BUCKY BALL
THE C_{60} STORY.D

THE C_{60} STORY

*SMALLEY CONNECTED HIS LASER ABBLATION NOZLE EXPANSION SYSTEM TO TIME OF FLIGHT MASS SPECTROMETER..

*CONTRACTED WITH EXXON TO BUILD KALDOR A SIMILAR SYSTEM.

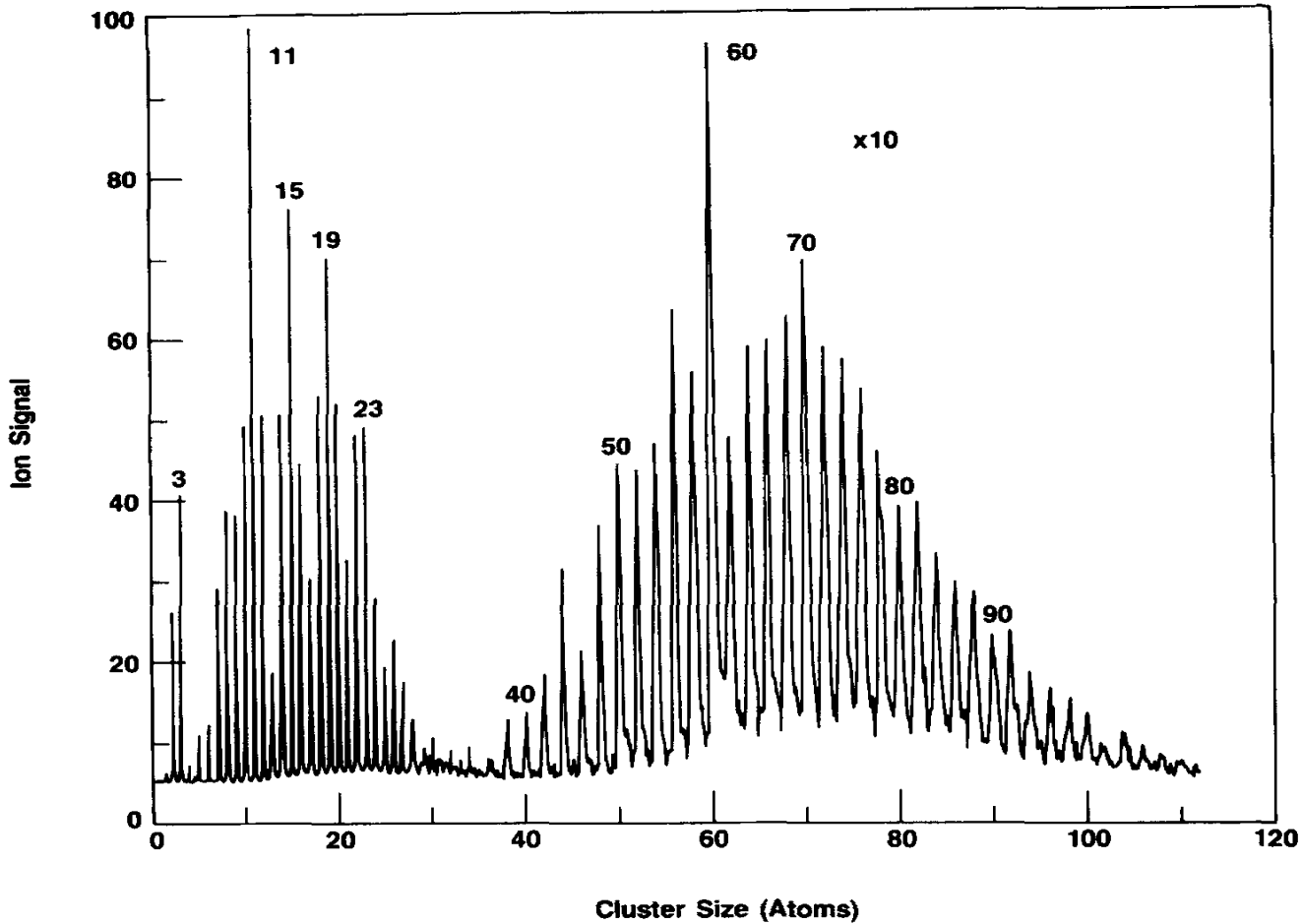
*BOTH BEGAN VAPORIZING MATERIALS TO MAKE AND DETECT COLD CLUSTERS.SMALLY MOSTLY METAL AND SEMICODUCTOR CLUSTERS.

*ROHLFING, COX& KALDOR WERE THE FIRST TO DETECT FULLERENES BY VAPORIZING CARBON IN 1984.

* KROTO & CURL CONVINCED RICK TO VAPORIZE CARBON.

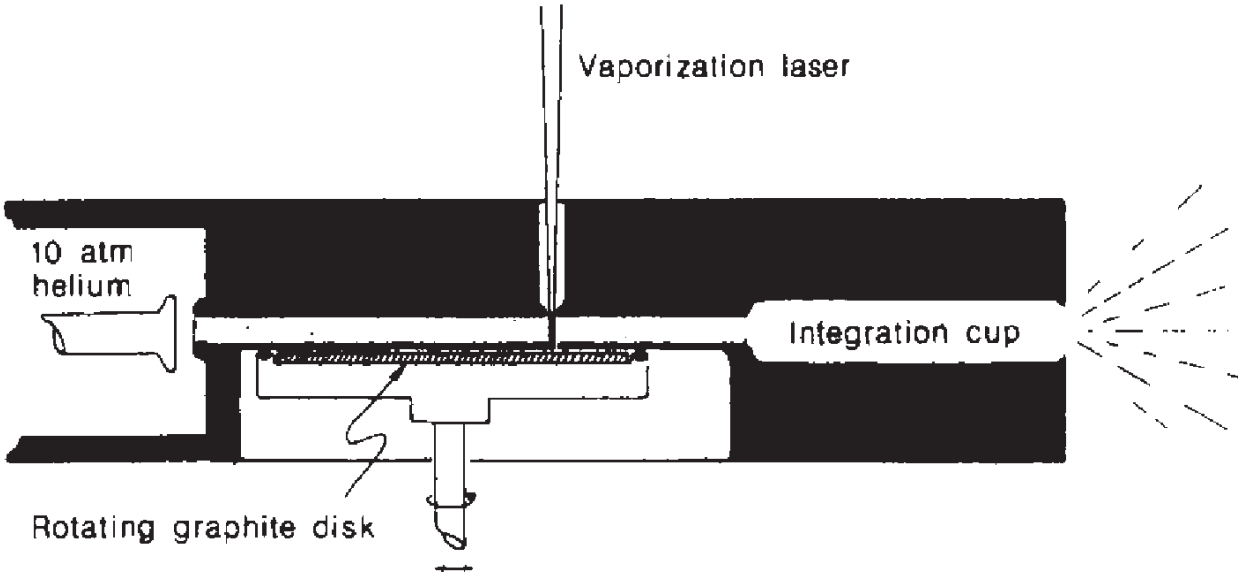
*IN SEPTEMBER 1985,SMALLEY WITH JIM HEATH ,O'BRIAN,KROTO&CURL,USING IMPROVED SYSTEM, SAW UNUSUALLY STRONG MASS PEAK FOR C_{60} FULLERENE !!!

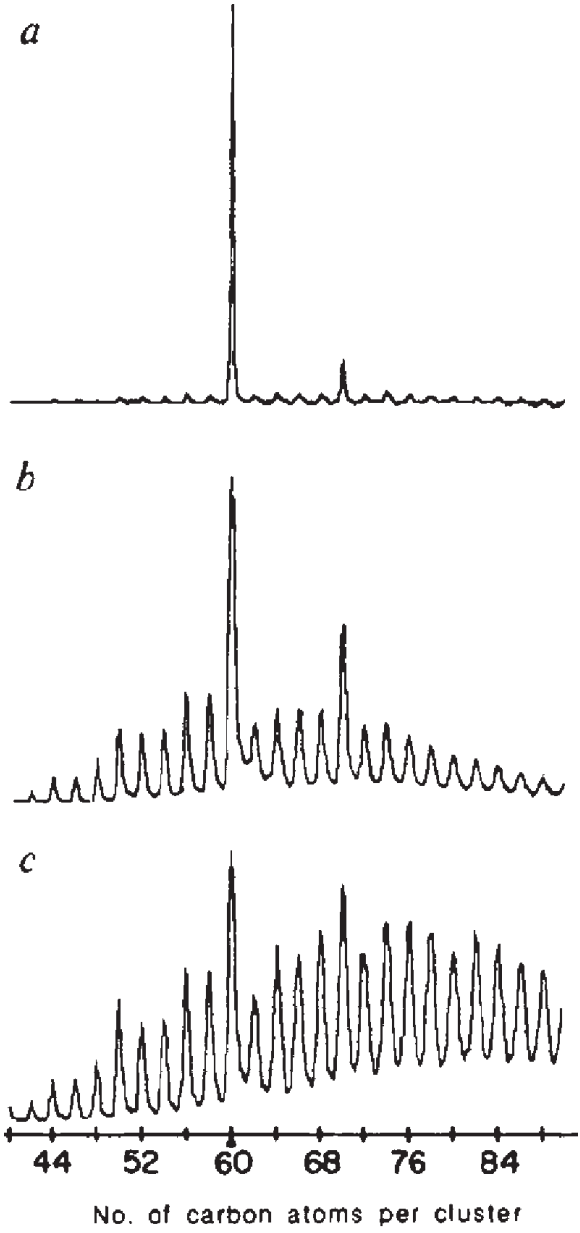
THE FIRST FULLERENE MASS SPCETRUM



Nature VOL. 318 14 November 1985

C_{60}: Buckminsterfullerene





THE 1996 NOBEL PRIZE IN CHEMISTRY

- Smalley,kroto&curl spent 5 years trying to convince the world of the bucky (soccer) ball structure.
- The independent theoretical prediction of the stability of c_{60} soccor ball type structure by tony haymet at uc berkely.
- The very unreactive nature of c60 with many gases (e.G.No,co ..) supports unusual stability.
- The heath la.C_{60} experiment.
- In 1990,huffman&kratschmer(physicists) were able to make c_{60} in large quantity.
- Spectroscopy (specially nmr in 1991, showing single carbon peak, i.E. Only one carbon environment) Supported the bucky ball structure.

SMALLEY'S fullerene Research Areas

- Fullerene Nanostructures
- Synthesis,Purification, chemical cutting and Alignment of Single Wall nanotubes.
- Single Wall Carbon Nanotube Single-Crystal Growth
- Molecular Science of Fullerene Nanotubes
- Synthesis, Purification, and Assembly of Carbon Single Wall Nanotube Fibers
- Advanced Nanotechnology Materials For Potential Applications

Some Selected Publication Titles.

- "Chemical doping of individual semiconducting carbon-nanotube ropes." M. Bockrath, J. Hone, A. Zettl, P. L. McEuen, A. G. Rinzler and R. E. Smalley. Physical Review B, 61, 10606-10608 (2000).
- "Electronically excited C-2 from laser photodissociated C-60." S. Arepalli, C. D. Scott, P. Nikolaev and R. E. Smalley. Chemical Physics Letters, 320, 26-34 (2000).
- "Physical adsorption of xenon in open single walled carbon nanotubes: Observation of a quasi-one-dimensional confined Xe phase." A. Kuznetsova, J. T. Yates, J. Liu and R. E. Smalley. Journal of Chemical Physics, 112, 9590-9598 (2000).
- "Electrical and thermal transport properties of magnetically aligned single walt carbon nanotube films." J. Hone, M. C. Llaguno, N. M. Nemes, A. T. Johnson, J. E. Fischer, D. A. Walters, M. J. Casavant, J. Schmidt and R. E. Smalley. Applied Physics Letters, 77, 666-668 (200
- "Purification and Characterization of Single-Wall Carbon Nanotubes (SWNTs) Obtained from the Gas-Phase Decomposition of CO (HiPco Process)." I. W. Chiang, B. E. Brinson, A. Y. Huang, P. A. Willis, M. J. Brownikowski, J. L. Margrave, R. E. Smalley and R. H. Hauge. Journal of Physical Chemistry B, 105, 8297-8301 (2001).
- ***"Two-dimensional imaging of electronic wavefunctions in carbon nanotubes." S. G. Lemay, J. W. Janssen, M. van den Hout, M. Mooij, M. J. Bronikowski, P. A. Willis, R. E. Smalley, L. P. Kouwenhoven and C. Dekker. Nature, 412, 617-620

Selected Publication Titles,(continued)

- **"Optimization of Xe adsorption kinetics in single walled carbon nanotubes." A. Kuznetsova, J. T. Yates, V. V. Simonyan, J. K. Johnson, C. B. Huffman and R. E. Smalley. Journal of Chemical Physics, 115, 6691-6698 (2001).**
- **"Fluorotubes as cathodes in lithium electrochemical cells." H. Q. Peng, Z. N. Gu, J. P. Yang, J. L. Zimmerman, P. A. Willis, M. J. Bronikowski, R. E. Smalley, R. H. Hauge and J. L. Margrave. Nano Letters, 1, 625-629 (2001).**
- ***"Oral Testimony given before the US House of Representatives Subcommittee on Science on Future Directions of the DOE Office of Science." R. E. Smalley. 1-4 (2002).
- ***"Band Gap Fluorescence from Individual Single-Walled Carbon Nanotubes." M. J. O'Connell, S. M. Bachilo, C. B. Huffman, V. C. Moore, M. S. Strano, E. H. Haroz, K. L. Rialon, P. J. Boul, W. H. Noon, J. Ma, R. H. Hauge, R. B. Weisman and R. E. Smalley. *Science*, 297, 593-596 (2002).
- "Cutting single-wall carbon nanotubes through fluorination." Z. Gu, H. Peng, R. H. Hauge, R. E. Smalley and J. L. Margrave. *Nano Letters*, 2, 1009-1013 (2002).
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Macroscopic, Neat, Single-Walled Carbon Nanotube Fiber

SCIENCE

Well-aligned macroscopic fibers composed solely of single-walled carbon nanotubes (SWNTs) were produced by conventional spinning. Fuming sulfuric acid charges SWNTs and promotes their ordering into an aligned phase of individual mobile SWNTs surrounded by acid anions. This ordered dispersion was extruded via solution spinning into continuous lengths of macroscopic neat SWNT fibers. Such fibers possess interesting structural composition and physical properties.

SOME SIGNIFICANT CONTRIBUTIONS OF SMALLEY TO NANOTECHNOLOGY

- **CODISCOVERING A NEW FORM OF AN IMPORTANT ELEMENT©.**
- **Multi-Wall Carbon Nanotubes(MWNT) Were Discovered in 1991 by Sumio Iijima.In 1993,Iijima &also Smalley found the single wall nanotubes (SWNT).** Smalley Studied a Great Amount of their Synthesis ,Chemical& Physical Properties.
- His important Hi pressure CO(HiPco)method OF SWNT gives large quantities of cheap monodispersed nanotubes.
- He Founded A Company(CNI) To Make SWNT In High Quality and Large Quantities Using the CO(HiPco) method to Speed up the Progress of Nanotechnology
- TESTIFIED At the US Senate Committee on Commerce, Science, and Technology Hearings, Washington, DC. (May 12, 1999). This Was instrumental in Establishing the National Nanotechnology Initiative

CNI SMALLEY'S COMPANY

MAKING NANOTUBES

- **CNI had over 500 customers, including many commercial firms that are purchasing tiny amounts of nanotubes for test in products ranging from plastics, batteries, water purification systems to aerospace, defense and space exploration. One corporate client, Korean electronics titan, Samsung, is using CNIㄱs carbon nanotubes to create a new generation of energy-saving, flat-screen televisions.**