

southern New Mexico, followed soon by several hundred German rocket scientists, led by Werner Von Braun.

The newly assembled U.S. rocket program launched 67 V-2 rockets there between 1946 and 1951, some reaching 132 miles altitude. One of the charred

V-2 rocket remains is now featured as an exhibit in front of the Alamogordo Space History museum.

Scientists used these launches for the first-ever space age experiments of the upper atmosphere, and its effects on everything from fruit flies to corn seed.

When Werner Von Braun moved his team to Huntsville, Alabama in 1951, NASA utilized the New Mexico area and R&D facilities for certain aspects of the Mercury program. The U.S. government built two huge science labs at Los Alamos and Sandia, which continue today.

## Women at the Forefront of Astronomy

by Steve Carr

---

### Women Astronomers: Reaching for the Stars

by Mabel Armstrong

Marcola, Ore.: Stone Pine Press, Inc., 2008  
Paperback, 288 pp., \$16.95

---

Mabel Armstrong has written a refreshing and inspiring tale of triumph for teenage readers about pioneering female astronomers who made great contributions in science, and who dared to challenge many assumptions of the day.

This is not a feel-good book, however, and in fact is a bit alarming, since over and over again these most promising women found that their biggest adversaries were often the prestigious universities and ivory tower research institutions which used blatant, heavy-handed tactics to discriminate against women and protect their “Big Bang”-style sacred cows.

The joy of discovery—that uniquely human quality—was usually the only reliable ally for these female heroes, whose lives were not about personal ambition, fame, or fortune.

For thousands of years, women have been at the forefront of astronomy. In the famous library at Alexandria, Egypt, Hypatia (370-415), a dedicated follower of Socrates and Plato, designed the astro-

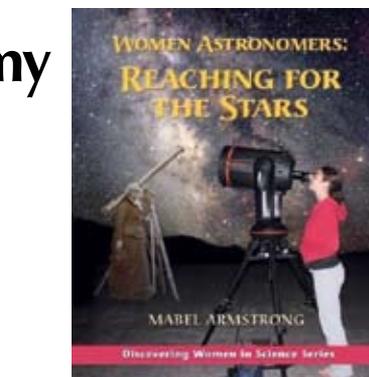
labe for navigation, along with a table of positions of stars that was used for more than 1,200 years by sailors around the world.

Caroline Herschel (1750-1848) and her brother, William, had two great passions, music and astronomy, and they built the world’s largest telescope, considered to be the eighth wonder of the world at the time. They discovered Uranus, comets, and numerous nebulae, but it was Caroline’s rigorous method that became the foundation of modern observational astronomy.

### American Women Astronomers

Maria Mitchell (1818-1889) was the first to discover a comet in America, but had to defy the authorities at Vassar College, where she was head of the astronomy department, to carry out her work. She objected to the rules from the Vassar principal, which were obsessively concerned with creating proper ladies instead of enthusiastic learners. Mitchell violated many rules including the campus curfews, by calling her class at 3 A.M. to see a lunar eclipse.

Henrietta Swan Leavitt (1868-1921), an expert on variable stars, was reduced to working as a human computer (doing the tedious and time-consuming astronomical calculations) at Harvard’s obser-



vatory, yet she discovered a method of measuring the size of our galaxy and the universe, which was considered to have been the greatest scientific advancement in 10 years.

Many thought that she had the best mind in the department, but she was personally barred by the department head, Edward Pickering from more advanced astronomy classes at Harvard. Some say that research of variable stars was set back several decades by this decision.

Another “computer,” Antonia Caetana Maury (1866-1952), left Harvard because she used spectrograms to learn about entire life cycles of stars and their composition, while the department head, the same Pickering, only wanted to classify stars by brightness. If Harvard could not compete



Portrait of Hypatia of Alexandria (370-415), who designed the astrolabe for navigation.



Maria Mitchell (1818-1889) was the first in America to discover a comet.

**“We need imagination in science. It is not all mathematics, nor logic, but is somewhat beauty and poetry.”**

—Maria Mitchell, astronomer



Courtesy of Grasslands Observatory

Some of the women astronomers who worked evaluating photographic plates at the Harvard College Observatory, under the direction of astronomer Edward Charles Pickering. The photo dates from around 1900.

with the newer, more powerful telescopes at observatories situated at more ideal viewing locations, Pickering was determined to at least impress the world with the sheer volume of raw data, and he increasingly put less emphasis on analyzing that data.

Years later, Maury did return to Har-

**“Science is about making connections where there were none before. For that reason a broad education is as crucial as development of technical skill. Reading great literature, seeing art in all its forms, and internalizing them are challenges of understanding nature.”**

—Margaret Geller astronomer

vard but was treated as an outsider in her own office and again barred from more advanced studies or research.

#### More Pioneers

To name just a few of the women astronomy pioneers discussed in the book:

- Nancy Roman (born 1925) helped to design and build almost every NASA orbiting observatory during the 1970s and 1980s.

- Vera Rubin (born 1928) shocked the world of astronomy when she discovered clumps of galaxies that were not randomly distributed, as suggested by the Big Bang Theory.

- Margaret Geller (born 1947), who was told by her elementary school teacher that girls should not study science or math, went on to discover structure in the universe which again disproved all the prevalent theories.

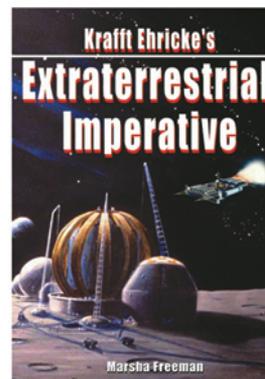
These efforts continue with Carolyn Spellman Shoemaker (born 1929) who still spends 12 to 13 hours each day at the U.S. Geological Survey labs in Flagstaff, Ariz., in planetary astronomy, searching for asteroids that might threaten Earth. She developed a stereo machine that more easily allows astronomers to find any moving objects in near space.

The book ends with a few pages of photos and short personal profiles of many young and promising women starting careers in the cutting-edge research projects around the world. The last, and perhaps most provocative page of these youthful profiles has a blank photo and an empty profile that needs to be filled, merely asking, “You?”

**NOW ON KINDLE!**  
**How We Got to the Moon:**  
**The Story of the**  
**German Space Pioneers**  
 by Marsha Freeman  
[Click here](#) to purchase

## Krafft Ehricke's Extraterrestrial Imperative by Marsha Freeman

ISBN 978-1-894959-91-9,  
 Apogee Books, 2009,  
 302pp, \$27.95



From this new book the reader will gain an insight into one of the most creative minds in the history of space exploration.

Krafft Ehricke's contribution to space exploration encompasses details of new, innovative ideas, but also how to think about the importance and value of space exploration for society.

The reader will gain an understanding of the early history of the space pioneers, what they have helped accomplish, and how Ehricke's vision of where we should be going can shape the future.

At this time, when there are questions about the path of the space program for the next decades, Krafft Ehricke has laid out the philosophical framework for why space exploration must be pursued, through his concept of the "Extraterrestrial Imperative," and the fight that he waged, over many years, for a long-range vision for the program.

Readers will find it a very imaginative work, and a very up-lifting story.

Krafft Ehricke's *Extraterrestrial Imperative* is the summation of his work on encouraging the exploration and development of space. The book contains all of his reasons why we need to get off the planet and explore space.



[www.apogeebooks.com](http://www.apogeebooks.com)

1-888-557-7223