Three appendices, a glossary, and a set of endnotes are crisp and sober. They are excellent.

The Lightness of Being is not unbearable, but it is weighed down with too much clutter to rank as a masterpiece. It's a pity: Wilczek's best writing—some of it in this book—is lucid, lively, and illuminating. A tough editor could have reined in the silliness and produced a splendid book. As it stands, readers will find a mixture of thrills and self-indulgence.

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To a Distant Day

The Rocket Pioneers

Chris Gainor
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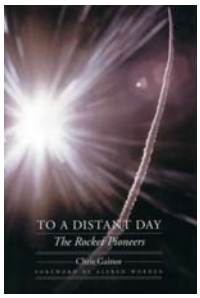
To a Distant Day: The Rocket Pioneers is a scholarly contribution to the history of space exploration. In it, Chris Gainor, a historian of technology, describes in great detail the development of rockets, the birth of the space program, and dramatic moments during the space race between the Soviet Union and the US.

The book begins with a generous description of the daring first steps—the vision, struggles, and contributions of the founding fathers of space exploration: Russia's Konstantin Tsiolkovsky, Germany's Hermann Oberth, and the US's Robert Goddard. They laid the groundwork on which subsequent generations of scientists and engineers constructed the space age.

Gainor includes plenty of behind-the-scenes details that surprise and delight the reader. We read of the fierce rivalries not only among nations but also among the US armed forces (the army, navy, and air force), each of which ran its own rocket program and had ambitions of launching its own man in space. One realizes the wastefulness in the duplication of effort and how disorganized and scattered the American space program was prior to the formation of NASA in 1958.

To a Distant Day includes sections on high-altitude ballooning and supersonic flight, both of which were valuable to the space program. The use of different animals to study the effects of high acceleration, weightlessness, and reentry is well documented by Gainor. He also describes extensively the German rocket program and how it was carved up after World War II, not only as a result of the capture of German rockets but also because thousands of scientists and technicians were "invited" to continue their rocket research in the US and the Soviet Union.

A notable feature of the book is how deftly the author has woven the distinct personalities of the space innovators into his account of their professional lives and work. We read of Goddard's insistence on working alone and his stubborn refusal to collaborate or to share his research and of the tragic life of Sergei Korolev, once known to the Allies only as the "chief designer" of the Soviet space program, who as a young engineer was imprisoned and nearly died in a Siberian gulag under Joseph Stalin. We learn that Wernher von Braun, whose Saturn V rocket took us to the Moon, was the aristocrat who ran Adolf Hitler's rocket program and designed the V-2 rocket that ravaged London during World War II. Despite his memberships in the Nazi party and the SS, he was arrested by the Gestapo and briefly jailed. We read of Tsien Hsue-shen, a brilliant scientist at Caltech who spent time in jail and was considered a security risk by the FBI during the McCarthy era. Angered by that



persecution, he returned with his family to China, where he became a leader of the Chinese space program.

Gainor also tells of the everyday struggles that many early space scientists lived through—poverty and hunger, disease, political persecutions, and fierce competition. Their commitment to space research remained unwavering because of their passion and vision. The book includes lucky mishaps like the one caused by Soviet physicist Andrei Sakharov. Overestimating the weight of the hydrogen bomb, he called for larger and more powerful intercontinental ballistic missiles. It was primarily those larger ICBMs that enabled the Soviets to be the first in space. Another lucky misfortune occurred in 1947 when, during the test-firing of a captured V-2 rocket with a malfunctioning gyroscope, Americans accidentally bombed Mexico. Fortunately, the rocket landed in an old cemetery and caused only minor damage.

I find it amazing that the founding fathers of the space program read and were inspired by the same science-fiction book by Jules Verne, *From the Earth to the Moon* (1865). Equally astonishing is the role that clubs and societies for young rocket and space enthusiasts played. Those organizations turned out many notable space scientists and engineers. The book also suggests that besides the childlike enthusiasm of space scientists, the most powerful motive that took us to space came from the military.

Unfortunately, *To a Distant Day* lacks clear and labeled diagrams of historic technologies such as Goddard's first liquid-fuel rocket and von Braun's V-2 rocket. A comparison of Yuri Gagarin's and Alan Shepard's space capsules would have been another valuable inclusion. The satellite section is brief and incomplete, and Gainor fails to explain the importance of some historic breakthroughs, like the first use of liquid fuel in rockets by Goddard in 1926.

As someone who has been teaching a course on space exploration for many years and has visited most of NASA's space centers, I have found plenty of new and valuable material in *To a Distant Day*, and I regard it as a valuable addition to my library. Its minor omissions aside, I recommend the book to all who wish to know more about the conditions, people, and discoveries between 1890 and 1960 that led to the space age.

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Earth: The Sequel

The Race to Reinvent Energy and Stop Global Warming

Fred Krupp and Miriam Horn
W. W. Norton, New York, 2008.
$24.95 (279 pp.).
ISBN 978-0-393-06690-6

The intertwined problems of energy supply and sustainability provide both a great threat and a great challenge not just to the US but to all nations on Earth. There are many dreamers and schemers, numerous well-posed and difficult scientific problems, and a number of entrepreneurial and financial ideas. The subject overwhelms the popular press, the blogosphere, scientific meetings, and publications ranging from intelligent magazine articles to scandal sheets to books of varying quality.

In *Earth: The Sequel—The Race to Reinvent Energy and Stop Global Warming*, authors Fred Krupp and Miriam Horn take a straightforward tack, essentially arguing that the missing weapon in our approach to the intertwined energy problems is a carbon cap-and-trade system. Effectively, a cap-and-trade system issues permits to emit carbon dioxide. The permits can be