The Diffuse Interstellar Bands

C_{60}: Buckminsterfullerene

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During experiments aimed at understanding the mechanisms by which long-chain carbon molecules are formed in interstellar space and circumstellar shells, graphite has been vaporized by laser irradiation, producing a remarkably stable cluster consisting of 60 carbon atoms. Concerning the question of what kind of all-carbon atom structure might give rise to a superabundant species, we suggest a truncated icosahedron, a polyhedron with 60 vertices and 92 faces, 12 of which are pentagonal and 20 hexagonal. This object is commonly encountered as the football shown in Fig. 1. The C_{60} molecule which results when a carbon atom is placed at each vertex of this structure has all valences satisfied by two single bonds and one double bond, but many resonance structures, and appears to be aromatic.

![Graphene Nanotube and Laser Experiment Diagram](image)

![Mass Spectrum](image)

![C_{60} Molecule](image)
Space, Stars, C_{60}, and Soot

Harold Kroto

was a more elegant and, at the time, overwhelming solution—the truncated icosahedron cage:

This structure negates the throwing of a dart to the wind. The Greek word for wind is ψηλή, and it was proposed immediately (22). After all, it was surely too perfect a solution to be wrong. We named C_{60}.

10-GEODESIC DOME (1954)

U.S. Patent 2,488,270
APPLICATION—DECEMBER 12, 1945
Serial No. 48,108
Patented—JUNE 25, 1950
Leonhard Euler
1707-1783
CHROMATOGRAPHY

Fig. 2. Absorbance FT-IR spectra of films of chromato graphically separated C_{60} and the C_{60} fullerene derivative. Absorbance values are for samples with uncontrolled thicknesses.
Representations of the two spin states of the proton interacting with a magnetic field

Spin $\frac{1}{2}$
- Low energy

Spin $\frac{1}{2}$
- High energy

The molecular structure of bromoethane

The expected NMR spectrum for bromoethane

Area ratios 2 3

The spin of proton $H_y$ can be "up" or "down"
The spins for protons $H_y$ can be "up", can be opposed (in 2 ways) or can both be "down".

The spins for the protons $H_y$ can be arranged as shown in (a) leading to four different magnetic environments.

The NMR spectrum of $CH_3CH_2Br$ (bromoethane) with TMS reference.

The molecule (2-butanone).
A technician speaks to a patient before he is moved into the cavity of a magnetic resonance imaging (MRI) machine.

A colored Magnetic Resonance Imaging (MRI) scan through a human head, showing a healthy brain in side view.
The future has always depended on our ability to see new possibilities.