**Science With A Vengeance: How the Military Created the U.S. Space Sciences After World War II** *by David H. DeVorkin. Springer-Verlag, 1992. 404 pp., b&w photos, $69.00 (hardbound).*

This is the story of a select group of American scientists. In the aftermath of World War II they banded together, seized an opportunity, and set in motion events that culminated in what is known today as "space science," that is, scientific research conducted in outer space. These particular men, for the most part physicists and astronomers—Homer Newell, James Van Allen, Fred Whipple, and Lyman Spitzer among them—sought to understand the mysteries of the upper atmosphere and the fields and particles surrounding Earth. They emphasized meteoritics, solar and cosmic ray physics, plasma dynamics, and the interaction of the solar and terrestrial electromagnetic fields. They used the military services—the subtitle of this book notwithstanding—as the military, for its own purposes, used them: to fly experiments into the sky atop a variety of missiles and sounding rockets.

DeVorkin, a curator of space history at the National Air and Space Museum, has divided his book into two parts. The first addresses the formation and early work of the primary scientific groups and the rocket technology that they sought to exploit. The second considers the scientific questions pondered, the development of the instruments that might provide answers, and the results obtained on rocket flights between 1946 and 1957. Although the author appears at home in part two, part one contains some eye-catching errors. The Aerobee sounding rocket, for example, was the production version of JPL's WAC Corporal B; although he may have set payload specifications, James Van Allen did not "design" the rocket. James Forrestal was Secretary of the Navy in 1946, not Secretary of Defense. And the National Security Council never called for rearmament "in anticipation of war in Korea" in the spring of 1950.

Despite irritations such as these, there is much to commend in this work to anyone interested in the evolution of American science in the 20th century. DeVorkin marshals an impressive amount of information, most of it drawn from primary sources, to explain the people and institutions that promoted scientific research with rockets. For scholars concerned with the sociology of science, he also raises but leaves unanswered some fascinating questions. Among them: Why were these scientists almost exclusively from institutions on the east coast (a few were from the midwest), and why were those on the west coast, such as Fritz Zwicky at the California Institute of Technology, frozen out, at least until Ernst Krause departed the panel of V-2 scientists? Also, who decided the merit of, and how was payload space allocated for, the scientific instruments that flew on these rockets into the upper atmosphere? Except for the printed recollections of some of the principals and a contribution from John Naugle, the arcane process of selecting the "best" science for flight before the International Geophysical Year-Vanguard era remains to be plumbed.

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## FILM

**So Many Galaxies...So Little Time.** *Directed by Boyd Estus, written and produced by Margaret Geller and Boyd Estus. A production of Heliotrope Studios Ltd. for the Smithsonian Institution. Available on videotape from the Smithsonian Astrophysical Observatory (60 Garden St., Cambridge, MA 02138, or call 617-495-7390), $39.95.*

When scientists want to communicate to a popular audience, they traditionally choose to do so in books. Astronomer Margaret Geller, in a progressive and enterprising move, chose film. Teamed with the Academy Award-winning cinematographer Boyd Estus, Geller has co-produced and co-written an engaging 40-minute film that depicts a slice of astronomical life at her home turf, the Harvard-Smithsonian Center for Astrophysics in Massachusetts. The film is a sequel, in a way, to the team's first collaboration, a short educational video called *Where the Galaxies Are.*

Geller and her CfA colleague John Huchra have been mapping the universe since the 1980s, and in 1986 they garnered headlines worldwide when they discovered that galaxies are arranged in huge bubble-like structures (see "Surveyor of the Universe," August/September 1991). *So Many Galaxies...So Little Time* tells the story of this ambitious ongoing endeavor.

Geller is not the focus of the film; rather, she has graciously shifted the spotlight onto her research group, particularly Ph.D. students Ann Zabludoff and Ron Marzke. Through their eyes we see how astronomy is both a creative and a cooperative venture, filled with a variety of activities: late-night sessions in basement offices preparing for the next observing run, dusty treks to remote Arizona mountaintops, communal meals (beer being the secret ingredient to Huchra's celebrated enchilada sauce), patient vigils in the observatory control room, rooting for each photon that arrives at the telescope, and philosophical discussions over Italian cuisine in Geller's kitchen (you can almost smell the garlic as it sizzles in the pan).

A highlight of the film is the graphic display of the cosmic mapping completed so far, a stunning look at the universe's bubbly texture. The state-of-the-art computer animation was done by the National Center for Supercomputing Applications at the University of Illinois and takes viewers on a colorful, warp-drive ride through the galaxies, from the famous galactic chain dubbed the Great Wall a few hundred million light-years distant to our galaxy, the Milky Way.

*So Many Galaxies...So Little Time* is an informative and original effort, a rare chance to see a scientist's cinematic view of the scientific enterprise. Thanks to Estus' keen eye at the camera and Guy van Duser's lovely musical score, it is also a film replete with moments of visual and auditory pleasure. I have only one recommendation for the distributors: with each film or videotape, include the recipes for those mouth-watering meals. Watching this film made me hungry!

*—Marcia Bartusiak is a contributing editor of* Discover *magazine. Her latest book,* Through a Universe Darkly: A Cosmic Tale of Ancient Ethers, Dark Matter, and the Fate of the Universe, *will be published by HarperCollins this summer.*

**Flying the Hump: Memories of an Air War** *by Otha C. Spencer. Texas A&M University Press, 1992. 217 pp., b&w photos, $24.50 (hardbound).*

Like the enduring controversy over the effectiveness of strategic bombing in


World War II, a question lingers as to whether the Hump airlift furthered the Allied cause or hindered it. The movement of tens of thousands of tons of cargo every month was certainly costly in lives. The author cites a grim