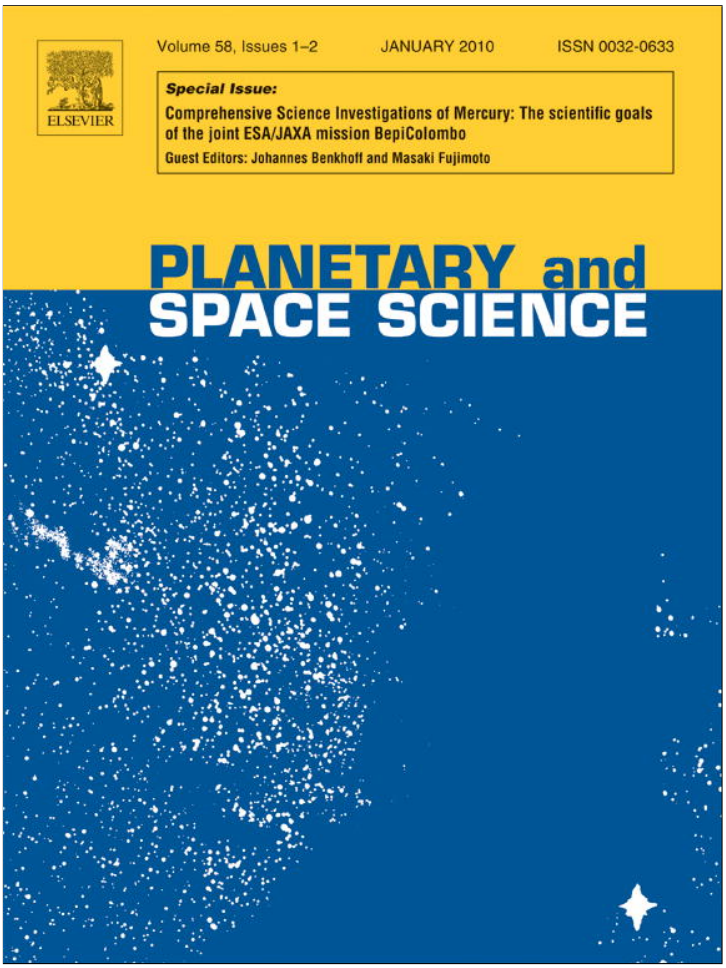

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Foreword

Foreword to the Special Issue of *Planetary and Space Science* on the BepiColombo Mission to Mercury

Mercury is a planet of superlatives and paradoxes. Among Solar System planets, it is the closest to the Sun, displays the highest diurnal variation in surface temperature, and has the most transient atmosphere, yet it may harbor long-lived water ice on the floors of its polar craters. It is the only Solar System body in a 3:2 spin–orbit resonance, so that its solar day lasts for 2 Mercury years. The smallest planet in our Solar System, Mercury also has the highest uncompressed density. Its surface is the oldest among the family of terrestrial planets, yet it is the smallest planet with a modern global magnetic field, and it has the most Earth-like magnetosphere.

Despite Mercury's intriguing mix of characteristics, as recently as 2 years ago the planet had been visited by only a single spacecraft. Mariner 10 flew by Mercury three times in 1974–1975, imaged about 45% of the surface, discovered the planet's internal magnetic field, documented three species in Mercury's tenuous atmosphere, and sampled the planet's small magnetosphere. Those early Mariner 10 observations, and subsequent ground-based astronomical discoveries, raised a number of basic questions about Mercury that could not be addressed without further spacecraft exploration. In the last decade, three space agencies responded to this scientific imperative. In 1999, the US National Aeronautics and Space Agency (NASA) selected the MErcury Surface, Space ENvironment, GEochemistry, and Ranging (MESSENGER) spacecraft to be the first probe to orbit the innermost planet. Launched in August 2004, MESSENGER flew by Mercury three times in 2008 and 2009 en route to a scheduled insertion into orbit about Mercury in March 2011. In 2000, the European Space Agency (ESA) announced the selection of the dual-orbiter BepiColombo mission and engaged the partnership of the Japanese Institute of Space and Astronautical Science (now the Japan Aerospace Exploration Agency, or JAXA) to develop one of the two spacecraft and much of its payload.

Named for Giuseppe Colombo, the Italian mathematician who in 1965 offered one of the first explanations for why Mercury is in its peculiar spin–orbit resonance and later pointed out to NASA how a modification to the trajectory of Mariner 10 would permit multiple flybys of Mercury rather than only the one originally planned, the BepiColombo mission is the most ambitious effort yet attempted in the exploration of Mercury. Two spacecraft, ESA's Mercury Planetary Orbiter (MPO) and JAXA's Mercury Magnetospheric Orbiter (MMO), are to be launched together in July 2014 on an Ariane 5. Through a combination of solar electric propulsion and inner-planet flybys, the two probes will be delivered in 2020 into coplanar polar orbits about Mercury, where the MPO will study the planet in unprecedented detail and the MMO will conduct a thorough characterization of Mercury's dynamic magnetosphere and its strong interaction with the interplanetary magnetic field and solar wind plasma.

This special issue of *Planetary and Space Science* is the first detailed description of the BepiColombo mission in the scientific literature. Following a mission overview by BepiColombo Project Scientist Johannes Benkhoff and his colleagues, there are papers on each of 15 instruments and instrument suites in the mission's scientific payload, including 10 on MPO and five on MMO. Complementing those technical descriptions are three papers summarizing the state of scientific knowledge of Mercury at this stage in BepiColombo development and one paper on mission science operations.

A bit more than a decade from now, at the completion of the BepiColombo mission, our understanding of Mercury will at long last rival that of its larger sister planets, and we will have gained critical new insight into how the inner Solar System formed and evolved.

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