Sears D. W. G. (2001a) Aiming for the stars: The dreamers and doers of the space age. *Meteorit. Planet. Sci.* **36**, 1174-1175. (Book review).

Aiming for the Stars: The Dreamers and Doers of the Space Age by Tom D. Crouch. Smithsonian Institute Press, Washington, DC, USA, 1999, 338 pp., $16.95 (ISBN 1-56098-833-9).

I have a collection of about 12 large scrapbooks, filled with newspaper clippings about the world's space programs. My father would come home from working on the railway, the pockets of his heavy British Railways uniform stuffed full of pages that he had torn from newspapers he found left on the trains. He would unload them ceremoniously on the kitchen table and take great joy in my reaction. Crouch's book brought such wonderful memories flooding back. The book is a history of our exploration of space, with emphasis on the manned space programs of the U.S. and the U.S.S.R. It is a tightly written, very readable, and well-organized paperback book printed on the usual paperback paper that is fine for text, but awful for pictures. That's a pity because the pictures are well-chosen and numerous, but the print quality is very poor.

Crouch starts with Copernicus and Kepler, goes on to Goddard, H. G. Wells, Jules Verne and Tsiolkovsky, and thence to the development of rocketry in Germany and Russia. Then it documents, rather neatly, post-war evolution of missiles and rockets in the U.S. and the U.S.S.R, the Cold War, the race into space, Sputnik, Gargarin, the Mercury, Soyuz, Gemini and Apollo programs. Next comes the post-Apollo era, with the evolution to Shuttle and space stations, Sayut, Skylab, Mir and the International Space Station. Essentially, each step is given a chapter. Finally, there are chapters on robotic exploration of the solar system and future developments.

For a book of this type, written by an American author for a semi-popular audience, the text is remarkably candid. "Goddard was on a branch that died," Crouch quotes Caltech's von Karmàn as saying. "If he had taken others into his confidence, I think he would have developed workable high-altitude rockets, and his achievements would have been greater than they were." Instead, much of Goddard's work was independently duplicated and bettered in Germany and Russia and ultimately it was not Goddard's work that led to the modern space programs. There are many examples of such refreshing candor in the book. Crouch devotes a lot of attention on Goddard, whose role he contrasts with von Braun's. Wernher von Braun's ability to be open and lead large teams was responsible for NASA's successful response to President Kennedy's challenge to land a man on the moon by 1969.

Another strength of the book is the knowledgeable and skillful way Crouch explains the development of space-flight in terms of national and world developments. Of course, it is impossible to avoid describing the space race without mentioning the Cold War, but the role played by the strengths of national economies, world conflicts, advisory groups, the whims of politicians, and the Soviet and then Russian economy, the comings and goings of various presidents and NASA administrators, and many other forces, are all apparent in Crouch's text. Even the well-known tension between engineering and science, so important and yet hardly mentioned in the popular histories of spaceflight, is nicely discussed.

One criticism I have of the book is the way in which robotic exploration of the solar system is handled. It is relegated to a chapter at the back of the book and is essentially a list of missions, almost all U.S. This is the way unmanned missions are usually handled in books on the history of space research, and it is a great shame. I feared that this would be the case when I first perused the book, but there were signs in the early chapters, when the history of JPL and the first artificial satellites were discussed, that this book was to be different, but no. Artificial satellites were a way to the first men in space and we were to read little more about their history after Gargarin and Shepard. This is despite the assertion made in the penultimate chapter that in some respects robotic missions have contributed more to our knowledge and understanding of space, and to the progress of our society, than the manned missions. There is still a need on our bookshelves for a history of space-flight that gives due emphasis to the robotic missions.

As a history of rocketry and the manned (and frequently womanned) exploration of space, this is a wonderful book that I thoroughly enjoyed reading.

Derek Sears
Arkansas-Oklahoma Center
for Space and Planetary Sciences
University of Arkansas
Fayetteville, Arkansas 72701, USA