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# Donald S Bethune


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**Professional Associations:** [American Association for the Advancement of Sciences](#) | [American Physical Society \(APS\)](#) | [Optical Society of America](#)

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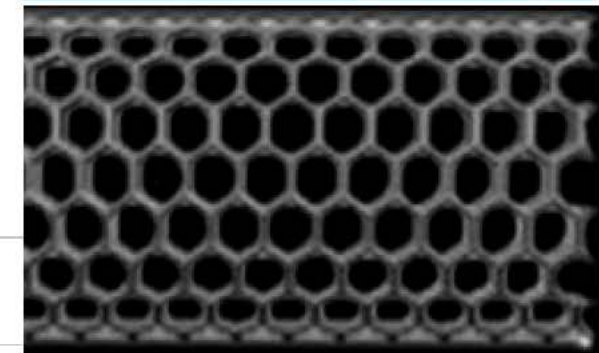
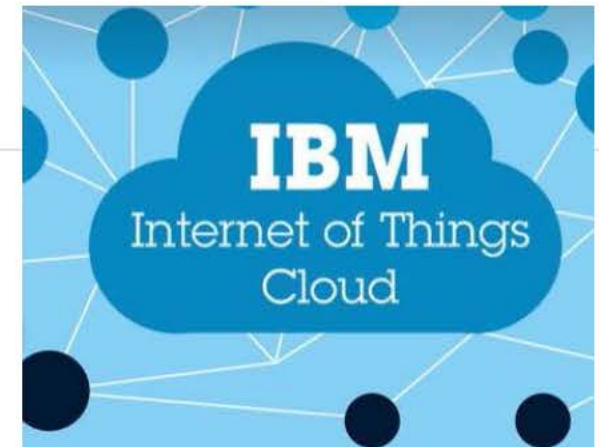
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## Research areas:

Accessibility, Artificial Intelligence. Blockchain, Energy and environment, Financial services. Healthcare and life sciences, Internet of Things, Quantum computing, Security, Semiconductors, Social good



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Dr. Bethune is a physicist and Research Staff Member at IBM's Almaden Research Center in San Jose, Calif. He was born in Philadelphia, Pa., in 1948. He and wife, Ann, have five children. He received his B.S. in Physics from Stanford University in 1970 and

his Ph.D. in Physics from U.C. Berkeley in 1977 for research in nonlinear optics, studying with Prof. Yuen Ron Shen. Dr. Bethune then joined IBM's Watson Research Center in Yorktown Heights, N.Y., where he worked on laser spectroscopy in the group of Dr. Peter P. Sorokin, invented the 'Bethune dye cell' and co-invented a nonlinear-optical method for nanosecond recording of broadband infrared spectra known as Time-Resolved Infrared Spectral Photography (TRISP). He moved to IBM's San Jose Research Laboratory (Almaden's predecessor) in 1983, where he has worked on nonlinear optics, gas-surface interactions and novel carbon materials such as C60, metallofullerenes and single-wall carbon nanotubes. He and his colleagues recorded the first Raman spectra of C60 and C70, which helped confirm their fullerene structures, measured the rotation rate of buckyballs in C60 crystals, and studied the properties of metallofullerenes such as La@C82, Sc3@C82 and others.

In 1993, Dr. Bethune and his IBM Almaden colleagues discovered that transition metals such as cobalt can catalyze the formation of single-wall carbon nanotubes. In 2002, the American Physical Society awarded the James C. McGroddy Prize for New Materials jointly to Bethune and Prof. Sumio Iijima of NEC for their independent discoveries of single-wall carbon nanotubes and methods to produce them using transition-metal catalysts. In 2004, the American Carbon Society Medal was awarded to Bethune, Iijima and Prof. Moribundo Endo of Shinshu University for their outstanding contributions to the discovery of and synthesis work on carbon nanotubes.

Dr. Bethune and colleague William P. Risk co-invented and built an autocompensating fiberoptic quantum cryptography system and invented a novel method for detecting single photons at telecom wavelengths, which they developed into a prototype product.

More recent work has focused on developing 193 nm laser sources and optics for immersion lithography experiments aimed at shrinking the size of lithographically defined features to lengths below 30 nm, developing experimental approaches to studying the fundamental chemistry of Li-Air batteries, working on the materials science underlying a novel type of semiconductor device crucial to the development of ultradense solid-state "storage class memory", and working on a new type of rapid access mass storage system.

## Projects and Groups

- Lithium/Air Battery Project (Battery 500)
- Storage Class Memory at Almaden

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## Research areas

Accessibility

Artificial Intelligence

Blockchain

Energy and environment

Financial services

Healthcare and life sciences

Internet of Things

Quantum computing

Security

Semiconductors

Social good

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**Professional Associations:** [American Association for the Advancement of Sciences](#) | [American Physical Society \(APS\)](#) | [Optical Society of America](#)

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## Projects and Groups

- [Lithium/Air Battery Project \(Battery 500\)](#)
- [Storage Class Memory at Almaden](#)

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**Professional Associations:** [American Association for the Advancement of Sciences](#) | [American Physical Society \(APS\)](#) | [Optical Society of America](#)

[Profile](#) [Publications](#) [Patents](#)

## 2017

[Backend of line \(BEOL\) compatible high current density access device for high density arrays of electronic components](#)

Bethune; Donald S (San Jose, CA), Gopalakrishnan; Kailash (San Jose, CA), Kellock; Andrew J (Sunnyvale, CA), Shenoy; Rohit S (Fremont, CA)

US Patent 9,812,638

[Abstract](#)

[Optical disc drive](#)

Altknecht, David J and Best, John S and Bethune, Donald S and Dyer, William M and Erpelding, A David and Hetzler, Steven R and Lawson, Drew B and Smith, Daniel F

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### [High performance robotic optical storage system](#)

Altknecht, David J and Best, John S and Bethune, Donald S and Dyer, William M and Erpelding, A David and Hetzler, Steven R and Lawson, Drew B and Smith, Daniel F

US Patent 9,741,389

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### [Disc storage cassettes](#)

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US Patent 9,633,686

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### [Disc gripper for storage discs](#)

Altknecht, David J and Best, John S and Bethune, Donald S and Dyer, William M and Erpelding, A David and Hetzler, Steven R and Lawson, Drew B and Smith, Daniel F

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US Patent App. 15/494,368

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[D.S. Bethune](#), W.P. Risk

US Patent 6,188,768

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Process for making fullerenes [↗](#)

[D.S. Bethune](#), R.D. Johnson, J.R. Salem

US Patent 5,275,705

Magnetic recording disk having a contiguous fullerene film and a protective overcoat [↗](#)

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## 1992

Laser system and method with temperature controlled crystal [↗](#)

[Donald S Bethune](#), William J Kozlovsky

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[D.S. Bethune](#), W.J. Kozlovsky

EP Patent 0,503,929

## 1985

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## 1983

[Apparatus for four side transverse irradiation of a region](#) 

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### Projects and Groups

- [Lithium/Air Battery Project \(Battery 500\)](#)
- [Storage Class Memory at Almaden](#)

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