Antony Hewish
(1924–2021)

Radioastronomer who won share of Nobel for role in discovering pulsars.

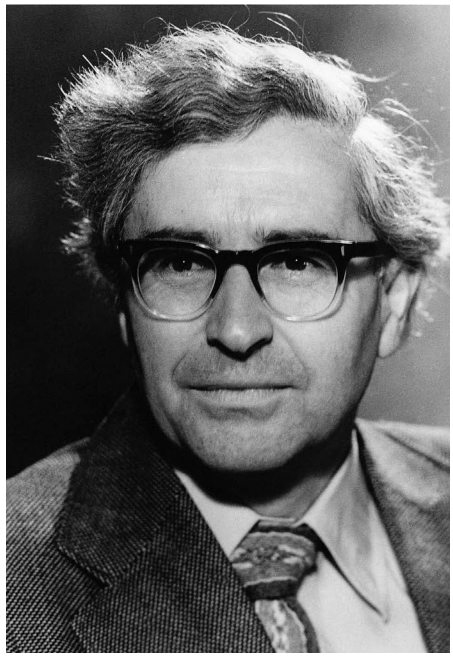
Antony (Tony) Hewish was a pioneering radioastronomer. His research student Jocelyn Bell (later Bell Burnell) made the first detection of a strange scintillating radio source that they subsequently showed was the first identified pulsar. These sources emit intense bursts of radio emission at precise time intervals, like the beam of a lighthouse. At first jokingly called LGM for 'little green men', these enigmatic sources were almost immediately identified as magnetized, rotating neutron stars, one of the end points of stellar evolution. Hewish was awarded the 1974 Nobel Prize in Physics for his "decisive role" in the discovery. He has died aged 97.

This finding opened up new areas of high-energy and relativistic astrophysics. It confirmed the existence of neutron stars, predicted in the 1930s, and showed that Albert Einstein's theory of general relativity could not be ignored in studies of their structures and stability.

As a member of the Cavendish Laboratory's radioastronomy group at the University of Cambridge, UK, Hewish worked initially under the dynamic leadership of physicist Martin Ryle. Ryle and Hewish co-authored papers on aperture synthesis, the technique by which the signals from many small telescopes could be combined to reconstruct the imaging capability of a single, very large one. Ryle shared the Nobel prize with Hewish; Bell's role led many to argue she should have shared the Nobel.

Hewish grew up in Newquay on England's Atlantic coast, where he developed a love of the sea and boats. In 1944, two years into his undergraduate studies in natural sciences at Cambridge, he was sent for war service to the Telecommunications Research Establishment in Malvern, UK, where Ryle was head of radar counter-measures. Hewish worked on a device to jam the interception radar of hostile night-fighter aircraft. He wrote how checking the radiation pattern of the antennas on the ground required crouching in the slipstream of a B-17 Flying Fortress aeroplane, "while bombarded with gravel, dead rabbits, etc."

Hewish returned to Cambridge to complete his undergraduate degree in 1946. He did not hesitate to join Ryle's fledgling radioastronomy group there, following up the recent discovery that astronomical objects, including the Sun, emitted radio waves. Ryle showed Hewish to a large pile of brass tubing, and asked him to cut it into dipole antennas for his arrays. For the next ten years, Hewish worked on a succession of innovative radio telescopes.



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Hewish was the group's expert on radio scintillation, the flickering or twinkling of radio sources. He worked out the theory of radio source scintillation in detail in 1951–52. In 1954, he noted that strong scintillations would be observed from sources of small angular diameter because of plasma irregularities in the interplanetary medium. In 1964, such scintillations were observed in compact radio sources. Many of these were the newly discovered radio quasars. Associated with hyperluminous active galactic nuclei, they were soon to be linked with supermassive black holes.

> "The discovery of neutron stars by this radio technique came as a complete surprise."

Hewish realized that a large array designed to detect low-frequency scintillation would address three important astronomical problems: the discovery of many more radio quasars; the measurement of their angular sizes; and the determination of the structure and velocity of the solar wind, the stream of charged particles flowing out of the Sun. He won a grant of £17,286 (about US$48,000 at the time) to design and build a 1.82-hectare array at the Mullard Radio Astronomy Observatory near Cambridge to detect fluctuating intensities on a timescale of one-tenth of a second.

In October 1965, Jocelyn Bell joined the team as a graduate student. She became responsible for the network of cables connecting the dipoles. The telescope was commissioned in July 1967. Bell meticulously analysed the huge amount of data arriving each day, entirely by hand. On 6 August, she noticed a strange scintillating source that had an unfamiliar radio signature. On 28 November, the apparent scintillation proved to be a train of stable pulses arriving every 1.33 seconds. Nothing like this had been observed before. Bell discovered three similar sources, including one with a period of only 0.25 seconds.

Within a few months of the discovery's publication in *Nature* (A. Hewish *et al. Nature* **217**, 709–713; 1968), the former Cambridge physicist Thomas Gold, then at Cornell University in Ithaca, New York, identified the pulsars as magnetized, rotating neutron stars. The discovery of neutron stars by this radio technique – they were much too faint to be detected by optical telescopes – came as a complete surprise. In the years after, other researchers detected many radio pulsars, including in binary neutron-star systems that provided precision tests of general relativity. Astronomers also inferred that the acceleration of pulsars' orbits is caused by the emission of gravitational radiation.

Hewish also used the scintillation technique to study interplanetary weather. In particular, he identified major plasma outbursts from the Sun that could affect GPS navigation. He led the Cambridge radioastronomy group from 1977–89, and was head of the Mullard Radio Astronomy Observatory from 1982–88.

Tony – a friendly and hands-on colleague and supervisor – had the ingenuity to realize what could be achieved by constructing a low-cost radio telescope with a small team of dedicated research students and assistants. Within this vibrant research environment, discovery thrived.

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