

Median of (average annual award) = $172,057

- Inter-quartile Range (measure of variation) = $68,759

Other details:

- 4 requests to the PME were approved
- 2 Early Career Fellowships were awarded
- 2 proposals requesting access to Antarctica selected and transferred to ASTEP
- 2 proposals requesting super-computer time selected

27% of awarded proposals seem to have female PIs

Advice to the Astrobiology/Exobiology Program provided by the NRC since 1976

Panel on Exobiology within the Committee on Space Biology and Medicine

Committee on Planetary Biology and Chemical Evolution

Committee on Planetary and Lunar Exploration (Steering Group on Astrobiology)

Committee on the Origins and Evolution of Life

Committee on Astrobiology and Planetary Sciences

NRC Committee on Assessment of Balance in NASA's Science Programs (2006):

Statements on Astrobiology

Recommendation 2. NASA should move immediately to correct the problems caused by reductions in the base of research and analysis programs, small missions, and initial technology work on future missions before the essential pipeline of human capital and technology is irrevocably disrupted.

- "**The *decadal surveys for astrophysics and for solar system exploration both embraced astrobiology as a key component of their programs***, with the questions encompassed by astrobiology serving as overarching themes for the programs as a whole…Astrobiology provides *the intellectual connections between otherwise disparate enterprises*."
- "***Astrobiology is just beginning the type of synthesis and integration that will allow it to provide science input for future mission development***. Without it, the science and the scientific personnel will not be in place to support the missions when they do fly."
- "***At a time of increasing desire for cross-disciplinary programs*, astrobiology represents an outstanding example of the development of *a successful new interdisciplinary area*.** Universities across the country have established new programs in astrobiology and appointed numerous faculty members. *A generation of undergraduate and graduate students has been inspired* by the intellectual challenges and the Vision [for Space Exploration] to undertake courses and research projects in broad areas of space science."
- "In a new discipline that has a larger than average number of early career participants, the *proposed cuts will have a disproportionate impact on young people* (students, postdoctoral fellows, and junior faculty) and will strongly discourage new entries into space research."
- ***"The proposed halving of the [astrobiology] program is a complete reversal of years of NASA efforts and will be counterproductive to any long-term space exploration strategy."***

Planetary Science Objectives

NASA's goal in Planetary Science is to "*Ascertain the content, origin, and evolution of the solar system, and the potential for life elsewhere*."

Planetary Program seeks to answer fundamental science questions:

1. What is the inventory of solar system objects and what processes are active in and among them?
2. How did the Sun's family of planets, satellites, and minor bodies originate and evolve?
3. **What are the characteristics of the solar system that lead to habitable environments?**
4. **How and where could life begin and evolve in the solar system?**
5. What are characteristics of small bodies and planetary environments that pose hazards and/or provide resources?