

Proposal for Survey of Planetary Science Workforce

NASA spends \$1.45B in the Planetary Science Division, mostly on missions that explore the solar system. If we make a rough approximation that ~10% of mission costs go to science, then ~\$145M is spent on mission science. Furthermore over \$200M is allocated to Research and Analysis programs in planetary science. At the same time, we know very little about the planetary science workforce.

Planetary science is a highly interdisciplinary field. Planetary scientists are trained in a broad area of science (from math to physics to geology to atmospheric science to chemistry), work in a variety of types of institutions (government labs, non-profit labs, industries, universities), and belong to different organizations: the Division of Planetary Science (DPS) of the American Astronomical Society, the American Geophysical Union (AGU), The Meteoritical Society. As a community we have little information about the profession. Put 3 planetary scientists in a room and we can list a dozen or two of universities producing PhDs in planetary science – but soon we run out of names. How many people get PhDs in planetary science each year? What fractions of these PhDs take which career path thereafter? While astronomers talk about over-production of PhDs, anecdotal evidence suggests that post-doctoral and even faculty positions are sometimes hard to fill. But we do not know concrete numbers. There have been demographic studies of astronomers, physicists and geologists. DPS has taken surveys of its membership every 5 years for decades. But we do not know the demographics of planetary scientists who are not members of DPS. Studies of the academic pipeline in physics, astronomy and other STEM fields show that women do not apply for faculty positions in proportion to the fraction of PhDs awarded to women (e.g. NRC's *Gender Differences at Critical Transitions in the Careers of Science, Engineering and Mathematics Faculty* (2009), Co-Chairs Professors Claude Canizares and Sally Shaywitz). While DPS meetings seem to have a healthy proportion of women and young scientists, a mental tally of women faculty in planetary science seems short. But there are no proper statistics.

The objective of this proposal is to gather statistics on professional planetary science (estimated to be about 2000 people) and to provide the analysis of these data to NASA's Planetary Science Division, the DPS, AGU and the Meteoritical Society. We propose to contract the Statistical Division of the AIP to work with the committee to craft appropriate questions (below are draft ideas), deliver two questionnaires and analyze the data.

Goals of Survey of Memberships (electronic only):

1 – Establish the basic facts on the pipeline in planetary science:

- what undergraduate degrees do planetary scientists have, from where and in what field?
- what PhD degrees do planetary scientists have, from where and in what field?
- where are current memberships employed?

2 – Career issues

- what peaked your interest in planetary science?
- What is your current job title?
- what do you greatly value as experience in your career?
- what would you do differently if you were to start again today?
- are there topics that you feel you should have studied more in grad school?
- what factors influenced your decision on where to work?
- did family issues affect your career decisions?
- do you feel you have had enough experience in hardware? would you like more experience with hardware?
- since PhD, have you had time when you worked part time? How long? Reason?
- since PhD, have you had time when you were unemployed? How long? Reason?
- how many years did you spend as a years post-doc?
- are you married to another scientist?

3 – Relationship to NASA, NSF or other funding agencies

- when did you write your first proposal?
- When did you write your first successful proposal?
- have you served on a review panel?
- What percentage of your funding comes from NASA?

(drop down options: Yes, I'm 100% funded by NASA. Yes, I'm a PI. Yes, I'm a Co-I. I'm a funded postdoc or associate but not named on the grant. No, I receive no NASA funding.)

- What percentage of your funding comes from NSF?

(drop down options: Yes, I'm 100% funded by NSF. Yes, I'm a PI. Yes, I'm a Co-I. I'm a funded postdoc or associate but not named on the grant. No, I receive no NSF funding.)

- Have you worked on a NASA flight mission?

(drop down options: Yes, I've been a PI. Yes, I've been a Co-I. Yes, I've been a funded postdoc, engineer, scientist, or associate but not named on the proposal. No, I've never worked on a NASA flight mission.)

- Have you ever proposed a new NASA flight mission?

(drop down options: Yes, I've proposed as PI. Yes, I've proposed as Co-I. Yes, I've worked on a proposal on which I've not been named. No, I've never proposed a NASA flight mission.)

- Have you ever served on an official NASA working group or subcommittee?

(drop down options: Yes, I've served on the SMD-wide advisory group (previously called the SSAC). Yes, I've served on the Planetary Science Subcommittee (or its predecessors). Yes, I've served on a working group. Yes, I've served on an SDT. No, but I've participated in open meetings of assessment groups for my discipline (OPAG, SBAG, etc)

The AIP will consult on constructing appropriate and effective questionnaires, sorting the membership lists (removing duplication, estimated to be large), delivering electronic questionnaire, converting, and analyzing the results.

Goals of Survey of Academic Departments (probably paper/email):

1 – Establish the basic facts on the pipeline in planetary science:

- how many BS students graduate per year from your department and go into careers in planetary science?
- how many MS/PhDs are produced per year in planetary science?
- how many researchers/faculty in planetary science are there in your dept?
- for all of the above track gender & ethnicity

2 – Establish how supply relates to demand

- how many more/less planetary MS/PhD students would your department like to have?
- where do your graduate students come from?
- how many postdocs have been hired in the last five years?
- how do you rate the supply of PhDs for open post-doc positions?
- how many openings for planetary science faculty has your department advertised in the last five years?
- how do you rate the supply of applicants for open faculty positions?

The AIP will consult on constructing appropriate and effective questionnaires. The committee will compile departments that include at least one planetary scientist on the faculty and graduate planetary scientists.

Potential Extension of Survey to Other Employers

One expected finding of the above demographic survey is that many planetary scientists are employed outside universities – e.g. JPL, LPI, NASA Centers, PSI, SWRI, etc. It would be very useful to follow up with a third survey to such employers to evaluate the state of the planetary workforce within the industrial/FFRDC/government lab environment. Such an extension of the project to a third survey would best be guided by outcomes of the first two surveys. But we hope to keep such an extension in mind as we proceed.

Outcome

We will compile a report on the basic statistics and their analysis which will be made publicly available within one year. The report will be presented at society “NASA Nights”, PSS meetings, and other events as requested.

Submitted by an intersociety committee on the planetary science workforce:

Fran Bagenal, Chair, University of Colorado (Professor and Associate Chair of the Department of Astrophysical & Planetary Sciences, Laboratory for Atmospheric & Space Physics, member of AGU & DPS, Interim Chair of the Planetary Science Subcommittee of the NASA Advisory Council)

Melissa McGrath, Chief Scientist, Marshall Space Flight Center (council member AAS DPS)

Susan Niebur, Niebur Consulting (founder of Women In Planetary Science, member of DPS, representative of the Lunar & Planetary Science Conference)

Bonnie Buratti, JPL (former secretary of the planetary science section of the AGU)

Rachel Ivie, Statistics Division of the American Institute of Physics