Obituary

J. Beverley Oke (1928–2004)

Optical telescopes have very long useful lives, but they are only as good as the light-detecting instruments at their focal planes — which, in turn, are only as good as their designers. J. Beverley (Bev) Oke, who died on 2 March 2004 at the age of 75, devoted most of his scientific career to devising and building a succession of such instruments — photometers, cameras and spectrographs that have helped, in particular, to keep the 50-year-old Hale telescope at the Palomar Observatory, California, at the forefront of astronomical research.

Oke was not solely an instrument-builder; he was also interested in the data gleaned from the observations made with his instruments. His doctoral thesis, submitted at Princeton in 1953, was in fact a theoretical study, of the atmospheres of O-type stars — the most massive, hottest stars that burn hydrogen as their main energy source. Later, he moved into observational spectroscopy and this dominated his scientific interests for the rest of his career.

When Oke joined the Caltech faculty in 1958, he built a single-channel scanner, which could measure 10-nm-wide segments of the spectrum of a star or galaxy successively, by stepping a diffraction grating through the appropriate angle. Using this photometer, Oke became a key player in one of the most momentous events in modern astronomical history — the discovery, in 1963, of the large redshift of the quasar 3C273. (Redshift is a measure of an object's distance from the Earth.) Although we now know quasars to be extremely luminous, distant stars marking the centres of galaxies, at that time they were an enigma. Using the Hale telescope, Oke's Caltech colleague Maarten Schmidt identified the pattern of emission lines in the spectrum of quasar 3C273 as the Balmer series of lines from hydrogen atoms. The lines were difficult to recognize because they had been shifted to such long wavelengths — a consequence of the quasar's large redshift. Schmidt identified the Balmer series up to the so-called H β line from his photographic spectra of 3C273. Oke used his own photoelectric scanner to detect another line, H α ; his paper followed Schmidt's in *Nature*.

Oke went on to build a 'multi-channel scanner', a linear array of 33 photomultipliers, for the 200-inch Hale telescope. With colleagues, he used this device to make accurate measurements of the spectra of stars, Seyfert galaxies (tiny,

Astronomer and master instrument-builder

bright nuclei found in a few per cent of galaxies), quasars and the brightest galaxies in rich clusters over a range of redshifts. This last work, with James E. Gunn, was an attempt to determine the rate at which the expansion of the Universe is changing — brave though it was, it did not succeed. The changing expansion rate could not be measured because the luminosity of the brightest cluster galaxies changes with time or redshift. Only in the past decade has this classic cosmological measurement been made, using supernovae as 'standard candles'.

Oke always strove to make his observations as quantitative as possible: to do so meant facing the problem of calibrating observations to correct for the constantly changing, distorting effects of the Earth's atmosphere. The solution is to calibrate against the absolute fluxes of a few 'standard' stars, as they would be observed above the atmosphere. In a classic piece of work in 1970, Oke took his prime-focus photoelectric scanner from the 200-inch telescope and attached it to a 4-inch telescope at Palomar. His intention was to compare the flux from Vega, one of the brightest stars in the sky, at different wavelengths with the flux from a black-body cavity, held at the temperature

of molten platinum and mounted at the top of a pole at the observatory. By observing Vega at different 'air masses' as the atmosphere changed, and comparing it with the black body, Oke and Rudy Schild were able to eliminate the effects of the atmosphere and measure the absolute flux of Vega in physical units. Larger telescopes have since been able to make absolute-flux measurements of fainter stars and galaxies by observing both the source and the standard, Vega, through the atmosphere.

In the late 1970s, the charge-coupled device, or CCD, came into use in astronomy. The CCD offered a light-collection efficiency vastly better than that of the photographic plate, which had been the workhorse detector in astronomical applications for many decades. Oke built a revolutionary double spectrograph for Palomar, which split the light entering it into two beams. The beams were directed to two different CCDs, one optimized for blue light and one for red. This spectrograph is still in use today, although the CCD technology has been upgraded over the years. At the Keck Observatory in Hawaii, Oke was the principal investigator, with Judith Cohen, of the low-resolution imaging spectrograph (LRIS), mounted on one of the twin 10-m telescopes. LRIS contributed to many of the Keck telescopes' early successes, including the discovery and analysis of hundreds of galaxies at astonishingly high redshifts.

Oke retired from Caltech in 1992 to return to his native Canada. Until his death, he worked at the Dominion Astrophysical Observatory in Victoria, British Columbia, continuing his research into clusters of galaxies and rapid spectroscopy of cataclysmic variable stars. His scientific output was remarkable, given his commitment to teaching and to developing instrumentation.

Bev was a modest, phlegmatic man with a laconic sense of humour. His lectures were clear, matter of fact, and unadorned with fanciful speech. He led by example, not by fine words. His greatest indulgence was his MG sports car, which he delighted in driving along the S6 'highway to the stars' from Pasadena to Palomar Mountain. Until the very end, as well as fixing the MG, he was working on the design of a spectrograph for the proposed 30-m telescope, a US–Canadian project intended to achieve a resolution ten times better than that of the Hubble Space Telescope. It will be a fitting tribute.

Wallace Sargent

Wallace Sargent is in the Department of Astronomy, California Institute of Technology, Pasadena, California 91125, USA.
e-mail: www@astro.caltech.edu