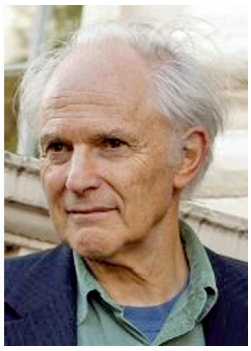
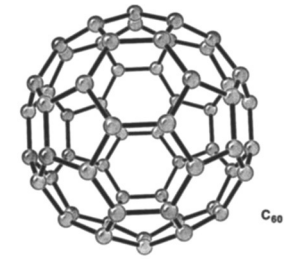


Sir Harold Walter Kroto

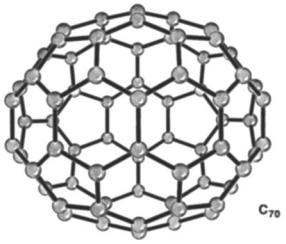
Sir Harold Walter Kroto (1939–2016)

Leader in the Field of Fullerene Research

On April 30, 2016, Sir Harold (Harry) Kroto, Nobel Prize winner and Professor of Chemistry passed away aged 76. Kroto's name will always be associated with C_{60}, the discovery of which resulted in the award of the Nobel Prize in Chemistry in 1996 to Kroto, Rick Smalley, and Robert Curl. The events surrounding the discovery of C_{60} must rank as a definitive example of serendipity in research—an experiment designed to aid the discovery of molecules in space that ultimately led to an entirely new branch of condensed-phase physics and chemistry.

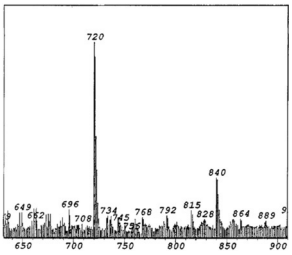


C_{60}



C_{70}

Kroto was born Harold Walter Krotoschiner in 1939 in Wisbech, Cambridgeshire; his parents were refugees from the National Socialist regime in Germany. The family settled in Bolton after the war, and from there he went to Sheffield University in 1958 to study chemistry. After taking a PhD in molecular spectroscopy with Richard Dixon, Harry went first to the National Research Council Laboratory in Canada to work with Gerhard Herzberg and then spent time at Bell Laboratories in New York. He returned to the UK in 1967 as a tutorial fellow at the University of Sussex and rose through the ranks to become Professor of Chemistry in 1985. In 2004, Harry accepted a position at Florida State University, Tallahassee, but returned to live in Sussex when he retired in 2015. Kroto was elected a fellow of the Royal Society in 1990 and was knighted for services to science in 1996. He was the recipient of many awards in addition to the Nobel Prize, including the Royal Society's Michael Faraday Medal and Lectureship in 2001 and the Copley Medal in 2004.



As a young lecturer at the University of Sussex, Kroto began developing experiments to study the rotational spectra of transient species containing main-group-element atoms in multiple bonds with carbon atoms. Selected precursors were thermalized at the entrance to a microwave spectrometer to produce high-resolution spectra of such species as $CH_2{=}PH$ and $CH_3CH{=}S$.

The next step in this work was to lead ultimately to the Nobel Prize. David Walton, a colleague at Sussex, had been synthesizing long-chain molecules of carbon atoms, and to Kroto their spectroscopy seemed ideal as a means of testing how rotational and bending motions couple. However, in association with Takeshi Oka, it was found that the accurate spectroscopic measurements also resulted in HC_5N, HC_7N, and HC_9N, which belong to the heaviest molecules in space. It soon became apparent to Harry that large carbon-containing species could be an integral part of the composition of some interstellar dust clouds.

A visit by Robert Curl to Sussex in the early 1980s introduced Harry to the technique of laser vaporisation that Rick Smalley had been using to create transient species from refractory materials—SiC_2 being a classic example. Following visits to Smalley's laboratory in 1984 and 1985, Harry became convinced carbon chains might hold the key to identifying the elusive diffuse interstellar bands, and that laser vaporization of solid carbon might simulate conditions found close to giant carbon-rich stars. However, once C_{60} and C_{70} had been identified by mass spectrometry, links to space chemistry became secondary to the emergence of what became known as fullerene science.

At first the proposal that two peaks in a mass spectrum might represent a whole new branch of chemistry was met with some scepticism from his colleagues. Harry remained convinced of the significance of this discovery; but it was a bittersweet moment when in the summer of 1990 he received a manuscript by Wolfgang Krätschmer and co-workers in which the synthesis of isolable quantities of C_{60} was described. Sweet, in that the work vindicated Harry's conviction that the fullerene family of molecules was something unique and special, but bitter, in that working parallel to Krätschmer, Harry and a student, Jonathan Hare, were just days away from isolating their own sample of C_{60}. More about the work that led to the Nobel Prize can be found in two Reviews by Harry Kroto in *Angewandte Chemie*: "C_{60}: Buckminsterfullerene, The Celestial Sphere that Fell to Earth" (*Angew. Chem. Int. Ed. Engl.* **1992**, *31*, 111) and "Symmetry, Space, Stars, and C_{60} (Nobel Lecture)" (*Angew. Chem. Int. Ed.* **1997**, *36*, 1578).

Once reliable techniques had been developed to synthesise fullerenes on laboratory scales, there followed an explosion of both synthetic chemistry and hyperbole—C_{60} was going to solve most if not all of humankind's problems. Harry did not subscribe to the latter view. However, the story does go full circle—last year a very elegant experiment by John Maier and co-workers provided conclusive evidence for the existence of C_{60}^+ in the interstellar medium.

In addition to research, Harry was also passionate about education and the teaching of science to young people. In 1994, he established the Vega Science Trust, which began as a catalogue of inspiring lectures by famous scientists, but went on to become a world-wide teaching resource. The move to Tallahassee in 2004 provided the opportunity to expand his outreach activities to schools and colleges, and up until a year ago Harry was criss-crossing the world to give public lectures and workshops. He was an inspiring teacher and was

only too willing to share his passion for science to audiences young and old.

I was fortunate to be able to visit Harry just a few weeks before he died. Although quite frail, he still wanted to talk science and was quite critical of recent work on a graphene derivative. He was an original and very creative scientist whose contagious enthusiasm for research and teaching will be sadly missed.

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