



*Edward . G. Bowen*

## Edward George Bowen

1911-1991

Written by R. Stevens

Submitted by the NAE Home Secretary

This is in Memory of Edward George "Taffy" Bowen. He was counsellor (scientific) to the Australian Embassy in Washington, D.C., chief of the Radiophysics Division of the Australian Commonwealth Scientific and Industrial Research Organization, and scientific officer of the British Air Ministry. He was a pioneer in the development of radar, radio astronomy, radio navigation, and experimental cloud physics. At critical times, in war and peace, he was instrumental in achieving cooperation between academic, industrial, and governmental organizations of the United Kingdom and the United States. Dr. Bowen died August 12, 1991.

Edward George Bowen was born January 14, 1911, in Swansea, Wales. His parents were George and Ellen Ann Bowen. He attended University College, Swansea, earning a B.Sc. (first class physics honors) in 1930, and a M.Sc. in 1931. In 1934 he was awarded the Ph.D. by Kings College, London, for his research under radio physicist Professor Sir Edward Victor Appleton.

In 1935 Dr. Bowen joined a small team of scientists led by Robert Watson-Watt to research and develop the new concept of radar. The work was under the British Air Ministry; it was a closely guarded secret. At Orfordness and Bawdsey, the team soon demonstrated detection of aircraft 100 miles distant. Bowen's role was development of the high-powered pulse

transmitter for the radar. The timely success of the work enabled building a coastal radar network that was vital to winning the Battle of Britain.

Airborne radar to find and follow aircraft and surface ships, especially at night, was another of Britain's urgent needs. Late in 1935 Dr. Bowen was assigned responsibility to create such a radar for practical use in British combat aircraft. By mid-1939, early production models of a cable radar were being installed. Through the war, tens of thousands of the breed were installed in British and Allied forces aircraft. The radar was vital in protecting Britain from night air attacks and in protecting Allied shipping from submarine attacks.

By mid-1940 Britain had decided to share its defense technology with the United States and Canada. Sir Henry Tizard led a mission to the United States and Canada to initiate the process. Dr. Bowen accompanied the mission to advise on military radar and its application. He brought with him a working model of the secret British radar invention: the high-pulse-power centimeter-wave Magnetron. The Magnetron was a breakthrough, and in the course of the war, millions were made and used by Allied forces in Europe and the Pacific. Dr. Bowen remained in the United States for three years, advising scientific, industrial, and governmental leaders on military radar. He helped define the role, mission, and staff profile of a wartime United States radar research laboratory—what soon became the Massachusetts Institute of Technology (MIT) Radiation Laboratory with the distinguished academician Lee A. DuBridge as director.

In 1944 Dr. Bowen accepted an invitation to join the Australian Commonwealth Scientific and Industrial Research Organization (CSIRO), and he and his wife, Vesta, departed for Sydney. Shortly afterward he was appointed chief of the Radiophysics Division, a position he held for twenty-five years. Dr. Bowen assembled and steadfastly supported a talented and energetic group of fledgling radio astronomers led by J. L. Pawsey. The radio astronomy endeavor of the Radiophysics Division soon became, and remains today, world renowned. Since it was commissioned in 1961, the 210-foot radio

telescope at the CSIRO Parkes Observatory has been one of the radio astronomy community's premier technical facilities. Taffy Bowen made it happen.

In the mid-1950s, California Institute of Technology astronomy Professor Jesse Greenstein was devising the institute's entry into radio astronomy. He asked Caltech President Lee DuBridge about an outstanding leader for the enterprise. Dr. DuBridge talked with Taffy Bowen, his friend from the MIT Radiation Laboratory days, and soon John G. Bolton of the CSIRO Radiophysics Division arrived in Pasadena. John Bolton established the Owens Valley Radio Observatory and the initial radio astronomy program for Caltech; then in 1960 he returned to Australia and CSIRO to oversee the construction of Taffy's 210-foot antenna at Parkes.

In the early 1960s, the Caltech Jet Propulsion Laboratory (JPL) undertook for the National Aeronautics and Space Administration (NASA) to design and construct giant antennas to track scientific spacecraft throughout the solar system. William H. Pickering, JPL's director, discussed the project with his friend, Taffy Bowen. In due course, engineers from the Parkes telescope team, including drive system expert Harry C. Minnett, joined the JPL design team. The early collaboration and sharing of lessons learned helped immensely; the network of 210-foot spacecraft tracking antennas that resulted is the mainstay of the NASA/JPL Deep Space Network.

During the "Bowen Years" the Radiophysics Division performed valuable research and development work in radio navigation and experimental cloud physics. The Radiophysics Laboratory adapted and extended previous military developments to meet current civil needs. A very successful instance is the Distance Measuring Equipment (DME) system that provides a precise measurement by radio of the distance from an aircraft to a ground terminal. DME was developed and demonstrated on commercial aircraft by Dr. Bowen's staff in 1950; in 1954 it was required on all passenger aircraft in Australia. The question "How does rain happen?" was getting some scientific answers in the mid-1940s. In 1946 Nobel scientist Irving Langmuir reported that dry ice dropped in supercooled water

vapor induced water drop formation. That interested many persons, including Dr. Bowen. He was especially interested because of the potential for inducing rain in the vast arid regions of Australia, and because he knew well how to use radar to observe internal processes of clouds. Through the 1950s, Bowen and his group investigated naturally and artificially induced rain formation in clouds. The program included carefully planned and executed cloud seeding experiments. The work made a major and lasting contribution to understanding the potential and problems of weather modification.

From 1967 to 1973 Dr. Bowen was a prominent and effective advocate for constructing the Anglo-Australian Telescope. He was appointed chairman of the Anglo-Australian Telescope Board in 1971, and through his good offices brought accord between the contending English and Australian astronomical communities. Design and construction of the telescope proceeded; it was commissioned in 1974.

Dr. Bowen was appointed counsellor (scientific) to the Australian Embassy in Washington, D.C., in 1973. He retired from that position in 1976 and returned to Australia.

Dr. Bowen was elected a foreign associate of the U.S. National Academy of Engineering in 1977.

For his many accomplishments, Dr. Bowen received the following recognition:

- Officer of the Order of The British Empire for contribution to the U.K. war effort (1941)
- The U.S. Medal of Freedom for contribution to the U.S. war effort (1947)
- The Thurlow Award by the U.S. Institute of Navigation for outstanding contribution to the science of navigation (1950)
- Honorary D.Sc. by the University of Sydney (1957)
- Companion of the Order of The British Empire for contribution to Australian science (1962)

In addition Dr. Bowen held the following special memberships:

- Fellow of the Royal Astronomical Society
- Fellow and past vice-president of the Australian Academy of Science
- Fellow and first president of the Australian Institute of Navigation
- Foreign Member of the American Academy of Arts and Sciences
- Fellow of the Royal Society of London

Taffy was an accomplished sailor and cricketer. He had many friends worldwide who miss him dearly.