

Survey of Planetary Science Workforce

Abstract: Planetary science is a highly interdisciplinary field. Planetary scientists are trained in many areas 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, including the Division of Planetary Science (DPS) of the American Astronomical Society, the American Geophysical Union (AGU), and the Meteoritical Society. As a community, we have little information about the profession. There may be ten to twenty universities producing PhDs in planetary science – but we have no fundamental data such as the number PhDs in planetary science produced each year and the types of career paths the PhDs typically take. While astronomers talk about over-production of PhDs, anecdotal evidence suggests that post-doctoral and even faculty positions are sometimes hard to fill. But there are no 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. The objective of this proposal is to fill the data void by gathering statistics on professional planetary science (estimated to be about 2000 people) and providing the analysis of these data to NASA's Planetary Science Division, the DPS, AGU and the Meteoritical Society. We will contact individual planetary scientists to examine career paths, and we will ask departments and programs that award degrees in planetary science to establish basic facts on the pipeline in planetary science. As a result, we may be able to draw conclusions on the relationship between supply and demand.

Project Description

NASA spends \$1.45B in the Planetary Science Division, mostly on missions that explore the solar system. If we assume 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. Thus, total expenditures are about \$350M. Yet, we know very little about the planetary science workforce, the stewards of those funds.

This lack of knowledge about the planetary workforce stems, in part, from the fact that planetary science is a highly interdisciplinary field. Planetary scientists are trained in many areas 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 a variety of different organizations, including the Division of Planetary Science (DPS) of the American Astronomical Society, the American Geophysical Union (AGU), and the Meteoritical Society. As a community we have little information about the profession. A group of three planetary scientists could likely list ten to twenty universities producing PhDs in planetary science, but this group would be hard pressed to answer fundamental questions such as the number of PhDs in planetary science produced each year and typical career paths for planetary scientists.

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. Rachel Ivie, Assistant Director of the Statistical Research Center at the American Institute of Physics, and other AIP staff will work with the advisory committee listed below to craft appropriate questions, deliver a questionnaire to planetary scientists who are members of the DPS, AGU, and the Meteoritical Society, and, analyze the data. AIP will also develop a survey instrument appropriate for departments and programs that award degrees in planetary science.

The members of the Advisory Committee are:

- 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 of the 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)
- Jim Slavin, Director of the Heliophysics Science Division at the Goddard Space Flight Center

Goals of Demographic Survey (Members of DPS, AGU, and the Meteoritical Society) (electronic only):

- 1 – *Establish the basic facts on the pipeline in planetary science:*
- 2 – *Examine factors that affect career development*
- 3 – *Examine factors that affect career paths*
- 4 – *Examine participation in programs and projects run by NASA, NSF or other funding agencies*

SRC staff at AIP will consult with the advisory committee to construct an appropriate and effective questionnaire. SRC staff at AIP will distribute the survey electronically to planetary scientists who are members for DPS, AGU, and the Meteoritical Society. This will include sorting and cleaning the membership lists (in part to remove duplicates, estimated to be large),

delivering the electronic questionnaire, analyzing the results, and preparing a report for dissemination.

Goals of Survey of Academic Departments:

- 1 – Establish the basic facts on the pipeline in planetary science*
- 2 – Establish how supply relates to demand*

SRC staff at AIP will consult on constructing an appropriate and effective questionnaire. The committee will compile a list of programs and departments that include at least one planetary scientist on the faculty and graduate planetary scientists. The committee will distribute the questionnaires to the department, will analyze the results, and will prepare a report. Funds are only being requested for questionnaire development by AIP.

Potential Future Extension of Survey to Other Employers

One expected finding of the 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

The SRC will compile a report on the basic statistics of the demographic survey. The advisory committee will prepare a report based on the results of the department survey. The results will be made publicly available within one year after funding is received. The report will be presented at society “NASA Nights”, PSS meetings, and other events as requested.

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