On ESA's FIRST and Planck Missions: Letter Report

DETAILS

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On February 18, 1998, Thomas Prince and John Huchra, co-chairs of the Committee on Astronomy and Astrophysics, Robert Dynes, chair of the Board on Physics and Astronomy, and Claude Canizares, chair of the Space Studies Board, sent the following letter to Dr. Wesley T. Huntress, NASA Associate Administrator for Space Science.

In July 1997, the Task Group on Space Astronomy and Astrophysics (TGSAA), chaired by Patrick Thaddeus, released its report *A New Science Strategy for Space Astronomy and Astrophysics* (National Academy Press, Washington, D.C., 1997). The top science priority of the Thaddeus report is the "[d]etermination of the geometry and content of the universe by measurement of the fine-scale anisotropy of the cosmic microwave background radiation," and the second priority is "[i]nvestigation of galaxies near the time of their formation at very high redshift" (p. 2).

The TGSAA did not comment on specific missions to address the high-priority science objectives discussed in its report. Recently, however, the Committee on Astronomy and Astrophysics (CAA) took up this issue. The CAA concluded that both the NASA Microwave Anisotropy Probe (MAP) mission and the European Space Agency (ESA) Planck mission will make significant contributions to the measurement of the cosmic microwave background radiation (CMBR) and should therefore have the highest scientific priority. The CAA also concluded that the ESA FIRST mission and the Next-Generation Space Telescope (NGST) directly address the question of galaxy formation at high redshift in a highly complementary fashion and therefore also have very high scientific priority.

MAP is an Explorer-class mission that will take a critical step in the measurement of the CMBR. Its angular resolution is substantially better than that of the earlier Cosmic Background Explorer (COBE) and will make possible the measurement of several of the most important cosmological parameters to high accuracy. The ESA Planck mission will have even better angular resolution than MAP because it will have high- as well as low-frequency receivers. Together the two missions will be able to reap the full science benefits of CMBR studies in accord with the Thaddeus report's highest science priority. Planck promises as much of an advance over

MAP as MAP does over COBE.

The NGST is a major component of NASA's 2000-2005 strategic plan for space science, *The Space Science Enterprise* (NASA, November 1997). It would be sensitive to the red-shifted near-infrared radiation from the early period of galaxy formation. The ESA FIRST mission would complement the capabilities of the NGST by looking at far-infrared and submillimeter wavelengths. FIRST will be able to detect the highly luminous infrared emission associated with the high rates of early star formation in dust-enshrouded galaxies.

NASA participation in the ESA Planck and FIRST missions could be crucial to realizing the full science potential of these missions, which address the top two science priorities in space astronomy identified by the Thaddeus report. The science return to the U.S. science community will be significant and NASA's investment highly leveraged. In particular, NASA has a key role to play in developing enabling technologies and indeed has already made significant contributions to both of these missions by its support of suborbital flight opportunities from which relevant technologies have been developed. Since the technology for both Planck and FIRST is not yet fully developed, a steady, adequate flow of technology funding is likely to be critical to the ultimate success of these missions. The CAA is concerned that the NASA investment should be commensurate with the very high priority science of both these missions. We urge that the NASA investment be used to ensure that the science goals articulated in the Thaddeus report are fully met.

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