

## Mary Hesse Obituary, The Times

The idea that matter is composed of minuscule particles, or atoms, can be traced back to the Greek philosopher Democritus in about 400BC. It was not until 1808 that the atomic concept was described formally by John Dalton, one of the greatest early English scientists, who formulated the idea that gases are composed of solid, indivisible and indestructible units, much like balls bouncing around a billiard table. Dalton's atomic theory became almost immediately known as the billiard ball model of matter; the analogy is still used today.

There are many examples of analogy and metaphor in science, from the idea that light travels through space much as sound waves pass through air or water waves pass through the oceans, to the concept of the "selfish" gene. It was Mary Hesse, a towering figure in the philosophy of science, who dissected the use of metaphor and models by scientists to see just how well and accurately they encapsulate the true nature of science — and why they fail.

Hesse explained the way in which scientists go about their business of deconstructing the laws of the natural world by the construction of intellectual models, metaphors and analogies that are used as a convenient, if not always accurate, way of explaining the complexities of science. She will perhaps be best remembered for striking a middle path between the two extreme views of science: as a cool, objective activity, as was endorsed by Karl Popper, and the ideas of Thomas Kuhn, who viewed science as a subjective and culturally dependent ideology.

She showed how science is governed by metaphor, often drawn from culture **Michael Ruse**

Hesse trained as a mathematician and early on in her academic career turned her analytical mind to the subject in which she became a world authority. As a philosopher of science she focused on the interpretation of logic and scientific methods, as well as the principles of science. In particular she developed the understanding of how science progresses with the help of simple comparisons between what is known and what is still under study, using metaphor, analogy and modelling.

The billiard ball model, for example, could help to explain the dynamical theory of gases, where gaseous molecules are bouncing off each other in space, much like the balls on a table. The understanding of light would be easier explained if it were compared to waves of sound or water, even if the transmission of light can occur in a vacuum without any transmission medium.

Hesse's book, *Models and Analogies in Science* (1963) is widely considered to be her most influential work, and a seminal contribution to the field. It is written as an imaginary dialogue between two scientists, a "Duhemist", who believes that analogies in science may be useful, but are not absolutely essential, and a "Campbellian", who believes that models are essential to the logic of scientific theories. For some philosophers of science, it was her work on metaphor in particular that became her single greatest academic contribution.

Hesse's study of metaphor in science provided that middle ground between the two competing views of Popper and Kuhn, according to Michael Ruse, a professor of the history and philosophy of science at Florida State University in Tallahassee. "By the middle of the 1960s the traditional philosophical view of science, one endorsed, if not created, by Karl Popper, was of something cool and objective — as Popper used to say, 'Knowledge without a knower.' Then came Thomas Kuhn's *The Structure of Scientific Revolutions*, shattering that image and suggesting that science is a lot more subjective and dependent on the culture of the day. Objectivity is a myth put out by scientists to give themselves stature and research grants," Ruse explained.

“Mary Hesse, through her work on metaphor — good Anglican that she was — showed us the middle way. She showed how science is governed by metaphor, often drawn from culture. Natural selection, continental drift, force, attraction, repulsion, is applied to the real world, both shaping our understanding and being constrained by objective reality. For many of us, it was the beginning of a lifetime’s worthwhile creative thought,” he said.

Mary Brenda Hesse was born in Reigate, Surrey, on October 15, 1924, to Ethelbert (Bertie) Thomas Hesse and Brenda Hesse (née Pelling). When she was about five years old the family moved to Croydon, where she attended the small, private Woodford School.

Her brother Richard, 16 years her junior, remembers sharing similar interests to Mary, passed on to them by their father: “A love of the Surrey countryside, cycling, walking and the subjects of history and geography, including being avid users of the old one-inch Ordnance Survey maps.”

When Hesse finished school the Second World War was in its third year, and she took a job at the Philips electrical factory in Morden. She walked the hour and a half each way to get to work and home again, Richard recalls.

Mary was shut out from college life by the mere fact that she was a woman **Sir Richard Evans**

In 1943 Hesse became an undergraduate at Imperial College London, achieving a bachelor’s degree in mathematics in 1945, followed by a PhD in electron microscopy in 1948. She also studied history and philosophy of science at University College London, achieving a master’s in 1950. She taught the subject at the university from 1955 to 1959. In 1960 she arrived at the University of Cambridge as a lecturer in the fairly new department of the history and philosophy of science, and was appointed professor of philosophy of science in 1975, a position that she held until her retirement. She retired early because she was dissatisfied with the sociological turn that the history and philosophy of science was taking at Cambridge.

Hesse’s research interests at Cambridge included the history of physics from the 19th century, the relationship between theory and observation in science and the relationships of the natural and social sciences with religion. She was a committed Presbyterian.

Her books include *Forces and Fields* (1961), *Models and Analogies in Science, Revolutions and Reconstructions in the Philosophy of Science* (1980), and *The Construction of Reality* (with M Arbib, 1986).

One of the few female lecturers in Cambridge at that time, her first five years at the university were made difficult by the male-dominated establishment. “Mary was shut out from college life by the mere fact that she was a woman, and so not allowed to dine in any of the men’s colleges, even as a guest,” said Professor Sir Richard Evans, the president of Wolfson College. This changed when she became a fellow of Wolfson, with which Hesse retained a close, lifelong association, which included being elected vice-president in 1976, a position which she held until 1980.

Even in her retirement Hesse frequently came to the college, especially for Saturday brunch, where she was a magnet for former students, academic visitors and acquaintances, Evans: “She was always approachable and had a gift for friendship.”

Hesse was a deeply private person and little is known of her personal life, except that she never married. In retirement she turned to landscape history and archaeology, recalling, no doubt, her childhood fascination with one-inch Ordnance Survey maps.

She took to this hobby with the professionalism of a skilled academic. She went on field trips and gained a certificate in archaeology, and then in landscape history, at Madingley Hall in Cambridge, researching the place names and field patterns of the surrounding districts and reinterpreting significant entries into the Domesday Book in the process, according to Evans.

“Many of the sites she tramped over herself. This led her to be elected president of the Cambridge Antiquarian Society, after having acted as honorary secretary. She thus achieved eminence in two entirely separate fields, a rare achievement,” he said.

Although she guarded her privacy, Hesse welcomed visitors into her home. In 2009 Ruse was touring the UK with his 21-year-old daughter Emily when he phoned Hesse, who by then had been in retirement for many years: “She could not have been nicer — a glass of sherry and real interest in Emily for herself — I think it was a special way of communicating with young women setting out in their careers and needing friendship and support, very impressive.”

In the last three years of her life Hesse suffered progressively from Alzheimer’s disease and bemoaned the fact that she, a once great mathematician, could no longer count the change in her purse, according to her brother Richard. “From the messages I have received,” he said, “it is evident that Mary was unique in her specialist field, philosophy of science, highly qualified yet so modest and understanding. Also, she was a special friend to many and a very nice person to know.”

**Mary Brenda Hesse, philosopher of science, was born on October 15, 1924. She died on October 2, 2016, aged 91**