SOME HISTORY AND CHARACTERISTICS OF NASA's PLANETARY MATERIALS AND GEOCHEMISTRY PROGRAM: Donald Bogard, NASA, Johnson Space Center, Houston, TX 77058

The main elements of NASA's PM&G Program, formed in FY84, are nearly 100 funded research projects and a JSC planetary materials curation facility for lunar samples, Antarctic meteorites, cosmic dust particles, and impact debris on returned spacecraft parts. This abstract by the PM&G discipline scientist presents current and historical information that may be informative to the scientific community. The FY, or fiscal year terminology is used throughout.

Fig. 1 (upper left) shows the total number of principal investigators (PIs) and total research funding that the PM&G Program supported from FY84 through current FY92. Funding in FY92 is up -5% compared to FY91. In three previous years (FY88, 89 & 91), however, PM&G funded less research than the year before. In FY89 the anniversary dates of many projects were shifted to the first fiscal quarter to make up the shortfall, and funding for most projects was not cut. Unfortunately, this action now makes it more difficult to get new funding authority to many grants on time. The total increase in research funding for the 8-year period of FY84-FY92 is 21.4%, or an average of 2.7%/year.

Fig. 2 (upper right) shows the number of new projects added and ongoing projects dropped for the years FY85-FY92. [These numbers do not include "turnover" within the Early Crustal Genesis (ECG) Project for FY85-89, although ECG PIs are included in the PI total of Fig. 1. Several ECG projects were dropped or merged into the main PM&G Program during FY90-91. For this reason, changes in the number of PIs in Fig. 1 may not match the net change in Fig. 2.] For FY85 through FY90, slightly more projects were added than dropped, the total number of PIs increased (Fig. 1), and the "turnover" rate of non-ECG projects was -7%/year. For FY91-92, however, the "turnover" rate has decreased, primarily due to 1) tight budgets which limit new starts, 2) relatively high review ratings for proposals of continuing projects, and 3) an attempt to ease the erosion of level-of-effort that has occurred in most highly ranked, continuing projects. PM&G supports the same number of PIs in FY92 as in FY84.

The number of proposals funded and declined for the period FY85-FY92 is shown in Fig. 3 (middle left). For FY85-88 the rejection rate for funding was -20%, whereas in FY89-92 it rose to -30%, as the total number of submitted proposals increased. In FY92, the Program will support -70% of the funding requested for PM&G research and -22% of the funding requested for laboratory instrumentation. The laboratory instrumentation mini-program (PIUP), new in FY91, was joined in FY92 by the educational researchers and computational equipment mini-programs. In FY92, PM&G projects will receive $900K from PIUP instrumentation and $105K from each of the educational and computational mini-programs.

Of the 97 research projects supported in FY92 (a number slightly greater than the number of PIs), 57 have been continuously supported since at least FY84. Fig. 4 (middle right) plots the ratio of FY92 funding to FY84 funding (non-inflated) as a function of the log of FY92 funding for these 57 projects. This FY92/FY84 ratio measures the fractional increase or decrease in individual project funding over this 8-year period. The solid, horizontal line at a FY92/FY84 value of 1.214 represents the 8-year increase in total research funding. Although most projects receive a similar funding increase (COLA) each year, Fig. 4 shows that over this 8-year period only some of the projects have received cumulative increases similar to the total program. Some projects received less funding in FY92 than in FY84. A few projects have received large fractional increases, but most of these started as relatively low-funded projects.

Fig. 5 (lower left) is a histogram of FY92 funding levels for 97 individual projects. The ordinate is a cumulative percentage of the total project funding level; the lowest funded project plots to the left, and the highest funded project to the right. This graph illustrates several characteristics of project funding. The 7 highest funded projects utilize 30% of total funding, and the 18 highest funded projects utilize 50%. Thus, the 79 lowest funded projects also utilize 50% of the total. The mean project funding level is -$96K and the median is -$57K. In part, the wide range in funding levels of individual projects reflects the technical nature of the research. Projects which support complex analytical laboratories such as mass spectrometers or ion probes tend to have large budgets, whereas most petrology and experimental projects tend to have smaller budgets.

Distribution of the number of PIs and research funding with PI age is shown in Fig. 6 (lower right) in seven age increments. The number of PIs peaks in the intermediate age range of 45-55 years, then falls off rapidly with increasing age. PM&G supports 24 PIs, or 26% of the total, whose age is 44 years or younger (the youngest is 34), and 41 PIs (44%) who are under age 50. Fifteen PIs (16%) are 60 or older. With the exception of one age increment, research funding shows a similar distribution as does the number of PIs. The average PI

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funding calculated for each age increment is shown as the solid triangle (one PI is omitted from these averages). For the five age increments from 45 to 65+ years, the average PI funding is relatively constant at ~$100K. However, for the two younger age increments, the average PI funding is significantly less at ~$50K. One major reason for this difference is that support for 18 of the 20 youngest PIS began since FY84 at relatively modest levels, and constrained Program budgets have limited growth of these projects.

Within the constrained research budget, PM&G has to make difficult decisions as to what cost-of-living (COLA) to give strong, ongoing projects, which new projects to support, and which ongoing projects to terminate or give funding cuts. Each year projects judged to have merit are not funded, or are funded at lower levels than that requested. To gain PM&G support, both new and ongoing projects must have quality science and planetary relevance and must maintain the technical balance within the Program. Investigators submitting new proposals that receive good reviews but are not supported are encouraged to propose again.