Bates, Sir David Robert

(1916–1994)

- Alan Cook

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Bates, Sir David Robert (1916–1994), theoretical physicist, was born on 18 November 1916 in Omagh, co. Tyrone, the younger of two surviving children of Walter Vivian Bates and his wife, Mary Olive, *née* Shera. Walter Bates came from Mountrath, Queen's county, and had set up a pharmacist's shop in Omagh. His wife's father was land agent for Lord Justice Ross near Omagh. Bates first went to a private school in Omagh but, to obtain a better education for him and his sister Margaret, his mother moved with them to Belfast, while the father travelled between there and Omagh. Bates attended a preparatory school, Inchmarlo, and the Royal Belfast Academical Institution, 1929–34, of which he was later a governor. He won a scholarship to the Queen's University of Belfast and graduated with first-class honours in mathematical and experimental physics in 1937. His professors were George Emeléus and Sir Harrie Massey. Under Massey he obtained the MSc degree for calculations on atomic recombination in the upper atmosphere, the beginning of a lifelong pursuit.

In 1939 Massey went to University College, London, as Goldschmidt professor of applied mathematics. Bates went with him and began work for a PhD degree, but did not complete it because of the Second World War. During the war he worked first at the Admiralty research laboratory with Massey and others on countermeasures to the magnetic mine, and then at the mine design department at Havant.

After the war Bates became a lecturer at University College, London, and with his research students Michael Seaton and Agnete Damgaard of Denmark began a programme of quantum mechanical calculations of atomic and molecular processes, especially those of importance in the upper atmosphere. For much of 1950 he was in Pasadena, California, and collaborated with Marcel Nicolet from Belgium. He also went to Princeton where he wrote an important paper with Lyman Spitzer on the formation of interstellar molecules. Bates received the DSc degree in 1951 and was appointed reader in physics, but the same year he was elected professor of applied mathematics in the Queen's University of Belfast, and appointed head of the department. He was elected to the fellowship of the Royal Society in 1955 and met his wife, Barbara Bailey Morris, a medical social worker, while in London for the admission ceremony. They were married on 20 March 1956. There were two children, Katherine Mary and Adam.

Bates worked almost entirely on the rates of atomic and molecular processes, especially in the presence of free electrons, and on the interpretation of the properties of natural plasmas in terms of those rates. His earliest investigations concerned ionized oxygen in the upper atmosphere, and he continued to study the atmosphere and ionosphere throughout his career. He developed procedures for quantum mechanical calculations of rates of ionization by collision with electrons, of recombination of ions with electrons with the emission of radiation, of rates of emission of radiation by excited atoms (oscillator strengths), and of recombination of electrons with ionized molecules, followed by dissociation. He and Agnete Damgaard developed the powerful Bates–Damgaard method for the calculation of oscillator strengths, used by himself and others to generate a large body of reliable values. After 1960 Bates had a powerful electronic computer (DEUCE) in Belfast for his calculations.

Through his fundamental work Bates accounted for the main layered structure of the ionosphere. With Marcel Nicolet he demonstrated the importance of oxygen and other molecules in the upper atmosphere and identified radiation from them in the light from the night sky and the dayglow.

Bates built up in Belfast an impressive group of theoretical physicists working on calculations of atomic processes. In his later years he worked particularly on collisions between atoms and molecules. He also studied clouds of interstellar molecules and laboratory plasmas. Widely admired and respected, his co-operation was sought by other groups, in particular the Harvard–Smithsonian Center for Astrophysics, which he visited a number of times.

Bates was deeply attached to Belfast and Ulster and refused many invitations to move to larger and more renowned institutions. By his devotion to his chosen field his own group and department won renown. Not surprisingly he was very distressed by the sectarian troubles in Ulster and the way in which they intensified over the years. He was one of the founders of the Alliance Party and served as vice-president.

Bates published more than 330 articles in scientific journals, a third of them after he suffered a serious heart attack in 1973. He edited books on atomic and molecular physics, and was editor for twenty-eight years of the annual series Advances in Atomic, Molecular and Optical Physics and for thirty-one years of the journal *Planetary and Space Sciences*.

Bates's work was recognized by many honours besides his fellowship of the Royal Society. He was a member of the Royal Irish Academy (1952, vice-president 1976); he was elected to the International Academy of Aeronautics (1961) and to the International Academy of Quantum Molecular Science (1985); and he was a foreign member of the American Academy of Arts and Sciences (1974), of the Royal Academy of Belgium (1979), and of the National Academy of Science (1984). The National University of Ireland, the universities of Ulster, Dublin, Glasgow, Stirling, Essex, York (England and Canada), and the Queen's University of Belfast conferred honorary degrees upon him. He received the Hughes medal of the Royal Society (1970), the Charles Chree medal of the Institute of Physics (1978), the gold medal of the Royal Astronomical Society (1979), and the Fleming medal of the American Geophysical Union (1987). He was made a knight bachelor in 1978 for services to science and education. The European Geophysical Society instituted the Sir David Bates medal in his honour, of which he was the first recipient.

Bates died in Belfast of heart failure on 5 January 1994. He was survived by his wife and two children.

Sources

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- *The Independent* (10 Jan 1994)
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Likenesses

- B. Blackshaw, oils, 1981, Queen's University, Belfast
- photograph, repro. in *The Times*

Wealth at Death

£145,943: probate, 23 May 1994, *CGPLA NIre*.