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BOOK REVIEW

John Krige, Angelina Long Callahan and Ashok Maharaj, *NASA in the World*: *Fifty Years of International Collaboration in Space*

Palgrave Macmillan, New York, 2013

David Baneke[1]

NASA is best known as the organization behind some of the most impressive technological feats of the modern era. It put a man on the moon, sent probes into deep space, and built scientific instruments that have changed our understanding of the universe. Less known is that NASA also has another mission. Ever since its foundation in 1958, the agency plays an important role in the foreign policy of the United States. Its mission is to establish international collaboration, while at the same time maintaining and promoting America's technological, economic and military primacy. In the words of Angelina Long Callahan, "geopolitics became reified in human spaceflight" (p. 127).

NASA's two goals went hand in hand. By generously sharing (carefully selected) space technology, the US underlined its peaceful and liberal intentions, which contrasted with those of the secretive and militaristic Soviet Union. Despite being a government agency, NASA was allowed to act relatively independently on the international stage. It carefully cultivated an image as an a-political scientific and technological organization, which was one of its main strengths from a diplomatic point of view.

NASA in the World, written by John Krige and his former students Angelina Long Callahan and Ashok Maharaj, focuses on this aspect of the organization's work. It tells the story of NASA's collaboration with the European, Japanese, Indian and Soviet space programs in a series of case studies that vary in length and detail. The book analyzes the earthly side of the space agency, with much attention for the practical, every-day side of international cooperation. A constant question in all the case studies is whether American efforts to cooperate were sincere or hypocritical.

✉ David Baneke
d.m.baneke@uu.nl

[1] Universiteit Utrecht, Utrecht, The Netherlands

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The answer is a bit of both, but the book's main conclusion is that NASA's actions matched its rhetoric more closely than many would expect. We should take public policy statements seriously.

In its first years, NASA's long-serving international officer Arnold Frutkin formulated a series of guidelines that have shaped its international collaborations ever since. They stipulated that collaboration should be in the form of well-defined projects rather than open-ended agreements, each country should be responsible for funding its own contribution ("no exchange of funds"), and all scientific results should be made accessible to all scientists. NASA also sought to maintain what they called "clean technological interfaces" with its partners, to minimize managerial complexity but also to minimize the need for sharing sensitive technological knowledge. Technology transfer is a recurring theme in the case studies throughout the book. Managing flows of information was a central issue in post-war international science and technology, a theme that is familiar from Krige's previous work. Crucial to keep in mind, however, is that information management influenced not only which information NASA kept secret, but also which information it shared. Through the case studies in the book, the authors show that classification and secrecy was just one half of the story; collaboration and active technology transfer were just as important.

In the first section of the book, John Krige discusses NASA's cooperation with Western Europe. He presents the reader with a detailed description of the long and painful negotiations about Europe's participation in NASA's post-Apollo space program, both between American and European officials and between various interests within the US. Eventually, Europe built Spacelab, a separate laboratory unit that could be flown inside the Space Shuttle's cargo bay. This setup minimized technology transfer: it was a "victory of clean technological interfaces" (p. 112). In the end, however, the difficulty of reaching an understanding with NASA indirectly bolstered European efforts to develop an independent satellite launcher. This became the highly successful Ariane launcher project, which became a serious competitor for American launchers from the 1980s.

After Krige's section, Callahan's analyzes NASA's cooperation with the Soviet Union and then Russia, focusing on the Apollo-Soyuz Test Project of the 1970s and (particularly interesting) the International Space Station in the 1990s. Callahan vividly evokes the chaos in Russia after the collapse of the Soviet Union, when various bureaus and agencies claimed ownership of the impressive Soviet space legacy, including its staff, infrastructure and equipment. This caused the West to worry: what if desperate Russian space engineers sold their knowledge to rogue states? The fear of proliferation was an important motivation behind cooperation on the International Space Station (another one was the expected cost reduction of using existing Russian hardware). This was a fundamentally new kind of cooperation, which violated nearly all of Frutkin's guidelines: it involved significant American funding of Russian projects and by incorporating Russian modules into the core of the Space Station, it made the project fundamentally dependent on foreign technical contributions. Callahan makes the interesting point that the collaboration also involved exporting American ways of managing space projects, including making contracts with private industry. The collaboration thus led to the "extension of Western capitalism order into the post-Soviet world" (p. 182).

Unfortunately, the book does not discuss the current situation, in which Russian Soyuz capsules are the only way to get astronauts to the Space Station - an extremely painful situation for the proud American space program.

In the third section of the book, Maharaj explores NASA's less well-known cooperation with Japan and India. In both cases, geopolitics played a significant role in defining the projects: the Japanese collaboration was influenced by the need to answer China's ambitions, especially after the first Chinese nuclear test in 1964. The Japanese case offers an especially clear example of the politics of technology transfer. In order to prevent proliferation of solid fuel rocket technology, which has more military value than liquid fuel technology, NASA supported a Japanese launcher that worked with liquid fuel.

India was a particularly complex diplomatic case because of its size and its strategic position between a US ally (Pakistan) and a rival (China). This case study is the only one in the book that discusses collaboration on a communications' satellite: the Satellite Instructional Television Experiment (SITE), designed to broadcast educational television about agriculture, health care and family planning to remote Indian villages. This was a high-profile social development project as well as a technological one. The project inspired several later projects, including ones in Brazil and Indonesia.

The book ends with two chapters by Krige that feel somewhat like an afterthought. One of them does add a very important element, however. It discusses the consequences of the International Traffic in Arms Regulations (ITAR), the American laws that regulate technology transfer, that were enforced increasingly more strictly after 2000. In the past twenty years, it has become one of the most important factors that has shaped (in many case: hindered) international cooperation in space, as well as in other fields.

In the introduction, the authors claim that this book fills a 'yawning gap' (p. 6) in historiography, thereby curiously overlooking a respectable body of literature, not least including much of Krige's own work. Indeed, *NASA in the World* can be seen as a series of case studies that demonstrate the mechanisms that Krige described in his influential book *American Hegemony and the Postwar Reconstruction of Science in Europe* (2006) about the asymmetrical relation between Europe and the US. *NASA in the World* shows that space cooperation worked in similar ways to the scientific cooperation that Krige described. Foreign countries were happy to accept American patronage in space projects for economic and scientific reasons, and NASA was eager to supply it for political ones.

The most interesting parts of the book discuss NASA's cooperation with non-allies: India and the Soviet Union. The scope of the book is thus wider than usual studies, and the detailed case studies provide valuable new insights. As in most of the existing literature, the perspective in this book is mainly American, but the authors add depth by also analyzing the interplay between various actors within the US: NASA, the State Department, the Department of Defense and industry. The amount of detail in some of the case studies, the sometimes confusing chronology, and the large number of acronyms do not always make it an easy read, but *NASA in the World* provides important empirical studies of the political *and* practical sides of international science and technology.