Ira S. Bowen
1898-1973

A Tribute by Horace W. Babcock

With the passing of Ira Bowen on February 6, the scientific community has lost a great astrophysicist. Through many years of distinguished and diversified contributions, his work was marked by innovation, rigor, and a thorough respect for fundamentals. His career spanned a half-century, from the beginning of serious work in physics at Caltech to guidance of the Mount Wilson and Palomar Observatories during a period of remarkable growth.

Ira Bowen ("Ike" to his friends) was born at Seneca Falls, New York, and attended Oberlin College, graduating in 1919. For the next two years he was a graduate student at the University of Chicago, where he was strongly influenced by A. A. Michelson. This association, as well as that with R. A. Millikan, was important in developing Bowen's unusual physical insight and providing him with an exceptionally solid foundation in classical physics.

Millikan arrived in Pasadena in 1921 to head the California Institute of Technology, frankly stating that it was his main objective to "build an outstanding department of physics." And it was no coincidence that he brought Ira Bowen with him from Chicago. For the next several years, Bowen was extremely active and productive in laboratory spectroscopy, especially vacuum spectroscopy of the ultraviolet. His work, partly in collaboration with Millikan, provided basic data on energy levels of ionized atoms of a variety of elements. Bowen also contributed to the high-altitude measurement of cosmic rays, and found time at the urging of his associates to complete a PhD thesis on heat losses and evaporation from water surfaces. He became an assistant professor in 1926, associate professor in 1928, and professor in 1931.

Bowen took much satisfaction in teaching, and for years gave outstanding courses in spectroscopy and optics. It is illustrative of his deep commitment to research that on holidays he was often to be found in his laboratory on the south side of Bridge; according to his own account, on New Year's Day he would sometimes take an hour off to watch from his window the conclusion of the annual Rose Parade as it turned into Tournament Park.

Familiarity with atomic structure and knowledge of atomic energy levels led to a striking discovery that brought Bowen international renown among physicists and astronomers. Many lines in the spectra of gaseous (planetary) nebulae in the Galaxy, including the two brightest lines, had for many years defied explanation, and could not be reproduced in the laboratory. They had been tentatively attributed to a hypothetical element, "nebulium." Bowen showed conclusively that these lines were due to "forbidden" transitions between energy levels of ionized atoms of ordinary elements such as oxygen; although not permitted according to the ordinary selection rules, the lines were strong and accurately predictable under the extraordinarily low density prevailing in gaseous nebulae.

In the 1930's, Bowen's interests turned increasingly toward astronomy and astrophysics. The 200-inch telescope was being designed, and he took a major part in decisions as to its optical parameters. Later, he was chiefly responsible for the optical design of the equally successful 48-inch schmidt telescope that was also located at Palomar Mountain. He was a Morrison Research Associate at the Lick Observatory in 1938, where he collaborated with A. B. Wyse in a thorough study and interpretation of the spectra of planetary nebulae.

During World War II, on the Caltech ordnance rocket project, Bowen organized, equipped, and directed a group concerned with improved trajectory determination through metric photography. High-speed cameras designed by him were widely applied. He also found time to engage in wartime research on some aspects of oceanography.

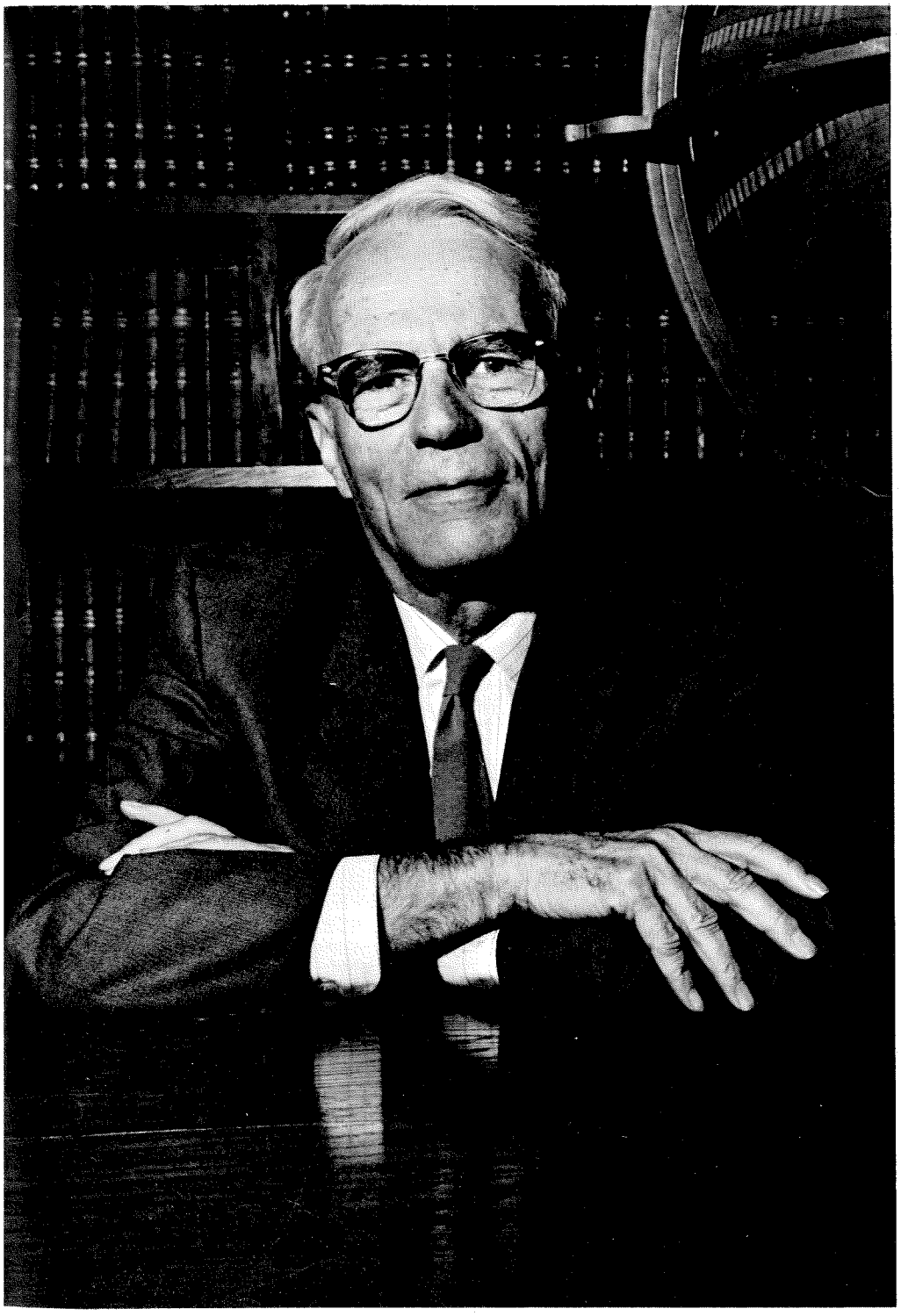
The year 1946 marked the beginning of a new phase of Bowen's career. He assumed the directorship of the Mount Wilson Observatory, and two years later presided over the establishment of the combined Mount Wilson and Palomar Observatories (now the Hale Observatories).

The optical figure of the 200-inch mirror was purposely left with a slightly "turned up edge" when it was transported from the optical shop to Palomar Mountain in 1948. Bowen personally assumed the task of testing the mirror on stars and of guiding the final steps of perfecting its figure by local polishing—accomplished in the dome by the optician, D. O. Hendrix. He took a quiet but firm pride in the performance of the 200-inch Hale Telescope, and sometimes commented on the thoroughness of the planning and engineering that made it such an excellent instrument: 75 man-years of effort by the Observatory Council and the engineering staff were devoted to the design.

In the early years of the Mount Wilson and Palomar Observatories, Ira Bowen took the lead in swinging the interests of many of the group away from investigations emphasizing the precise measurement of spectral wavelengths to those that depended on spectrophotometry—the measurement of the intensity rather than of the position of features in the spectra of celestial objects. This change of emphasis was informally guided by him at a series of gatherings at the Bowen residence on the brink of Eaton Canyon. His gracious wife, Mary, who survives him, contributed memorably to these warmly hospitable occasions. No less important was the support that Bowen gave to extragalactic research at the Observatories by speeding the application of the most modern photoelectric devices for photometry and by personally devising new and ingenious optical systems for the improvement of spectrographs. His effective planning and support were indispensable in the successful completion of the Palomar Sky Survey.

Bowen devised many new instruments and techniques for the advancement of observational astronomy. A partial list would include the baking of photographic plates to reduce reciprocity failure; the image slicer and the employment of composite gratings for improving high-dispersion spectrographs; fast optical cameras and ingenious optical designs for low-dispersion spectrographs; and perhaps of greatest recent import, the improvement of the optical design of telescopes to provide exceptionally large fields of excellent definition.

Although he retired from his administrative post in 1964, Ira Bowen continued



with characteristic energy as the first Distinguished Service Member of the Carnegie Institution. Not only did he remain active in the field of optics, but he found his advice sought more and more by astronomers and telescope designers the world over. He freely gave of his time and vast experience to other telescope and observatory projects, notably to the design of the 120-inch telescope of the Lick Observatory, to the planning of the Kitt Peak National Observatory, and to the design of its major instruments. He was consulted on the planning of the 98-inch Isaac Newton Telescope, the 156-inch Anglo-Australian Telescope, and the 6-meter telescope now approaching completion in the U.S.S.R. Bowen was responsible for the optical design of the new 60-inch telescope at Palomar Mountain. Finally, a most recent major optical design achievement—completed in collaboration with Arthur H. Vaughan—is that of the 100-inch telescope now under construction by the Carnegie Institution for the Las Campanas Observatory in Chile.

Except to a very few of his closest associates, Ira Bowen's peripheral interests were virtually unknown. As a young man, however, he was a devotee of the mountains of California. The trails and lakes of the High Sierra and the ridges and canyons of the San Gabriels were familiar to him. Later, he became a collector of early and rare books on physics and astronomy. He read much history; it was this, apparently, that led to an active interest in numismatics. Bowen left an impressive collection of ancient, medieval, and recent coins of many countries.

Numerous honors came to Ira Bowen during his lifetime: the Gold Medal of the Royal Astronomical Society (of which he was an Associate), the Potts Medal of the Franklin Institute, the Count Rumford Medal of the American Academy of Arts and Sciences, the Bruce Medal of the Astronomical Society of the Pacific, and the Ives Medal of the Optical Society of America. He was a member of the National Academy of Sciences, the American Philosophical Society, and the American Academy of Arts and Sciences, and he was the holder of a number of honorary degrees.