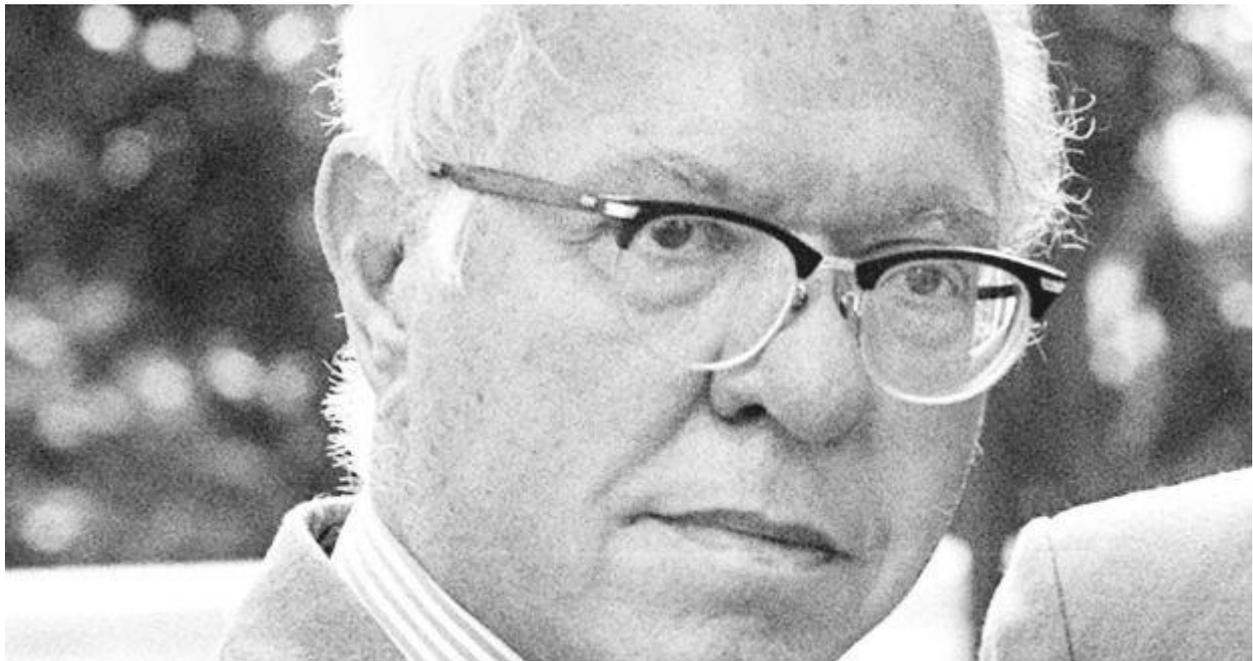


Fred Hoyle: The brilliant man who lost the Big Bang debate

Hoyle's resistance to Big Bang provoked astronomers into testing the theory of the universe

The Irish Times, Thu, Oct 29, 2015, 01:00
Cormac O'Raifeartaigh

2



Fred Hoyle, a brilliant and controversial figure who made a number of original contributions to 20th-century physics

Earlier this month, I attended a meeting at the [Royal Astronomical Society](#) in London in memory of the celebrated British [astrophysicist Fred Hoyle](#). Hoyle was one of the best-known physicists of his generation, a brilliant and controversial figure who made a number of original contributions to 20th-century physics.

It was a great treat to hear many of his former colleagues and students recall his contributions to science, from astrophysics to nucleosynthesis and from cosmology to astrobiology. However, Hoyle will always be remembered in the public mind as the scientist who was wrong about the [Big Bang](#).

Following the discovery that the universe is expanding on the largest scales (a phenomenon predicted by Einstein's general theory of relativity), the Belgian physicist Georges Lemaître suggested that our universe may have started as a hot, dense fireball

many billions of years ago, expanding and cooling ever since; a hypothesis later named the Big Bang.

Many physicists found Lemaître's Big Bang universe rather far-fetched, and the theory fell to one side for some years as there was no obvious way to test it. Then, in 1948, Fred Hoyle, a young professor at [Cambridge University](#), suggested an intriguing alternative: perhaps the expanding universe could remain unchanged over time if matter was continuously created out of empty space? This "steady-state universe" was attractive to many scientists because it did not require any speculation about cosmic origins or the behaviour of the universe in the distant past.

A serious debate arose between the steady-state and Big Bang theories during the 1950s and 1960s. The debate became rather bitter at Cambridge, when a group led by the astronomer Martin Ryle embarked on a systematic study of the galaxies using the new technique of radio astronomy. The purpose of this project was to study the distribution of the galaxies at different epochs, with the specific aim of proving that we live in an evolving Big Bang universe.

After a decade of uncertain results, the Ryle group eventually demonstrated that their observations supported the Big Bang model. Soon afterwards, their result was bolstered by an unexpected discovery by American astronomers: a universal background radiation thought to emanate from the hot infant universe (now known as the cosmic microwave background).

Increasingly contrived

It is fair to say that Hoyle was not pleased with the results from astronomy. He made many efforts to cast doubt on the data of the Ryle group, and suggested alternative explanations for the cosmic microwave background. Later, he proposed many modifications of his steady-state theory, but most physicists found his model increasingly contrived.

Meanwhile, astronomical evidence for a Big Bang universe continued to accumulate. Thus, it is often said that Hoyle was wrong on the Big Bang. However, such a statement is a little unfair in the sense that the evidence against Hoyle's theory was not available when it was first proposed. Indeed, Hoyle's steady-state model was a reasonable hypothesis at the time, as I pointed out in my talk at the conference.

I also made the point that we now know that Einstein considered a steady-state model of the expanding universe some time before Hoyle, a little-known fact unearthed by my research group a few years ago.

Hoyle lost the Big Bang debate, and he became very isolated in his later years, having taken early retirement after a dispute with university administrators at Cambridge.

However, his resistance to the Big Bang model played an important part in provoking astronomers to test the theory.

He made many other contributions to physics, notably the first successful model of the synthesis of the chemical elements in the stars (stellar nucleosynthesis). He also suggested that life on Earth might have been seeded by bacteria on comets, a suggestion that opened up an entirely new academic field known as astrobiology. But, outside of the UK, Fred Hoyle will always be remembered as the man who was wrong on the Big Bang.

- **Dr Cormac O’Raifeartaigh lectures in physics at [Waterford Institute of Technology](#) and is a fellow of the Royal Astronomical Society. He will give a public lecture, *Einstein’s Universe: Relativity and the Big Bang*, at the Dublin Institute for Advanced Studies on Burlington Road at 7pm on November 9th. Places must be prebooked on [dias.ie](#)**