White paper on the value of Participating Scientist programs to NASA

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Background

- OPAG instigated a white paper about the value of Participating Scientist programs to NASA and to the Planetary Science community
- The effort subsequently included the other Analysis Groups and CAPTEM; authorship includes several AG Chairs and Steering Committee members
- The white paper team produced a survey in two parts:
  - Phase 1 contained questions for existing/past Participating Scientists and/or anyone in the planetary community who has an interest in, or opinion about, these programs
  - Phase 2 contained questions for PIs or Project Scientists regarding their experiences of including Participating Scientists on their missions

Background

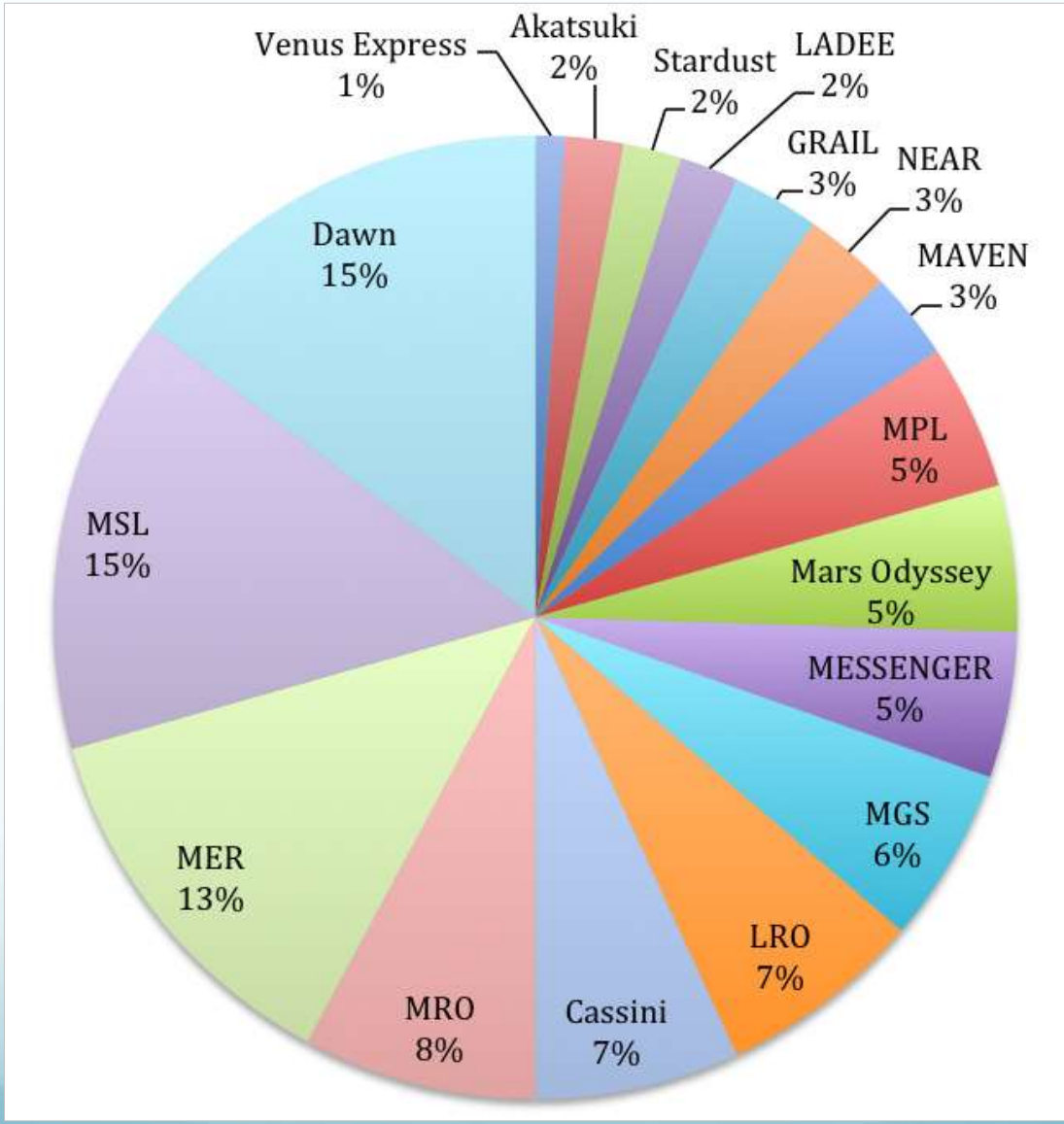
- We received 211 responses to the community survey, of which 102 were from current or former Participating Scientists or Guest Investigators
- We received inputs from the leadership of 12 flight missions, six of which were competed
  - Two of these did not have a PS call; several had more than one PS call
- Our results were analyzed by social scientist Janet Vertesi's group at Princeton; they have experience in analyzing qualitative interview data
  - A number of major themes were identified throughout the responses
  - Comparisons were made between themes identified by the community and by mission leadership

Results

- Based on the results of the study, we wrote a white paper containing eight recommendations:
  - Five of these are general or “best practice” recommendations, based on the perceived overall value of PS programs to the community and to the mission leaders who responded to our survey
  - Three are specific recommendations for implementing parts of PS programs
- The white paper was sent to the AGs and Jim Green, and was made available in April via planetary community mailing lists

Respondents by mission

(Current or former Participating Scientists)



About 110 responses were included in Part 1 of the study

What is the value of PS programs?
Community responses

Benefits to NASA included:

- Intellectual diversity
- Expertise throughout the mission timeline
- Increased science return
- Workforce development

"An indispensible training ground for future team leaders and members"

"I am currently the PI of a competed mission, and I credit my PS positions with providing much of the experience which made that possible."

"It broadens the science base for the missions by having a specific mechanism to bring in new people"

"It can be used to add missing expertise to a mission science team."

"Lots more bang-for-the-NASA-buck…involving relevant specialists that were not part of the original science team. These days, the selected teams for flight are very sparse, focused on those who are most relevant for the development/building/testing of instruments….who knew before arriving at the target that we needed oceanographers for Cassini at Titan? Or plume specialists at Enceladus?"

What is the value of PS programs?
Community responses

Personal value to respondents included:

- Collaboration
- Data access
- Unique experience of mission team involvement
- Personal career development
- Development of skills for future mission leadership

"Becoming involved in a mission, opportunity to work with exciting new data, opportunity to get to know both famous established researchers and younger scientists (grad students, post-docs)."

"I was a fully integrated [mission instrument] science team member, with data access and the chance to collaborate with colleagues from around the country. It has shaped my research career."

"PS programs are a way to provide early career scientists with an avenue for entry into active NASA missions. This provides critical experience that is, for all practical purposes, required for someone to be invited to join or lead a proposal effort for future mission opportunities."

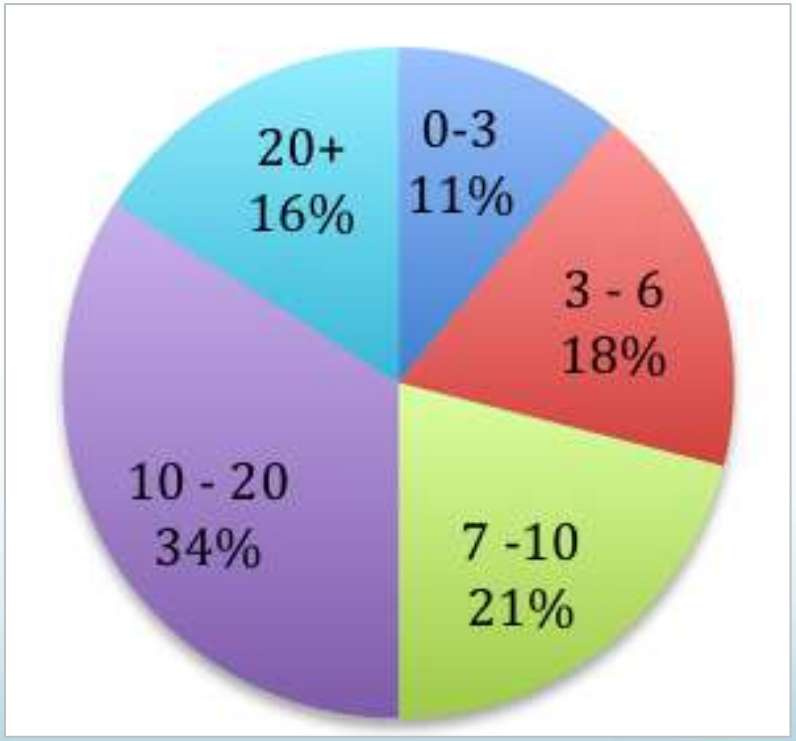
PS programs and diversity

- There is a widely shared perception among respondents that mission leadership can be an “old-boys’ club”
  - Perceived inability for younger scientists and scientists from underrepresented groups to break into missions and leadership positions
- Many participants emphasize the value to science that pulling in a diverse cross-section of the community provides
  - Intellectual and demographic diversity were noted as a way to foster innovative ideas and push the boundaries of research
  - PS programs widely perceived as a pathway of entry into a scientific research environment for outside or younger scientists, underrepresented groups, and the international planetary community

Participating Scientists by seniority

PS programs draw from all career levels:

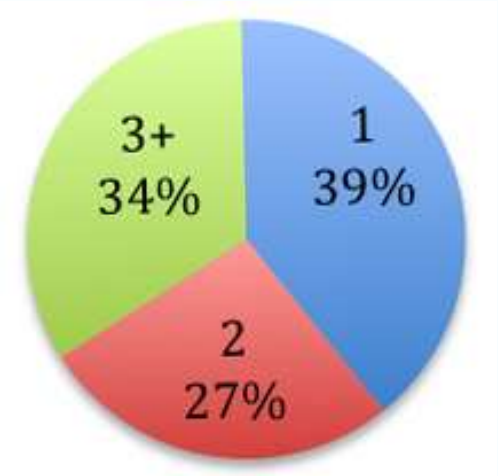
Over half of the respondents were early-career researchers when selected, i.e., within 10 years of their Ph.D.



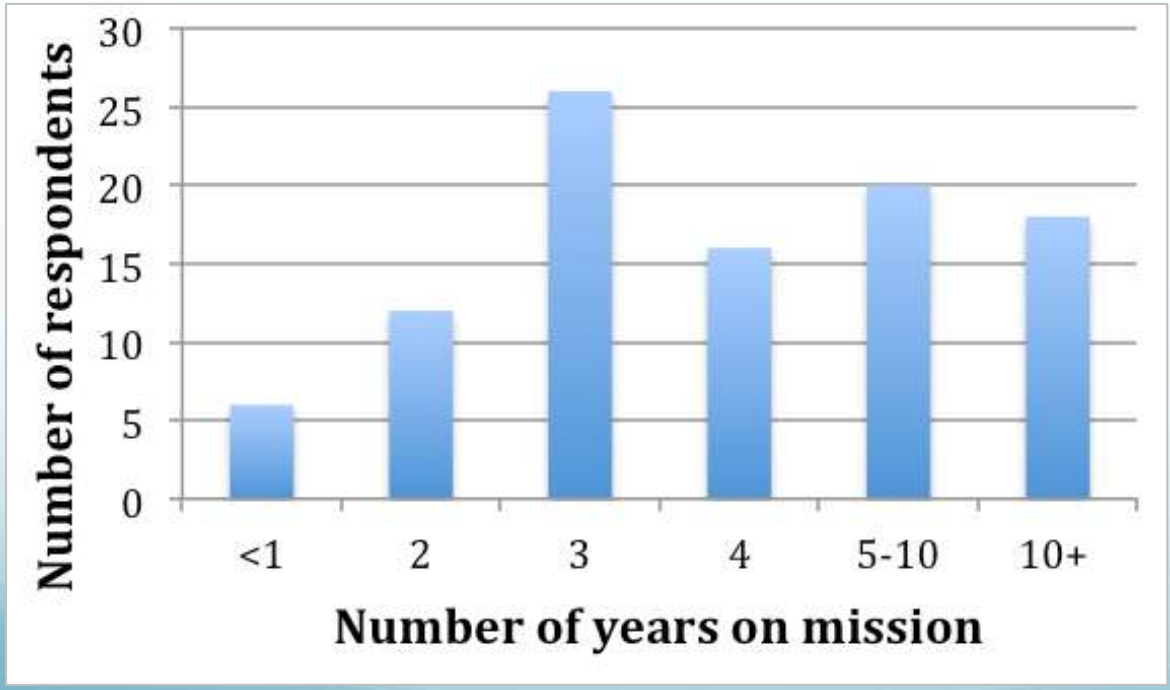
Number of years since Ph.D.

PS mission service

Over half of the respondents have been selected as PSs more than once, bringing increased experience (and therefore additional value) to the mission team



Number of times selected as a Participating Scientist



Length of time PSs served on a specific mission

What is the value of PS programs? **Mission Leadership responses**

- **Increased science return**
- **Intellectual diversity**
- **Expertise throughout the mission timeline**

"After the various instrument teams were integrated and the mission matured during development, it became clear where the gaps in expertise and experience were. These were filled by PS as much as possible."

"The [mission] PSs made important contributions; the team couldn't have done the work without them. They definitely increased the science return from the mission."

"The added experts brought fresh perspectives to the [small bodies] mission from the Mars and icy satellite community, which was stimulating for the rest of the mission team."

"The …mission made great use of PSs during the many extended mission phases we've had over a decade. So much was discovered…it was truly a godsend that we had the ability to bring in new energetic blood of unheard-of [at the time the mission was selected] specialists to figure it all out."

"[PS's] fundamentally enabled the mission."

What is the value of PS programs? **Mission Leadership concerns**

- Mission leaders (including instrument PI's) may be protective of their teams, and may find addition of PS's disruptive
  - On long missions it may be challenging to integrate new scientists into a team that has been together for many years
- Mission leaders prefer to have input into the selection of PS's
  - Some noted that PS's were selected in some areas where they already had ample coverage, while other areas were still lacking

General recommendations (1/3)

PS programs should be included on every planetary mission, whether competed or directed.

Expectations for the timing, duration, and scope of a Participating Scientist program should be agreed between NASA HQ and mission leadership as early as possible within the mission timeline, ideally during Phase A.

- The results of these discussions should be publicized to the planetary community through, e.g., NSPIRES, the Planetary Science Advisory Committee, relevant assessment and analysis groups, and community newsletters.

General recommendations (2/3)

Sources of funding for Participating Scientist programs should be identified early, and ideally included in the release of a competitive mission AO or in the announcement of a directed mission.

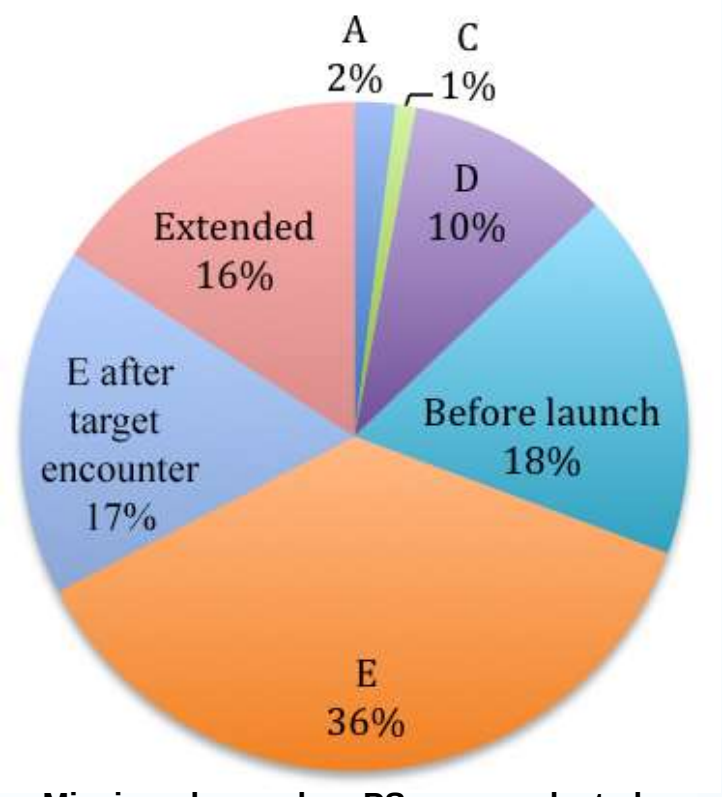
The planetary community should be given as much time as possible to prepare for a Participating Scientist call and sufficient information regarding mission payload and operations activities (e.g., through a Proposal Information Package), and existing team scientific capabilities and goals.

General recommendations (3/3)

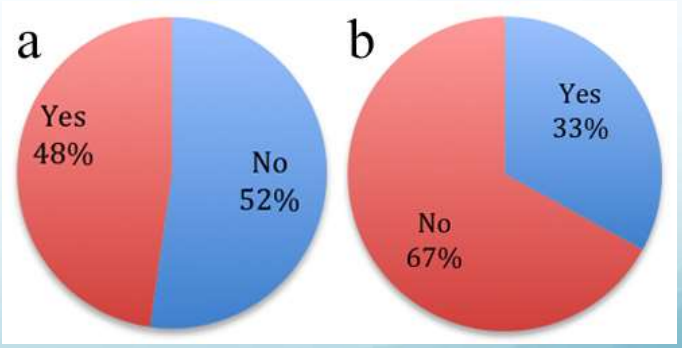
Once allocated, Participating Scientist funds should be held as inviolable, unless significant changes occur to the mission that would warrant a reduction in the program (e.g., failure of a portion of the mission or instrument), or an increase (e.g., groundbreaking findings that may require additional members with specific expertise). Participating Scientist programs should be included in extended mission phases.

Timing of PS additions

- PS's may be joining instrument teams and/or a larger science team that has already been together for many years – this may preclude their involvement in decisions, learning, and team building
- In many cases, participants noted that earlier involvement in the mission timeline would have been beneficial, enabling training and greater involvement in mission operations and planning
- However, longer missions may also benefit from PS additions during Phase E



Mission phase when PSs were selected



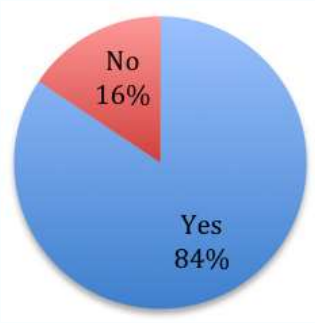
(a) Number of respondents who participated in mission operations. (b) Respondents who were invited to request or plan specific observations.

Timing recommendation

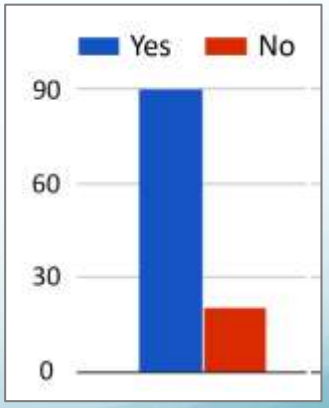
Participating Scientists should be brought onto a mission as early as feasible, bearing in mind the trade between cost and integration issues. For most missions, the Participating Scientists should be brought onto a project at least one year before operations at the relevant major target. If possible (and appropriate), Participating Scientists should be given the opportunity to participate in mission operations.

Participating Scientist funding

- Respondents acknowledged the realities of limited funding allotted for their positions
  - 90% responded having adequate funding over a wide range of funding timescales (<1 yr to 10+ yrs); 3 yrs average
- However, they also noted a lack of transparency and communication into the timing surrounding funding, including uncertainty as to how long a PS position would continue
- PSs sometimes had to scale back or abandon parts of their science plans
- Reproposing made some PSs feel like “temporary” team members and, as such, less integrated into the team



Number of respondents who felt that their PS funding was adequate



Did you have to re-propose for funding after the original performance period ended?

Funding recommendation

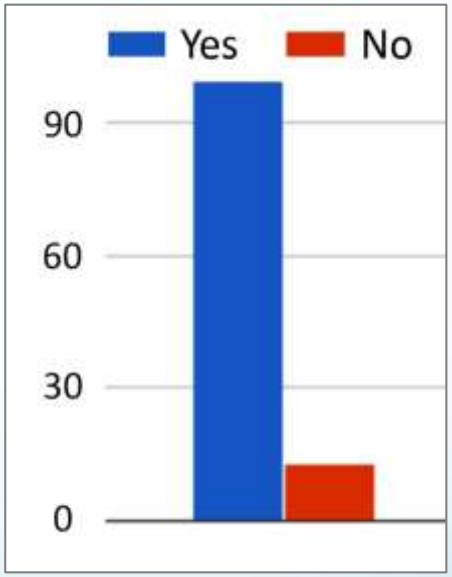
The amount of funding for a Participating Scientist program and expectations for its duration should be clearly communicated to Participating Scientists when they are selected.

Integration into teams

While most respondents did eventually feel integrated into the team, several noted that this is an area that could be improved. Issues noted include:

- PI leadership
- Onboarding issues
- The re-proposal process
- Involvement in planning processes
- Assigned tasks that were not part of their original proposal
- Lack of buy-in from Project for PS science

Some PS's were eventually promoted to the team as Co-Is



After an initial time period, did you feel integrated into the team?

Integration recommendation

Full integration of Participating Scientists onto a project should be given high emphasis by mission leadership and the mission team. Expectations for the Participating Scientists' scope of work should be made clear when they join the team (e.g., operations, data analysis only, etc.) and they should be treated as equivalent to any other Co-Investigator on the team. This is especially important for Participating Scientists who are selected later in a mission (e.g., missions with a long cruise phase).

Summary

- The overwhelming message from the survey respondents, both the science community and mission leadership, is that **Participating Scientist programs provide significant value for NASA**:
  - They greatly increase a mission's science return
  - They provide valuable training opportunities
  - They increase intellectual and demographic diversity among teams
- More consistency in timing and approach could make these programs even more effective and useful to NASA

http://www.lpi.usra.edu/analysis/

Backup

Phase 1 questions
(Past/present PSs and community)

1. A) On which mission were you a Participating Scientist? (And don't forget to include your identifier – see above, if you are submitting data on more than one PS experience.)

Your answer

1. B) How many years past PhD were you when selected as PS?

- ○ 0-3yrs
- ○ 3-6yrs
- ○ 7-10yrs
- ○ 10-20yrs
- ○ 20+yrs

1. C) At which point in the mission were you appointed as a Participating Scientist?

- ○ before launch (if you know the mission phase, please select it below)
- ○ Phase A
- ○ Phase B
- ○ Phase C
- ○ Phase D
- ○ during cruise (within Phase E)
- ○ during the primary mission but after arrival at the primary target (also within Phase E)
- ○ during the extended mission (also within Phase E)

1. D) How long did you remain on the project as a PS? Please describe how long your funding/PS position lasted, also whether you were kept on the team as an unfunded PS after this time period, or whether you were made a funded Co-I.

Your answer

1. E) Activities as PS:

If you have comments about any of these yes/no answers, please put them into the following comment box (1.F).

	Yes	No
Did you have an opportunity to participate in mission operations?	○	○
Were you invited to request/plan specific observations?	○	○
Or, did you have to pull your science from observations that the core team planned without PS interaction?		
After an initial time period, did you feel integrated into the science team? For example, did you actively participate in science telecons and team meetings?		
Were you required to re-propose to stay on the team as a PS after the original performance period ended?		
Was the funding support you received as a PS adequate?		

1. F) comments about items in (1.E)

Your answer

1. G) What was most valuable to you about your PS experience?

Your answer

1. H) What do you think could have improved your PS experience?

Your answer

1. I) How many times have you been selected for a PS position?

- ○ 1
- ○ 2
- ○ 3+

Part 2: PERCEPTIONS ABOUT PS PROGRAMS

(If you are sharing about more than one PS experience and have already filled the full survey out once, be sure you included your identifier at the end of question 1.A and then skip Parts 2 and 3 on your second/etc. submission.)

2. A) Is it likely you would apply to be a PS on future mission projects? (Please answer regardless of whether you have been a PS already.)

- ○ Yes
- ○ No

2. B) What do you think is the value of a PS program for NASA?

Your answer

2. C) Do you think that a PS program should be included in all directed SMD missions (that is, non-competed; directed to a NASA center), or should this be decided on a case-by-case basis? Please give a reason for your answer.

Your answer

2. D) Do you think that a PS program should be part of competed, PI-led missions such as Discovery and New Frontiers? Please give a reason for your answer.

Your answer

Part 3: OTHER INFORMATION

3. A) How many years past PhD are you now? (If "other", please specify: e.g., no PhD but active in the planetary field)

- ○ Pre-PhD
- ○ 0-3yrs
- ○ 3-6yrs
- ○ 7-10yrs
- ○ 10-20yrs
- ○ 20+yrs
- ○ Other : _____

3. B) Please tell us about your current professional role. Do you consider yourself to be primarily:

- ○ A faculty professor at a University or college
- ○ A soft-money researcher at a University or college
- ○ A researcher working at an institution that is primarily a mission or instrument provider, (e.g., JPL, GSFC, APL, etc.)
- ○ A researcher working elsewhere – non-profit (e.g., PSI, SETI, etc.)
- ○ A researcher working elsewhere – for-profit company
- ○ A postdoc
- ○ A graduate student
- ○ Other : _____

3. C) Any other comments, relevant to this study?

Your answer

Phase 2 questions (mission leadership)

Did you have Participating Scientists on your mission(s)?

If yes:

- At what stage in the mission was it decided that there would be a PS program (e.g., at the proposal stage, after selection, etc.)? How much input did you have into this decision?
- When were the PS's brought on board?
- With hindsight, do you feel that was the right time? ? If not, when would have been a better time?
- Do you feel it was challenging to incorporate the Participating Scientists into your mission team? If so, why? (And if, with hindsight, you have any suggestions on what could have been done better – by you, by the mission team, by NASA HQ, etc. – please share.)
- Do you feel the Participating Scientists brought additional value to your mission? Please give some examples to support your answer.
- If you were PI of a new mission now, what might you do differently with respect to a Participating Scientist program?

If no:

- What was the main reason for this (e.g., lack of appropriate finances, mission was too short to warrant them, just didn't see the need)?
- With hindsight, do you wish you had included Participating Scientists onto your mission?

Is there anything else you would like to tell us?