PhysPAG

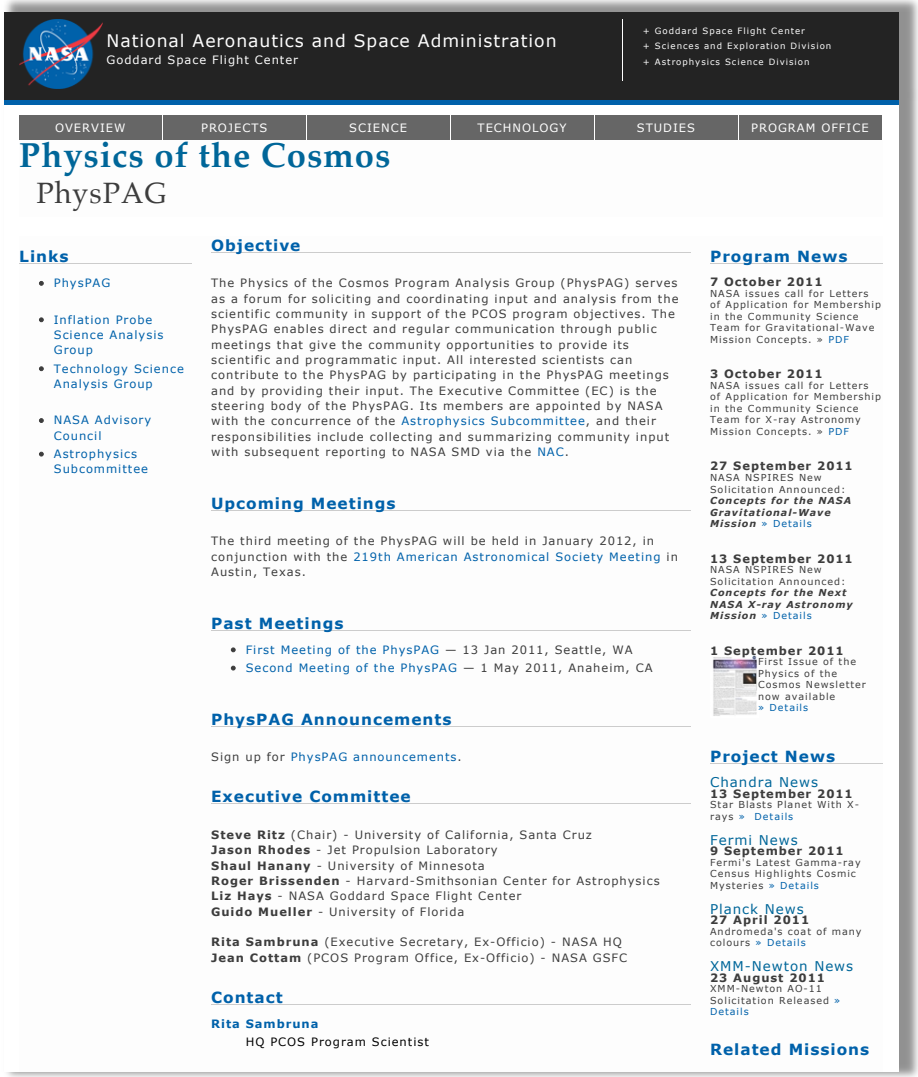
24 February 2012
NAC APS Report

Proposals shown in red

S. Ritz

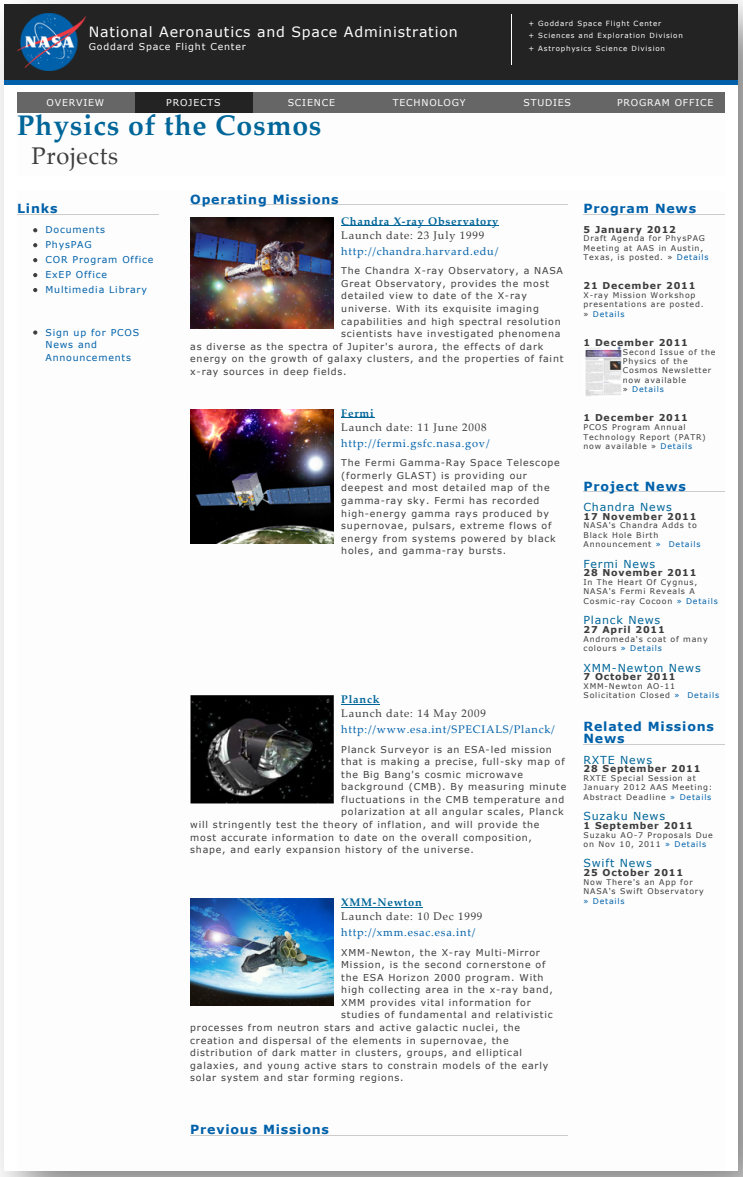
See
http://pcos.gsfc.nasa.gov/physpag.php

Includes email sign-up for news and announcements. Reports from previous meetings, links to APS reports, …



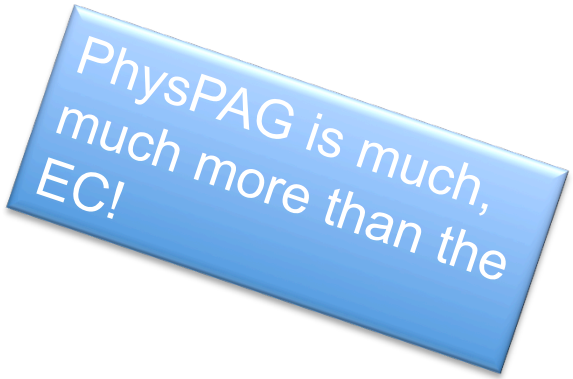
PCOS Science and Missions

- *Physics of the Cosmos spans the fields of high-energy astrophysics, cosmology, and fundamental physics, and includes a wide range of science goals. These include the following:*
  - ***Expand our knowledge of dark energy***
  - ***Precisely measure the cosmological parameters governing the evolution of the universe and test the inflation hypothesis of the Big Bang***
  - ***Test the validity of Einstein's General Theory of Relativity and investigate the nature of spacetime***
  - ***Understand the formation and growth of massive black holes and their role in the evolution of galaxies***
  - ***Study the origin and acceleration of cosmic rays***
  - ***Particle Signals of Dark Matter***



Executive Committee

- Jay Bookbinder (CfA) Nominee for NAC APS approval
- Shaul Hanany (Minnesota)
- Liz Hays (GSFC)
- Guido Mueller (UFL)
- Jason Rhodes (JPL)
- Steve Ritz (UCSC), chair



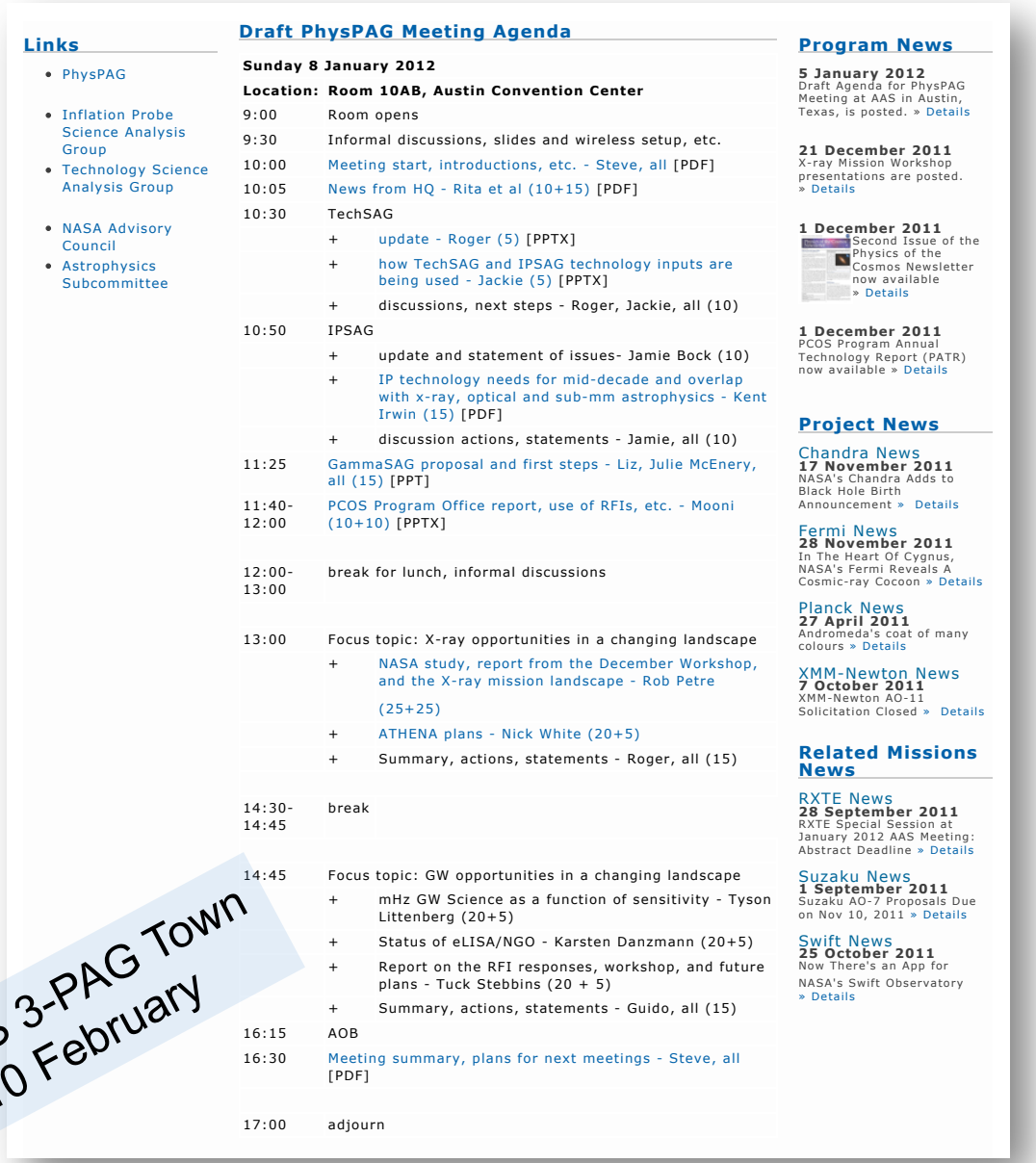
- MANY THANKS to Roger Brissenden for all his work on PhysPAG and the TechSAG!

- Also many thanks to Jean Cottam Allen, and welcome to Ann Hornschemeier Cardiff.

physpag-ec@bigbang.gsfc.nasa.gov

8 January AAS Meeting Agenda

- Reports from HQ and the PCOS Program Office
- SAG reports and discussions
- Two Community Special Focus Sessions:
  - X-ray Opportunities in a Changing Landscape
  - GW Opportunities in a Changing Landscape
- New PhysPAG work
  - Gamma-ray SAG
  - X-ray SAG
  - GW SAG
- Where/when should PhysPAG be meeting?
  - continue to expand community participation
  - PCOS is not “a community”
- What’s missing?



Links

- PhysPAG
- Inflation Probe Science Analysis Group
- Technology Science Analysis Group
- NASA Advisory Council
- Astrophysics Subcommittee

Draft PhysPAG Meeting Agenda

Sunday 8 January 2012

Location: Room 10AB, Austin Convention Center

9:00	Room opens
9:30	Informal discussions, slides and wireless setup, etc.
10:00	Meeting start, introductions, etc. - Steve, all [PDF]
10:05	News from HQ - Rita et al (10+15) [PDF]
10:30	TechSAG
	+ update - Roger (5) [PPTX]
	+ how TechSAG and IPSAG technology inputs are being used - Jackie (5) [PPTX]
	+ discussions, next steps - Roger, Jackie, all (10)
10:50	IPSAG
	+ update and statement of issues- Jamie Bock (10)
	+ IP technology needs for mid-decade and overlap with x-ray, optical and sub-mm astrophysics - Kent Irwin (15) [PDF]
	+ discussion actions, statements - Jamie, all (10)
11:25	GammaSAG proposal and first steps - Liz, Julie McEnery, all (15) [PPT]
11:40-12:00	PCOS Program Office report, use of RFIs, etc. - Mooni (10+10) [PPTX]
12:00-13:00	break for lunch, informal discussions
13:00	Focus topic: X-ray opportunities in a changing landscape
	+ NASA study, report from the December Workshop, and the X-ray mission landscape - Rob Petre (25+25)
	+ ATHENA plans - Nick White (20+5)
	+ Summary, actions, statements - Roger, all (15)
14:30-14:45	break
14:45	Focus topic: GW opportunities in a changing landscape
	+ mHz GW Science as a function of sensitivity - Tyson Littenberg (20+5)
	+ Status of eLISA/NGO - Karsten Danzmann (20+5)
	+ Report on the RFI responses, workshop, and future plans - Tuck Stebbins (20 + 5)
	+ Summary, actions, statements - Guido, all (15)
16:15	AOB
16:30	Meeting summary, plans for next meetings - Steve, all [PDF]
17:00	adjourn

Program News

5 January 2012
Draft Agenda for PhysPAG Meeting at AAS in Austin, Texas, is posted. » Details

21 December 2011
X-ray Mission Workshop presentations are posted. » Details

1 December 2011
Second Issue of the Physics of the Cosmos Newsletter now available » Details

1 December 2011
PCOS Program Annual Technology Report (PATR) now available » Details

Project News

Chandra News
17 November 2011
NASA's Chandra Adds to Black Hole Birth Announcement » Details

Fermi News
28 November 2011
In The Heart Of Cygnus, NASA's Fermi Reveals A Cosmic-ray Cocoon » Details

Planck News
27 April 2011
Andromeda's coat of many colours » Details

XMM-Newton News
7 October 2011
XMM-Newton AO-11 Solicitation Closed » Details

Related Missions News

RXTE News
28 September 2011
RXTE Special Session at January 2012 AAS Meeting: Abstract Deadline » Details

Suzaku News
1 September 2011
Suzaku AO-7 Proposals Due on Nov 10, 2011 » Details

Swift News
25 October 2011
Now There's an App for NASA's Swift Observatory » Details

Also held AAS 3-PAG Town Hall on 10 February

X-ray Study

X-ray Concepts Study

- **Objectives**
  - Determine the range of science objectives of IXO that can be achieved at a variety of lower cost points
  - Explore mission architectures and technical solutions that are fundamentally different from the heritage designs
  - Fully engage the community and ensure that all voices are heard, all perspectives considered
  - Create data for a report to the CAA that describes options for science return at multiple cost points for X-ray astronomy
- **Deliver final report to NASA HQ that:**
  - Describes and analyzes trade space of science return vs. mission cost
  - Summarizes the mission concepts developed during the study and how they relate to the trade space and other mission concepts that were not developed in a design lab
  - Summarizes the RFI responses and the workshop and describes how they were folded into the whole study

Talk by Rob Petre. Also talk on ATHENA by Nick White

Study Phases

- ✓ **Request for Information (RFI)**: solicit ideas for missions and enabling technology. **29 responses received.**
- ✓ **Community Science Team (CST)**: 10 members of the community selected by NASA HQ to serve as the study science team.
- ✓ **Workshop**: provide the community a forum to comment on concepts and technology and identify concepts for further study.
- ✓ **Notional Mission Selection**: Define up to three mission concepts at different cost points.
- **Design Labs**: Study team develops concepts through mission design lab runs. Focus is on identifying the technical and cost drivers of each concept.
- **Final Report:** Summarizes study activities and results for HQ and CAA. **Due to NASA HQ on June 7, 2012**

Town Hall Tuesday evening

Gravitational Wave Study

Goals of the Study

- Develop mission concepts that will accomplish some or all of the LISA science objectives at lower cost points.
- Explore alternative mission architectures and technical solutions (e.g., instrument concepts, enabling technologies).
- Assess the technical readiness and risk of the mission concepts, instruments and technologies.
- Report the options for science return at multiple cost points .

Talk by Tuck Stebbins. Also talks on eLISA/NGO by Karsten Danzmann, and GW science by Tyson Littenberg

RFI Responses

- 17 responses total
  - 12 for mission concepts
  - 3 for instrument concepts
  - 2 for technologies
- Four natural groups
  - Non-drag-free concepts (2)
  - Geocentric orbits (4)
  - LISA-like (5)
  - Other (2)

Summary

- Studying architecture choices and science and cost consequences to find lower alternate mission concepts.
- In the context of
  - The long history of LISA
  - The activities taking place today in Europe and the U.S., notably LISA Pathfinder
  - Decadals, NRC studies and reviews, past and future
  - The near term funding prospects
- The Core Team, Science task force, CST and Team-X are analyzing candidate mission concepts.
- Town Hall: Tuesday, 8 pm, Room 18A

Gravitational Wave Study

GW Science vs. mission requirements (Littenberg):

- Discussed the gain (or loss) of science with moderate mission changes
  - MBH parameter estimations are fairly robust
    - Both polarizations (3 arms) are critical for
      - sky localization
      - luminosity distance (growth history)
  - EMRIs have very little margin

GW mission study (Stebbins):

- Main goals:
  - Develop mission concepts
  - Explore alternative architectures

  to do some (all?) of the LISA science at lower cost points.
- RFI Responses:
  - 12 mission concepts, 3 instrument concepts, 2 new technologies
  - Now studied by Core Team, Science Task Force, CST, and Team X

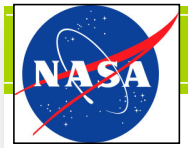
Situation in Europe (Danzmann):

- LISA Pathfinder progresses well
  - Launch 2014
- eLISA/SGO mission concept:
  - Reduced arm length (factor 5)
  - Only 2 arms
  - Different orbit & different launcher
  - Shorter minimum mission lifetime
  - Reduce cost by re-using LISA Pathfinder

Strongly emphasized the possibility for a future collaboration

LISA Pathfinder launch: 2014

Tuesday, January 10, 2012



The Inflation Probe Science Analysis Group

Technology Plan for the 2010-20 Decade

Jamie Bock (JPL/Caltech)
Kent Irwin (NIST)

With contributions from
Todd Gaier (JPL)
Shaul Hanany (U. Minnesota)
Adrian Lee (UC Berkeley)
Steve Meyer (U. Chicago)
Harvey Moseley (GSFC)

PhysPAG Meeting, AAS @ Austin, TX
8 January 2012

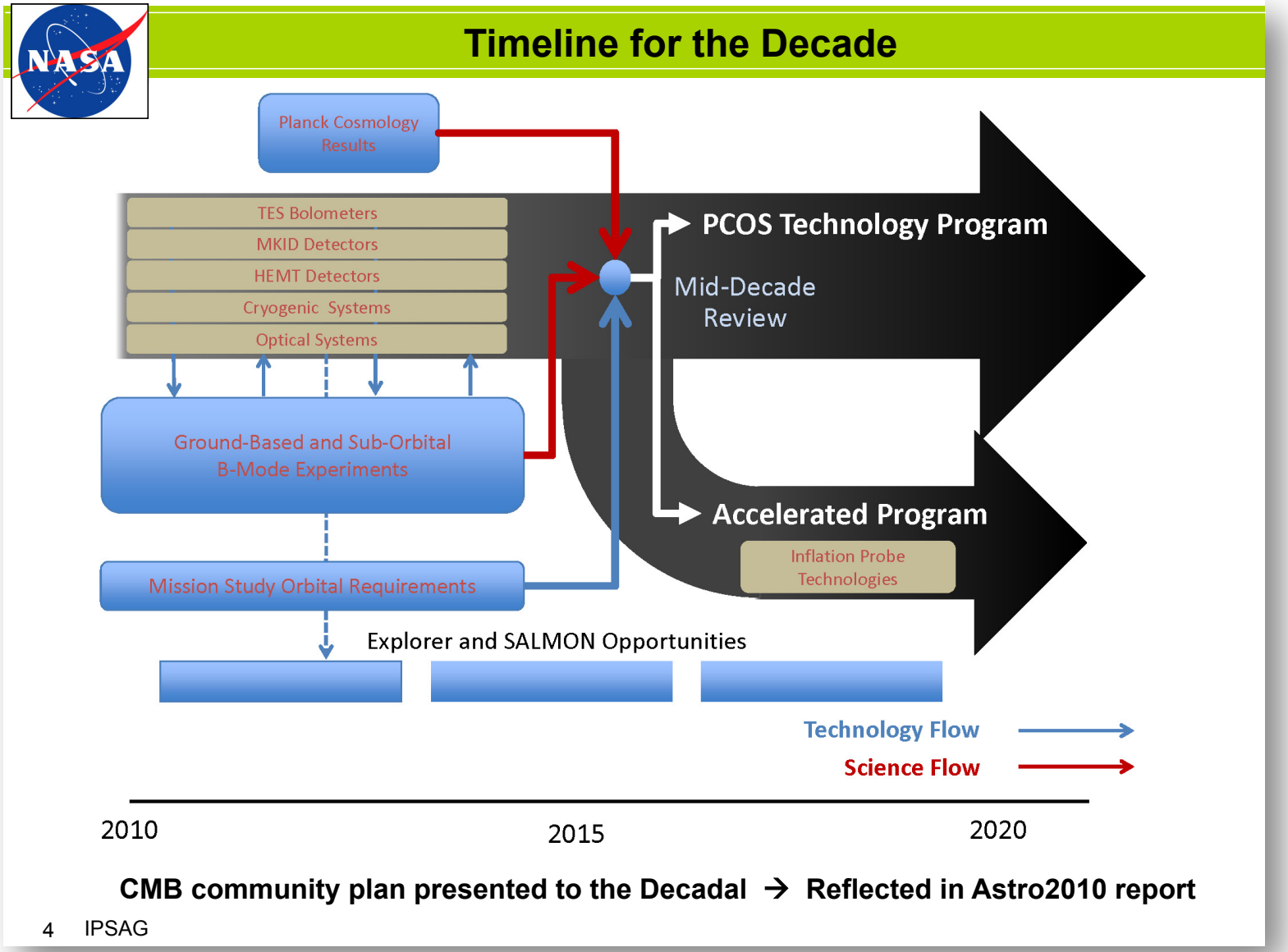
The Inflation Probe Science Analysis Group

Participation:
Open to all members of the astrophysics community
Currently 50 registered plus 10 unregistered participants
Includes Astro2010 Inflation Probe study team members
Reports to the PhysPAG via Shaul Hanany
Active participation from NASA's PCOS office

Role:
Open community input to Inflation Probe planning
- science goals following developments in the field
- mission planning for foreground removal, systematic errors
- technology development and prioritization

Communication:
Open invitation issued March 2011
Email list
Website: http://pcos.gsfc.nasa.gov/sags/ipsag.php
Telecons to date: April and November 2011

Planning Docs:
CMB Technology Roadmap for the NASA Inflation Probe, Sept. 2011


Timeline for the Decade
Planck Cosmology Results
TES Bolometers
MKID Detectors
HEMT Detectors
Cryogenic Systems
Optical Systems
PCOS Technology Program
Mid-Decade Review
Ground-Based and Sub-Orbital B-Mode Experiments
Accelerated Program
Inflation Probe Technologies
Mission Study Orbital Requirements
Explorer and SALMON Opportunities
Technology Flow
Science Flow
2010
2015
2020
CMB community plan presented to the Decadal → Reflected in Astro2010 report
4 IPSAG

The Inflation Probe Technology Roadmap

Technology	Priority	Timescale	Candidates	TRL
Detector Arrays	High	Current experiments	TES+SQUID+Antenna HEMT / MMIC	4-5
Optics	Medium	Current experiments	Polarization modulators AR coatings	2-5
Coolers	Low	Develop for space	Passive+mechanical+sub-K	3-9
Advanced Arrays		Develop for simplified space implementation. Connects to X-ray, far-IR and optical astronomy	MKID+RF resonator TES+RF resonator	3

- Time is short to the mid-decadal review, and significant work remains
- Ground-based and suborbital missions are critical to probe for an inflationary B-mode signal, and to mature technology options.
- However, significant advances specific to a satellite are needed: sensitivity, wavelength coverage, statistics and systematics, and cosmic-ray rejection.
- An additional concerted effort is required now to be prepared for the detection of hints of B-modes, and the likely high prioritization of a satellite that would follow.

8 January Meeting Results (1)

- IPSAG
  - *The PhysPAG very much appreciates the excellent work on the science and technology developments necessary for defining the Inflation Probe mission featured in the NWNH Decadal Survey. The NWNH report recommended a mid-decade review to evaluate the evolving scientific case and technology readiness of the Inflation Probe mission. The current budget situation endangers readiness for this review.*

8 January Meeting Results (2)

- Overall statement to NAC APS:
  - *Scientifically and technically, PCOS opportunities continue to be extremely exciting. In all areas of PCOS science discussed, the very limited and uncertain budget situation severely reduces the program developed in connection with the NWNH Decadal Survey. New focal points are needed for community organization, beyond the current studies.*
  - *Proposing new SAGs (see following slides)*

- TechSAG and Communication SAG work moves to new SAGs.
  - The EC will coordinate across groups as needed, including for the annual refresh of the tech plan and to help ensure completeness in areas not covered by the SAGs.

8 January Meeting Results (3)

- X-ray SAG Proposal
  - Role: Enable community discussion and input for future X-ray mission planning, with a focus on the capabilities to meet NWNH objectives. Ensure timely community-NASA communication.
  - Timing: operating on the timescale of the completion of the current study, to ensure a smooth transition, and as planning for the European-led ATHENA mission progresses.
  - Tasks:
    1. Track and analyze science goals and requirements in X-ray astrophysics in a rapidly evolving international scientific and programmatic landscape.
    2. Provide an active communication forum for X-ray astrophysics via regular telecons, a wiki/website, and (at least) annual town halls and workshops in well-attended venues.
    3. Foster mission concept studies and discussions, considering missions and capabilities at a variety of cost points.
    4. Analyze and prioritize X-ray astrophysics technology development. Post online for comment and provide to PCOS Program Office.

8 January Meeting Results (4)

- GW SAG Proposal
  - Role: Enable community discussion and input for future GW mission planning, with a focus on the capabilities to meet NWNH objectives. Ensure timely community-NASA communication.
  - Timing: operating on the timescale of the completion of the current study, to ensure a smooth transition, and as planning for the European-led eLISA/NGO mission progresses.
  - Tasks:
    1. Track and analyze science goals and requirements in GW astrophysics in a rapidly evolving international scientific and programmatic landscape.
    2. Provide an active communication forum for GW astrophysics via regular telecons, a wiki/website, and (at least) annual town halls and workshops in well-attended venues.
    3. Foster mission concept studies and discussions, considering missions and capabilities at a variety of cost points.
    4. Analyze and prioritize space-based GW astrophysics technology development. Post online for comment and provide to PCOS Program Office.

New Gamma SAG Proposal

- Provide an assessment to NASA HQ and the PCOS program office of the current status and the current and future needs of the gamma-ray astrophysics community.
- Act as a focal point and forum for the gamma-ray community.
- Deliverables
  - White paper briefly surveying current state-of-the-art capabilities, major open science questions, reasonable possibilities for leaps in capabilities over the next 10-15 years, and possible science return corresponding to those capabilities. The paper would separately cover the techniques used in each gamma-ray band and both balloon and satellite platforms. A summary of ground-based very-high energy instruments will be included to set context.
  - List of technology development needs based on the white paper discussions with possible timelines
  - Suggestions to help support the specific needs of this community: organizational, scientific, funding.

Next Meetings

- additional community outreach at relevant meetings
- informational presence at April APS this year only
- planning a three-day jamboree meeting in D.C. that includes reports from the X-ray and GW study teams, followed by face-to-face/startup meetings of the three new SAGs. Additional special focus sessions under discussion, including space-based Dark Energy studies. *Likely time is the week of 13 August.*
- Looking forward to 2013:
  - meet again at January AAS
  - American Physical Society Meeting and HEAD meeting: a full PhysPAG meeting at one and a more targeted town hall at the other, TBD.
  - SAG meetings and further community outreach
- Will also continue to help with PCOS outreach materials, including regular newsletter and flyers.

Thanks

- *Thanks to all SAG members for their hard work and the PCOS office for their support*
- *Thanks to all the speakers and organizers for the productive January meeting*

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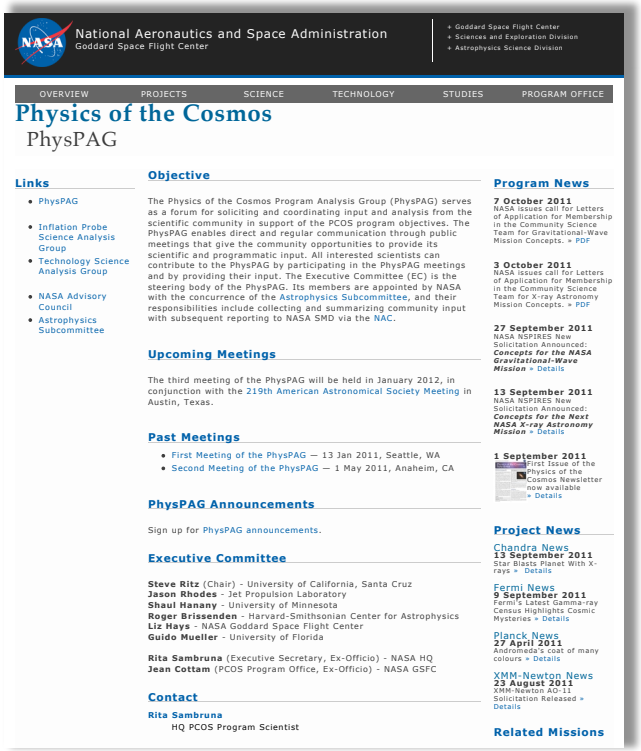

Discussion, Q&A

- Proposals:
  - New EC member
  - New X-ray, GW, and Gamma SAGs
  - TechSAG activities to move to new SAGs, with cross-group coordination for annual PCOS technology input coordinated by the EC
- Two statements to note (slides 12 and 13)