The Discovery of $C_{60}$

ACS Philadelphia 2016
Rick atop Ap2
Cluster beam TOF mass spectrometer

- Laser vaporization
- Cluster Source
- 20” Diffusion Pump
- 6” Diffusion Pumps
- UV Laser Ionization
- Ion Detector
Cluster beam source
Harry Kroto
Carbon Chain Molecules Found in Interstellar Clouds

H-C≡C-C≡N
H-C≡C-C≡C-C≡N
H-C≡C-C≡C-C≡C-C≡N
Emulating the Stars in the Lab

Space

Red giant

Laser

NH₃

He

Laboratory

HCCCCCN

He

H

C

C⁺

He

N

C₃

C₂
The Diffuse ISB’s
Origin of the Diffuse Interstellar lines

Here I suggest that the lines are caused by the absorption of polyatomic molecules and that the line width is the result of radiationless internal conversion between stable states. Furthermore, I propose that the absorbing species are long chain carbon molecules, $C_n$, where $n$ may lie in the range 5-15.

Rohlfing, Cox, and Kaldor, Supersonic Carbon Cluster Beams

Ion Signal vs. Cluster Size (Atoms)
Variations in $C_{60}$ peak intensity
Buckminster Fuller’s Dome at Expo
Kroto’s Stardome
Map of the sky on a truncated icosahedron consisting of pentagons as well as hexagons
Buckminsterfullerene

\[ C_{60} \]
Osawa 1971
Adjacent Pentagon Fullerenes

$C_{36}$

$C_{60}$

One of 1812 fullerene isomers with 60 carbon atoms
After bucky $C_{60}$, this $C_{70}$ structure is the first without adjacent pentagons.
Ariadne

Daedalus . . . has conceived the hollow molecule, a closed spherical shell of a sheet-polymer like graphite, whose molecules are flat sheets of benzene-hexagons. He proposes to modify the high-temperature graphite process by introducing suitable impurities into the sheets to warp them .. reasoning . . . that it will ultimately close on itself.

David E. H. Jones
New Scientist, 3 November 1966
Arc Apparatus for Making Fullerenes

Krätschmer
*et al.*
The diffuse interstellar bands

In the original letter to *Nature*, we suggested that buckminsterfullerene might be a carrier of the dib’s.

After enormous creative effort, John Maier’s group found two clear matches* of C60+.

Konarka flexible portable panel