Physics of the Cosmos Program Analysis Group Activities

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Overview

- **What are we doing here?**
- **What has PhysPAG been doing?**
  - Technology needs assessment
  - High-impact research assessment
- **What's coming up?**

What are we doing here?

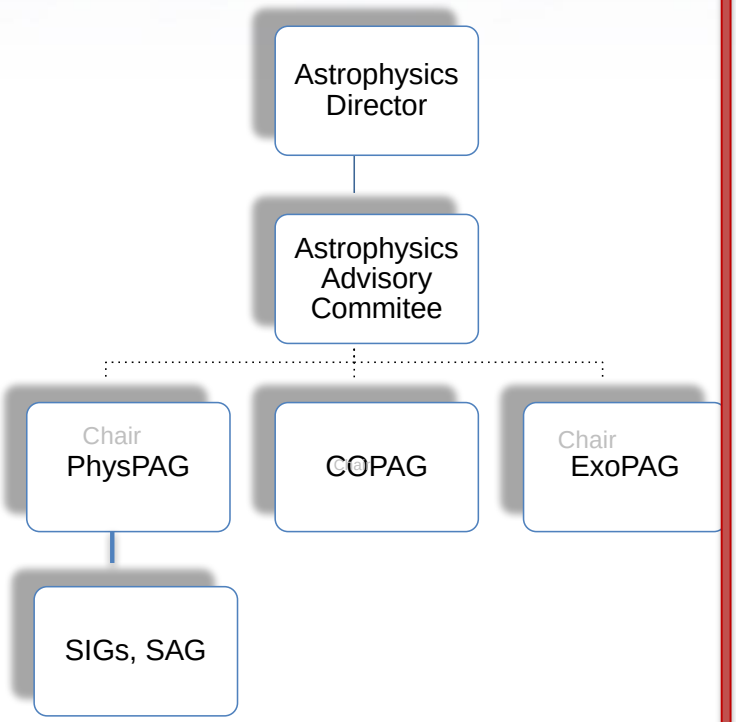
- **Who's in the the PhysPAG?**
  - Anyone interested in providing input to NASA relevant to its Physics of the Cosmos Program
- **What does the PhysPAG do?**
  - It provides input to NASA relevant to the Physics of the Cosmos Program (PCOS)
  - Helps NASA inform interested parties about PCOS doings
- **How does this work?**
  - Pretty well, actually
    - Direct, on-demand (!) communication with PCOS Program and Chief Scientists (Rita Sambruna and Terri Brandt)
    - Regular face-to-face meetings between PHYSPAG leadership and Astrophysics Division Director (via APAC)
- **In my experience, NASA listens to us!**

From Rita Sambruna's Presentation

Communicating with NASA Astrophysics via the Program Analysis Groups (PAGs)

- The Physics of the Cosmos Program Analysis Group (PhysPAG) coordinates input and analysis from the scientific community in support of the PCOS program objectives.
- Study Analysis Groups (SAGs) conduct specific analyses. PCOS is starting a SAG on Multi Messenger Astrophysics (see GWSIG meeting)
- Science Interest Groups (SIGs) are longer-standing discipline fora.
  - IPSIG
  - GWSIG (meeting today)
  - XRSIG (meeting today)
  - GammaSIG (meeting today)
  - CRSIG
  - CoSSIG

NB: This is communication network, not an org. chart!



Technology "Gaps" Assessment (1/3)

- **Physics of the Cosmos Program Office requests community input on technology development needs ('gaps') for strategic missions.**
- **Community and other inputs are prioritized annually by PCOS Technology Management Board**
  - Prioritization guides selection & funding of projects proposed in response to Strategic Astrophysics Technology (SAT) call
- **PhysPAG is asked for support in refining (not prioritizing) community input. Charge to PhysPAG:**
  - Consolidate community input
  - Refine/clarify descriptions
  - Add missing gaps
  - Identify gaps not relevant to Strategic Missions, viz., those prioritized by Decadal Survey and/or identified in Astrophysics Strategic Plan, viz.
    - **Athena, HabEx, Inflation Probe, LISA, LUVOIR, Lynx, OST**
    - **For 2017, these are the *only* PCOS strategic missions**

Technology "Gaps" Assessment (2/3)

- **PhysPAG EC recommendations to PCOS Program Office**

Relevant Mission	Total Reviewed	PhysPAG Recommendation
Inflation Probe	2	Forward all as is to TMB
LISA	7	Forward all as is to TMB
Lynx	9	4 Forward as is 2 Forward as edited 3 Consolidated
Multiple	3	2 Forward to TMB 1 consolidated
Not strategic	12	Do not forward to TMB
Total	**33**	

- **Note: 6 of the technology needs in the 'non-strategic' category are relevant to Astrophysics Probe mission concepts now under study**

Technology "Gaps" Assessment (3/3)

- **PhysPAG EC was concerned that more than 1/3 of the technology gap submissions had to be deemed 'non-strategic'**

- **The issue was raised by the EC at multiple levels with NASA**
  - with Astrophysics Division leadership at APAC
  - With PCOS technologist via PCOS program & chief scientists

- **Result: See Terri's talk: We believe the community will be much better informed in future about PCOS strategic technology processes and funding**

High-impact research: PhysPAG EC Discussion

In July, 2017, APAC received charge to

'Review NASA SMD R&A Methods to Foster High-Impact Research'

- **PhysPAG EC convened in September to discuss this charge**
- **Discussion featured participation by**
  - Dan Evans, Lead for Astrophysics Research, NASA HQ
  - Rita Sambruna & Thomas Hams, PCOS Program Scientists, NASA HQ
  - Ann Hornschemeier & Terri Brandt, PCOS Chief Scientists, GSFC

High-impact research charge

From Dan Evans Briefing, adapted from Michael New's briefing to SMD Advisory Committees :

Two questions to be asked of the ACs

Does the SMD R&A program have effective processes in place to solicit, review and select high-impact/high-risk projects?

PhysPAG EC Discussion

Does the SMD R&A program have effective processes in place to solicit, review and select focused, interdisciplinary, and interdivisional projects?

High-impact research charge

From Dan Evans Briefing, adapted from Michael New's briefing to SMD Advisory Committees :

Naturally, there are sub-questions

For high-impact/high-risk research:

a) What is your committee's working definition of a high-impact project? A high-risk project?

b) Are there aspects of the solicitation, review and selection process that could be added, removed or modified that would allow SMD to more effectively elicit and support high-risk/high-impact projects or, is the current practice of soliciting by topic and evaluation for merit followed by flagging high-impact/high-risk projects for the selection official adequate?

c) If it were to be recommended that solicitations or evaluation methods be modified for high-impact/high-risk projects, how should these be designed?

d) Acknowledging the value of incremental progress on achieving strategic objectives, and thus recognizing that much of the research that SMD supports will be of moderate impact, how should SMD determine the correct balance between moderate impact research and high-impact/high-risk research?

PhysPAG EC Discussion

High-impact research (HIR) discussion 1/2

PhysPAG EC Consensus, as conveyed to APAC Astrophysics Division Leadership:

- **Effective solicitation of HIR would require dedicated solicitations**
  - HIR proposals must be evaluated separately from those for 'moderate impact' (more conventional) research
- **Given fixed R&A budgets, allocation of a fixed fraction (e.g.~10%) or fixed $ total of R&A resources to HIR would be appropriate**
- **STMD's NASA Innovative Advanced Concepts (NIAC) program is a model that should be evaluated for relevance to Astrophysics HIR solicitation**

High-impact research discussion 2/2

Other results from PhysPAG EC discussion:

- **Very few PhysPAG EC members admitted to having submitted 'high-risk/high-impact' proposals**
- **It was suggested that broader community input could readily be obtained via web survey. Example questions (after T.J. Brandt):**
  - Have you considered proposing a high-impact/high-risk project to NASA?
  - Does NASA provide you sufficient opportunities to propose high-impact / high-risk research?
  - Would you like to see more funding opportunities for high-impact/ high-risk given a fixed total budget?
- **LIGO was noted as an example of high-risk/high-impact research**
  - Fraction of NSF PHYS resources devoted to LIGO may, alas, be unknowable
- **Concern was expressed by some that NASA's risk aversion may have had large and unrecognized opportunity costs.**
  - Possible example: LISA
- **For discussion today:**
  - Should NASA Astrophysics support more high-impact research?
  - Should PhysPAG get broader community input on this issue ?

Coming soon

- **ISS-Cream launched August 14!**
- **LISA Study Team has been appointed, began work in November**
- **Selection of XARM Participating Scientists in process, to be announced shortly**
- **Exciting new Science Analysis Group (John Conklin talk)!**
- **PhysPAG meetings under consideration:**
  - Special HEAD Meeting (March 18-20, Chicago)
  - APS Meeting (April 14-17, Columbus)
- **2020 Decadal Survey (before you know it!)**

Hail and Farewell

We welcome five new PhysPAG EC volunteer appointees…

- Kevin Huffenberger
- James Rhoads
- Graça Rocha (new vice chair)
- Abigail Vieregg
- Nicholas Yunes

And thank four departing veterans:

- Rachel Bean
- Olivier Doré
- Amber Miller
- Ed Wollack

Backup

High-impact research discussion: NIAC model

From NASA STMD web page:

"NIAC Phase I studies are focused on early studies of visionary concepts. Proposals must be:

- Aerospace architecture, mission, or system concepts
- Revolutionary, yet technically substantiated
- Very early development (TRL 1-2 or early 3; aiming 10+ years out)
- To be analyzed in a mission context"

NIAC Phase I solicitations are a two-step process

- Step A: 3-page white paper plus summary chart.
- Step B: Full proposal only if invited after Step A review