

Writing the History of Space Missions: Rosetta and Mars Express *M. Coradini¹ & A. Russo²*

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In May 2014 the European Space Agency's (ESA) **Rosetta** spacecraft, launched in 2004 and now cruising in interplanetary space, will rendezvous with Comet 67P/Churyumov-Gerasimenko and enter orbit around its nucleus. Six months later, the spacecraft will release a small robotic lander onto the icy nucleus, then spend the next two years orbiting the comet as it heads towards the Sun. The Rosetta mission, one of ESA's most important and ambitious scientific undertakings, will achieve many historic landmarks. Rosetta, in fact, will be the first spacecraft to orbit a comet's nucleus and fly alongside it as it heads towards the inner Solar System, and it will mark the first controlled touchdown on a comet nucleus. The lander's instruments will obtain the first images from a comet's surface and make the first *in situ* analysis to find out what it is made of.

Writing the history of this epoch-making space science mission within the general historical framework of space science development, Solar System exploration and Europe's joint space effort requires a major effort of data retrieval at many different levels: searching the ESA archives, interviewing the main protagonists of the mission, identifying the socio-economical conditions under which the mission was conceived, understanding the scientific needs that convinced the science community and a major space agency to embark in such ambitious project. The end result of this project is intended to be a scientific monograph worked out according to the standard of academic research, including full bibliographic references to published and unpublished sources. The general aim of the project is to discuss in a critical way the scientific, technological and institutional framework of this major space science mission. More specifically:

- The institutional framework in which such a complex and ambitious project was proposed, assessed, and eventually approved following a highly competitive decision-making process.
- The definition of the mission's scientific objectives, with regards to the available knowledge in the field and to the hoped-for new information; to the technical and financial constraints of a space mission; to the available skill and competence within the scientific community of reference; to the complexity of the managerial aspects of such a scientific undertaking (many research groups with different scientific cultures, nationalities, languages, institutional frameworks, funding problems, etc.).
- The technological aspects of the mission, e.g. the relationship between the scientific payload and the spacecraft; the handling, transmissions and analysis of data; the selection of the launcher and the launching campaign; the definition of the trajectory, in particular regarding the required gravity assist manoeuvres; etc.
- The relationship with industry during the implementation of the project, involving technical, financial, institutional and cultural problems.
- The project management, i.e. how was such a complex and challenging undertaking organized and managed both within ESA and among the scientific groups involved in the mission.
- The human and social aspects of a scientific project developing in the space of one or two scientific generations, and involving scientific groups and industrial teams across two continents.

- The scientific results obtained during the ten-year-long cruise and (hopefully) in the very first phase of operation around and on the comet.

As far as we know, the best example of a recently published book on the history of a large space mission devoted to planetary science is David M. Harland's *Cassini at Saturn* (Springer, 2007), a 400-page long scientific and technical account (including an impressive list of references to the scientific literature) of the NASA-ESA *Cassini-Huygens* mission to Saturn and its moons. The author is a space historian who has published several books in the field, including a history of NASA's *Galileo* mission to Jupiter and its moons (*Jupiter Odyssey*, Springer, 2000). The major difference between Harland's books and the one on Rosetta is the little (if any) analysis of the institutional and social aspects of the stories he is telling, and the lack of references to unpublished archival sources. In this respect, his books are certainly of interest for planetary scientists and space engineers, but they are not addressing the community of historians of science and technology or the wider STS field. On the opposite side, we can cite the book by B. Groen and C. Hampden-Turner, *The Titans of Saturn* (Singapore: Marshall Cavendish, London: Cyan, 2005), a US-focussed political and sociological analysis of the same mission, essentially based on interviews with a number of actors of the story. Another recent book to be mentioned is Michael Meltzer's *Mission to Jupiter: a History of the Galileo Project* (Washington, DC: NASA SP-2007-4231, 2007), a (official) history of the *Galileo* mission published under the aegis of the NASA History Office.

Mars Express is the first planetary mission accomplished by the European Space Agency (ESA). Launched in early June 2003, the spacecraft entered Mars's orbit on Christmas day of that year, demonstrating the new European commitment to planetary exploration. Following a failed attempt in the mid-1980s, two valid proposals for a European mission to Mars were submitted to ESA's decision-making bodies in the early 1990s, in step with renewed international interest in Mars exploration. Both were rejected, however, in the competitive selection process for the agency's Science Programme. Eventually, the Mars Express proposal emerged during a severe budgetary crisis in the mid-1990s as an exemplar of a "flexible mission" that could reduce project costs and development time. Its successful maneuvering through financial difficulties and conflicting scientific interests was due to the new management approach as well as to the public appeal of Mars exploration. In addition to providing a case study in the functioning of the ESA's Science Programme, the story of Mars Express discussed in this paper provides a case study in the functioning of the European Space Agency's Science Programme and suggests some general considerations on the peculiar position of space research in the general field of the history of science and technology.