Obituary

Thomas Gold (1920–2004)

Thomas Gold, who died on 22 June, was born in Vienna, Austria, emigrating to Britain along with his family in 1933. Following school in Switzerland, in 1939 he started studying mechanical sciences at Trinity College, University of Cambridge.

In his youth Gold never envisaged becoming a scientist, surprisingly so given the imaginativeness and variety of his later contributions. Evidently it was his experiences during the Second World War that brought science to the forefront of his thinking. He and I lived together in 1940 (in a British internment camp) and again (voluntarily) in 1942–45. In 1942, first I, then Gold, joined Fred Hoyle at the naval radar research establishment, working for the British Admiralty. From 1943, Hoyle, Gold and I spent many evenings together, and Hoyle's enthusiasm for astrophysics soon infected us both.

After the war, again in Cambridge, the three of us resumed our conversations. One of our subjects was cosmology. The main difficulty then was the discrepancy between the timescale of our neighbourhood (the ages of the Earth and the Sun) and that of the rate at which distant galaxies are receding, as determined by Edwin Hubble. This was so serious that such distinguished scientists as Paul Dirac, Edward Milne and Arthur Eddington proposed theories involving major secular changes to the laws of physics. This made us feel that one should first consider a stationary Universe. But the observed Hubble expansion was incompatible with the constant density of matter required for a stationary Universe.

We were stumped over this — until Gold proposed the idea of the continual creation of matter in space. We found no contradictions with known observations. Hoyle chose a different route from Gold and me, so the 'steady-state theory of the expanding Universe' was presented in two separate papers in the autumn of 1948. But only a limited number of astronomers found the theory attractive, and a few were hostile.

Early attempts to disprove our theory failed. Later, developments in astronomical instruments made the subject much more complicated. Most scientists now consider our theory to be disproved, but Gold thought to the end that it was the only valid analysis in cosmology and that a proper critique of the observations would remove any contradictions. Hoyle and two colleagues modified the theory, making it compatible with all observations. But they abandoned the stationary character of our model and therefore its chief attraction for Gold and me.

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A singular scientist

My interests have changed, and I have not worked in cosmology for half a century, so Gold's stand was a lonely one. Unfortunately, there is nobody knowledgeable in modern astronomy who is willing and able to carry out the critique he had hoped for.

Gold also studied questions involving magnetism in the Earth and in space. He and I wrote three joint papers, the last one dealing with the theoretical problem of radiation from a uniformly accelerated electric charge. But he soon moved on to thinking about human hearing. This was characteristic: he would see a difficulty in an unfamiliar subject and become intent on resolving it. The excellent frequency discrimination of our sense of hearing could not then be explained. Gold saw the similarity of the problem to that of receiver design for radio, radar and television, where the sensitivity has to be restricted to a narrow band of frequencies to avoid 'crosstalk'. This is achieved by the use of positive feedback. Gold proposed that the same principle applies to the human ear. This brilliant contribution led to his election to a fellowship at Trinity, but only some 30 years later was his theory accepted by physiologists.

From Cambridge, Gold went to the Royal Greenwich Observatory for the period 1952–56 before moving to Harvard University and then, in 1958, to Cornell University, where he spent the rest of his career. First he was head of the Center for Radiophysics and Space Research there, and then professor of astronomy. Soon after, he became involved in the Apollo space programme (but never tired of pointing out that an unmanned effort could yield much more science for the same money). He designed the astronauts' camera, and also raised the possible problem of the Moon's surface.

The darkness of the Moon was a puzzle. Gold suggested that the Moon is covered by a layer of dust resulting from the ceaseless bombardment of its surface by Solar System debris. But his analysis did not determine the dust's thickness. He warned that a very thick layer could act like quicksand. This suggestion made NASA send a robotic device to analyse the Moon's surface conditions. Although Gold's prediction of a dust layer was fully confirmed, he received little credit for it. Only his warning of the dangers of a deep layer was remembered.

In the late 1960s, radioastronomers discovered intense flashes of radio waves recurring at precise intervals and arriving from specific directions. Their sources were puzzling. Gold proposed the now universally accepted solution: that a very dense object (a neutron star), spinning about its axis, emits radiation along a line fixed in the object. The beam of radiation from this 'pulsar' hits us once in each rotation.

Gold's last major intervention was in geology. He thought that large amounts of hydrocarbons (especially methane) had been part of the Earth as it formed, and that the Earth has been 'outgassing' ever since. The methane rises through a layer of living organisms that he called 'the deep hot biosphere'. This corresponds to the observation of organisms living near mid-ocean ridges at high temperatures and existing on chemical energy. The rising methane acquires its organic 'baggage' there, but its origin is not organic. Most Earth scientists take issue with Gold's view. But if it is correct, reservoirs of hydrocarbons exist deep underground almost everywhere, with potentially enormous geopolitical consequences.

Tommy Gold will long be remembered as a singular scientist who stepped into any field where he thought an option was being overlooked. He was also unusual in working mainly theoretically, but using little mathematics, relying instead on his profound intuitive understanding of physics.

Hermann Bondi

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