

# Margaret Burbidge

Stars, quasars, supernovae, galaxies—if it's out of this world, she has seen it / **BY MARCIA BARTUSIAK**

**O**NE OF THE MOST important discoveries in modern astronomy was published in the *Reviews of Modern Physics* in 1957. Astronomers refer to the paper as simply B<sup>2</sup>FH, from the initials of the authors' surnames. The first B refers to E. Margaret Burbidge.

The scientific journal article opens with a quotation from Shakespeare: "It is the stars, the stars above us, govern our conditions." The words, from *King Lear*, are certainly appropriate. Burbidge and her colleagues—Geoffrey Burbidge (her husband), William Fowler and Fred Hoyle—had provided a map of the routes by which elements heavier than hydrogen and helium are forged within the fiery bellies of the stars. The calcium in our bones, the iron in our blood and the oxygen we breathe all came from the ashes of ancient stars, which had either exploded as supernovae or died slowly, releasing their matter into space.

Margaret Burbidge's colleagues worked on theory and laboratory experiments; she employed the telescope, seeking direct evidence from the heavens. Others had speculated about the origins of elements, but B<sup>2</sup>FH delivered the proof.

Burbidge first became aware of the stars 82 years ago, at the age of 4. The young Eleanor Margaret Peachey beheld them with vivid clarity during a nighttime crossing of the English Channel. Upon starting her studies at University College, London, in 1936, she discovered to her delight that astronomy could be a career as well as a hobby. Wartime blackouts, which kept the urban sky dark, allowed her to

settled in California, where she began her lifelong commitment to opening up opportunities for women in science. At a time when women weren't allowed to use the telescopes (or even stay overnight in the observatory's dormitory), she fought for—and won—access to those atop Mount Wilson near Pasadena. "Thanks to her influence," Caltech astronomer Anneila Sargent has said, "women can observe at any American observatory." Burbidge puts it simply: "If you meet with a blockage, find a way around it."

Verifying that we are composed of stardust was the first in a long list of achievements. Burbidge made pioneering measurements of the masses of galaxies and specialized in quasars. These celestial entities are believed to be luminous objects at the centers of galaxies, where a spinning, supermassive black hole generates tremendous radiation. For many years she held the record for finding the most distant quasar, a feat listed in the *Guinness Book of Records*.

Burbidge returned briefly to Great Britain in 1972 to serve as the first female director of the famed Royal Greenwich Observatory. But, happier at a telescope than a desk, she soon returned to the University of California at San Diego, where she studies quasars that emit large amounts of X-rays.

She has not always embraced the majority opinion on celestial matters. Both Burbidges suspect that the true nature of quasars has not been fully revealed and that quasars are closer to us than most astronomers assume. In a 1994 memoir, she says that she is "continually surprised by the almost religious fervor with which most astronomers demand a single 'Big Bang' act of creation for the Universe." Burbidge is more attracted to the notion, introduced by Hoyle, that matter was created in successive epochs, not just by a single event. Her unconventional views have often spurred the astronomical community to new lines of research.

Burbidge has devoted nearly 70 years to keeping watch on the universe. Unlike today's astronomers, most of whom sit in control rooms watching data displayed on monitors, she has had the pleasure of sitting directly at a telescope. "To ride with the telescope," she once recalled, "was an experience I wish I could share with today's generation. . . . One could look out at the spectacular vision of the heavens." She has held a front row seat on a golden age of astronomy. ●

"It's a bit like playing chess with nature as your opponent. You make a good move, but nature counters with half a dozen new ones."

—MARGARET BURBIDGE, SMITHSONIAN, JANUARY 1974

carry out research on the outskirts of London, using a telescope so antiquated that it was moved by a hanging weight.

After the war Peachey got married. She was eager to seek out the best telescopes and the best skies for observing, so she and her physics-trained husband, her closest collaborator over the years, moved to the United States. They eventually

MARCIA BARTUSIAK's most recent books are *Einstein's Unfinished Symphony* and *Archives of the Universe*.





Burbidge (in 1973 at the Lick Observatory near San Jose, California) verified the cosmic theory that human beings are made of stardust.