



Actor who was the
voice of the Daleks

Royce Mills

Page 54



Register

Obituaries

Professor David J Thouless

Physicist who shared the Nobel prize in 2016 for research that opened new possibilities in computing and electronics but shunned TV

David Thouless's gift for numbers was obvious even at the age of four. When discussing with his father how high it is possible to count, the boy reached 500. The youngster was also blessed with discipline and persistence, because he kept counting, heading towards 2,000. By the end of his recitation his family were impressed and bored in equal measure. Aged seven he set himself the task of figuring out how many seconds there are in a year (answer: 31,536,000).

Thouless was raised in an intellectual environment. His parents were academics and his father liked to discuss philosophy with a clever, if intense Austrian friend who occasionally came to the family's home in Cambridge — Ludwig Wittgenstein.

Thouless was in his eighties when awarded half of the 2016 Nobel prize in physics, with the remaining share going to two other British physicists who also became naturalised American citizens: J Michael Kosterlitz of Brown University and originally from Aberdeen, and Duncan Haldane of Princeton University, born in London. The three scientists applied topology to physics. It is a branch of mathematics sometimes termed "rubber-sheet geometry" because it examines the properties of objects that can be stretched, twisted and otherwise deformed.

The prize was given "for theoretical discoveries of topological phase transitions and topological phases of matter" — such an abstract and confounding field to the uninitiated that Thors Hans Hansson, a committee member, gamely tried to explain topology during the announcement by pulling a cinnamon bun, a bagel and a pretzel from a paper bag. What matters to a topologist, he said, is not the taste or shape, but the holes — none in the bun, one in the bagel and two in the pretzel. "The number of holes is what a topologist would call a topological invariant," he said. In other words, manipulate the bread however you like, the holes remain.

The Royal Swedish Academy of Sciences praised the winners for opening "the door on an unknown world where matter can assume strange states. They have used advanced mathematical methods to study unusual phases, or states, of matter, such as superconductors, superfluids or thin magnetic films. Thanks to their pioneering work, the hunt is now on for new and exotic phases of matter. Many people are hopeful of future applications in both materials science and electronics."

One sphere that may benefit from the foundations laid by Thouless is quantum computing, which promises to allow complex information to be processed at vastly faster speeds than is possible with traditional computers.

Thouless's brain often seemed to be doing something similar. According to Marcel den Nijs, one of his co-authors, his mind raced at such an advanced level that it was hard for others to keep up. They had more chance of overtaking him on the road, where Thouless drove a camper van that made an

unlikely contribution to his success. He and his wife, Margaret, travelled abroad during a year's sabbatical in the late 1960s and lent their Bedford Dormobile to neighbours, who moved to Bristol. On his return to Britain, Thouless went to reclaim the van, stopping for lunch with John Ziman (obituary, February 1, 2005), a physics professor at the University of Bristol. The conversation inspired Thouless to explore new research paths and he produced groundbreaking work in the years that followed.

He collaborated with Kosterlitz, a younger, enthusiastic researcher, and they published a paper in 1973 on what is known as the Berezinskii-Kosterlitz-Thouless transition theory. The theory explores phase transitions — such as substances changing from solids to liquids to gases — in two-dimensional materials, such as thin films, during temperature changes.

It was a key element in the Nobel award 43 years later as their work became fashionable among new generations of physicists. What might once have seemed an esoteric exercise in theoretical puzzle-solving now looked like a guide for practical applications with great potential value.

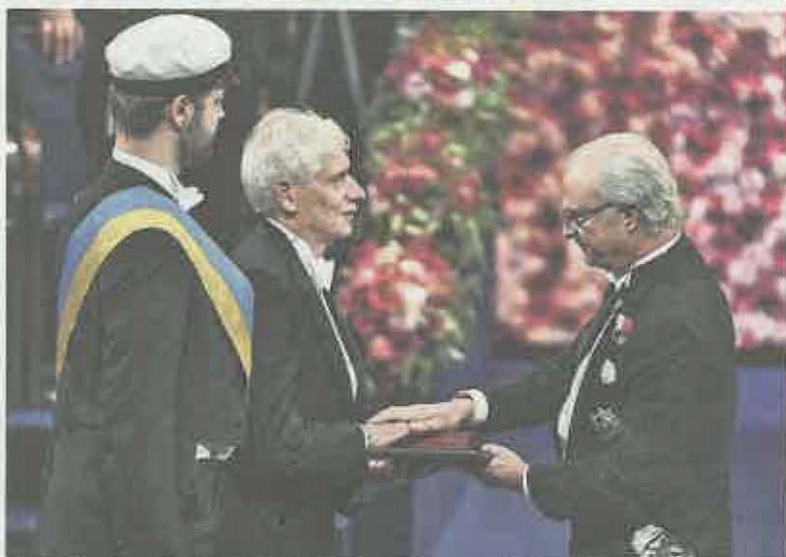
David James Thouless was born in the Glasgow suburb of Bearsden in 1934 and educated at St Faith's School, Cambridge, and Winchester College, where he came top in the scholarship examination. While his work was exceptional, his teachers were less impressed by his messy handwriting, so he made calculations on scrap paper before copying them neatly into his exercise books.

His mother, Priscilla (née Gorton), taught English at the University of Manchester, where she had studied literature on a scholarship. His father, Robert, was a scholar in natural sciences at Cambridge and in 1930 wrote *Straight and Crooked Thinking*, a classic how-to guide for winning arguments without resorting to irrational and distorted claims.

Thouless had a strong moral compass, with a loathing of fascist regimes informed by growing up during the Second World War. His uncle Neville Gorton was Bishop of Coventry, and he became a committed Anglican.

In 1954, while Thouless was reading natural sciences at Trinity Hall, Cambridge, the Soviet chess grandmaster David Bronstein played simultaneous matches against 25 members of the university chess club, winning 19 and drawing five. He was beaten, though, by Thouless.

The British scientist was lost to chess, however, when he entered graduate school and decided to devote all his brainpower to physics. He was offered the chance to study for a PhD at Cornell, an Ivy League university in New York state, under Hans Bethe (obituary, March 8, 2005), who helped to develop the atomic bomb, won the Nobel prize in physics in 1967 and later campaigned for the peaceful use of



David Thouless, top, teaching in 1987 and, above, in 2016 receiving his Nobel prize from the King of Sweden. Left: on a stamp issued to celebrate his achievement

nuclear technology. Thouless then spent a year in California on a postdoctoral fellowship at what is now called the Lawrence Berkeley National Laboratory, where he taught atomic physics, before returning to Britain in 1959 to take up a research role at the University of Birmingham. Here he was one of a number of talented scientists under the direction of a German-born British

physicist called Rudolf Peierls, who was influential in the nuclear weapons programmes in Britain and the US.

He returned to Cambridge as a lecturer and fellow of Churchill College. In 1965 he made a lengthy voyage to a conference in Akademgorodok, a Siberian "academic town" and the nuclear physics hub of the Soviet Union, despite suffering with pneumonia the previous

winter. Unusually, given the Cold War tensions, Soviet and western scientists were able to hobnob unmolested by security forces.

In the same year, at the age of 31, he was appointed professor of mathematical physics at Birmingham, which he held until 1978. With opportunities limited, given the economic malaise, Thouless reluctantly left Britain and, after short spells at Queen's University in Ontario and Yale in Connecticut, he moved to the University of Washington in Seattle in 1980. There he worked with others using topology to explain a phenomenon known as the quantum Hall effect, which was also a factor in the Nobel award.

At Cornell he had met Margaret Scrase, who became an associate professor of pathobiology at the University of Washington. They were married in 1958. She survives him along with their three children: Michael, who is a professor of mechanical engineering at the University of Michigan; Christopher, a zoologist in Kenya and director of the

He made the voyage to a conference in Siberia despite his pneumonia

Elephant Crisis Fund; and Helen, who is a lecturer in mathematics education at University College London.

Thouless did not have a television, preferring outdoor pursuits (a camping trip in Canada was enlivened when he tried to save the family's breakfast from thieving raccoons). A man of slender build, he was an introvert with a sharp-eyed intensity leavened by a broad smile. "He could be genial enough when circumstances warranted," his son Michael said, "but he was not fond of small talk, which meant that if he had something to say to you, you needed to pay attention, and what you thought was a casual conversation might quickly take on the aspect of a thesis defence."

Among other honours, Thouless was elected a fellow of the Royal Society in 1979, became a member of the US National Academy of Sciences in 1995 and was awarded the Wolf prize in physics in 1990. He retired in 2003 and became professor emeritus at Washington. In retirement he enjoyed the recreational opportunities afforded by the mountains, lakes and rivers. He read history books avidly and grew fruit and vegetables in his garden.

He became an honorary fellow of Trinity Hall in 2014 and returned to live in Cambridge, where the family had a home, in 2016. By the time of the Nobel award he was in the grip of dementia. Still, he was deeply moved by the prize and well enough to travel to Stockholm for the ceremony. "Beneath his mental rigour," Michael said, "there was also a deep well of affection and tenderness, which came ever more to the front in his last years as dementia progressively peeled away the intellectual aspects of his character."

Professor David J Thouless, FRS, condensed-matter physicist, was born on September 21, 1934. He died of pneumonia on April 6, 2019, aged 84