

Books

First Light

The Search for the Edge of the Universe

by Richard Preston

The Atlantic Monthly Press, 263 pages, \$18.95

I FIND RICHARD PRESTON'S book exciting, easy to read and informative, with a style that is vivid, slangy, and funny. It describes two aspects of contemporary astronomy and some of the trials and fun of people who work at Palomar. But the real heroes of this book, which reads in part like a novel but is mostly true, are two telescopes (plus attached electro-optical scientific instruments, computers and programs).

The book covers the stories of two quests. One of them is the search with the Palomar 200-inch Hale reflector for quasars at the largest redshifts attainable—and the implication for cosmology of looking back so far in time. The other, an account of which appeared in *The New Yorker* magazine in 1987, is the search with the Palomar 18-inch Schmidt telescope for asteroids whose eccentric orbits cross the path of the earth. Preston explains reasons for these searches: What fuels the enormous output of a quasar? (A black hole swallowing millions of suns?) How dangerous are asteroid impacts? (Very?)

In addition to the telescopes there are also vivid human heroes. For this remarkably intimate description of real scientists as human beings, working at their limits, Preston spent many nights at Palomar, and conducted many interviews. A particular novelty is the description of how it feels to conceive, design, build, de-bug, and use a one-of-a-kind instrument. He describes personal and emotional characteristics that make the scientists real, if somewhat larger than life. They are a varied group, many currently or formerly connected with Caltech: Carolyn and Eugene Shoemaker, Maarten Schmidt, Jim Gunn, Don Schneider. Another important and charming character in the story is Juan Carrasco, born on a small Texas farm, now senior night assistant at Palomar, the only one in this group trusted to move

the 200-inch. A large supporting cast includes Caltech scientists and engineers, past and present. Many of them are my good friends, but my enthusiastic recommendation for the book is not biased by this fact—nor by my own appearance in a “walk-on” role from an older pre-electronic generation.

The Shoemakers, husband and wife, revived the study of the asteroids, from rock to mountains in size, remnants of the origin of the solar system and fascinating hazards for interplanetary travel. They use (often in a shower of sparks) the oldest telescope on Palomar, the 18-inch Schmidt, taking photographs to find the trails of nearby, rapidly moving asteroids. Gravitational perturbations by the earth and other planets may cause eccentric, earth-orbit crossing asteroids to strike us, and Gene Shoemaker has become an expert on the geological remains (impact craters) of ones that did. Preston includes a capsule history of the solar system, a description of the Schmidt telescope, and his terrors on loading a piece of film into a holder in the darkroom. The reader will also meet some of astronomy's pioneers in anecdotal biographies of Bernhard Schmidt, Walter Baade and Fritz Zwicky.

The search for remote quasars at the 200-inch similarly introduces a number of great men; a short biography of George Ellery Hale depicts the charm and psychological stress of that founder of great institutions. The central hero, the 200-inch Hale reflector, is particularly appealing to me because of my 40-year love affair with that steel and Pyrex monster of 1930s design. What is amazing is that it still remains adaptable to the newest technologies. Preston describes the gadgeteers behind this application of electronics to the 200-inch—Jim Westphal and his “wizards of the

wastebasket,” Jim Gunn's home-designed, home-built electronics and his deep cosmological insight.

The central plot is about how Maarten Schmidt needed a statistically complete survey of the numbers and properties of quasars at the limit of detectability with CCDs (charge-coupled photosensitive diodes). The CCD field of view is small and quasars are rare; to obtain a large enough area, a scan is needed. The stationary telescope images a continuous strip of sky drifting by. For this, Jim Gunn invents and builds a “kludge” which transforms the “four shooter” (which carries four CCD's for stationary imaging) into a synchronized scanner, recording a night-long view of sky onto 12 large reels of tape output. The kludge is connected, fastened on with tape; the computer program fails and then triumphantly works. Juan Carrasco points the 200-inch and says “we are there”—a memorable phrase. The astronomers munch Oreos cookies, marvel at glimpses they see as the sky turns, listen to classical music and discuss why there might be so few quasars at large redshift. Are they seeing back too far in time to before galaxies existed, or before they contained all-devouring black holes? Was there an opaque screen at large redshift? Is it all only a statistical fluctuation? Twenty-five years ago we did not know that quasars existed; now we search for them near the unattainable edge of the Universe, from where the “first light” emitted billions of years ago just now reaches Juan Carrasco's 200-inch. Dawn arrives, stopping the quest. This is an excellent and true (even if somewhat romanticized) book about what it feels like to be an explorer. □

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