

NANOTECH

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Nanotechnology's Power Brokers

Based on my visits with nanotechnology insiders, research scientists and venture capitalists, I can happily report that despite the overall gloom gripping the country and the stock market, the emerging nanotechnology business is buzzing with activity. In these early stages, business people and techies are jockeying for position. Who are the players in the field wielding the respect and power to bring nanotechnology from the idea to application, from start up to market leadership?

My team at *Forbes/Wolfe Nanotech Report* surveyed leading investors, scientists, corporate execs and high-ranking government officials to give our subscribers a jump on who the top movers and shakers are in nanotech. We took their responses and combined them with quantitative criteria to get our results.

1. Mihail "Mike" Roco Director, National Nanotechnology Initiative (NNI)

The government's original voice on nanotech, Mike Roco (see *Thinking Small*, July 2002) helped launch the NNI in January 2001 with \$422 million from President Clinton. Under Roco's watch, 16 federal agencies now compete for federal nanotech research funding, which has grown from \$116 million in 1997 to a projected \$849 million in 2004. Roco also serves as Senior Advisor for Nanotechnology at the National Science Foundation (NSF). Some say his broad influence has faded in recent months as the industry grows legs of its own, but Roco still has the ears of Beltway power players, corporations and academic researchers.

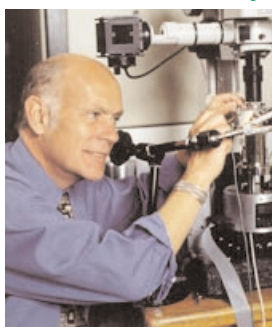
Key Achievement: Leading architect of the NNI.



2. Richard Smalley

Co-Founder, Carbon Nanotechnologies, Inc.

The chemist and carbon nanomaterials king was one of the winners of the 1996 Nobel Prize in Chemistry for discovering carbon fullerenes (60 carbon molecules in spherical form known as "buckyballs"), a relative of carbon nanotubes. With \$15 million in venture financing, Smalley spun his Rice University research into Carbon Nanotechnologies, Inc. (CNI) to commercialize



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single-walled nanotube production (see "Asian Nanotech Fever Running Hot," January 2003). He also serves on the Scientific Advisory Boards of CSixty (see "Nanotech Takes on AIDS," February 2002) and NanoSpectra Biosciences (see *Companies to Watch*, September 2002).

Key Achievement: Key scientific discovery of C60 fueled carbon nanotechnology's emergence as a viable industry.

3. Larry Bock CEO, Nanosys

A founding investor in 14 companies, eleven of which have been acquired or gone public with market caps over \$1 billion, Larry Bock (see *Thinking Small*, p.5) knows how to build a business. His entrepreneurial footprint includes Caliper [CALP], Illumina [ILMN], Pharmacopeia [POCP] (see "The Microsoft of Molecular Modeling," October 2002), Vertex Pharmaceuticals [VETX], and Neurocrine [NBIX]. Bock is now placing his chips on nanotech as the CEO of Palo Alto, California's Nanosys (see "A Recipe for Success," September 2002). Nanosys has used its \$17 million VC war chest to license more than 70 nanotech patents and patent applications from leading researchers, including Nanotech Power Broker list members Charles Lieber, Paul Alivisatos, and James Heath. Could Nanosys be Bock's next billion dollar baby? The challenge will be successfully transitioning his IP goldmine into products, but Bock is up to the task.

Key Achievement: Being first mover to round up IP platform for nanotech startup.



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4. Charles Lieber Chair of Chemistry, Harvard University

Charles Lieber (see *Thinking Small*, March 2002) was the first nano guru we profiled in our inaugural issue last year and with good reason. He holds the Mark Hyman Chair of Chemistry at Harvard University and is a Fellow of the American Physical Society and the American Association for the Advancement of



Science. I predict Lieber will contend for a future Nobel Prize in Chemistry. He has already been recognized with a number of awards, including the Foresight Institute's 2001 Feynman Prize, one of the nanotechnology community's top honors. He is a co-founder of Nanosys, which was formed to commercialize his work in nanowires, nanodots and nanotubes, for end use in sensors and nanoscale electronics.

Key Achievement: Leading expert in semiconductor nanowire devices and "bottom-up" assembly.

5. Mark Modzelewski Executive Director, NanoBusiness Alliance



Mark Modzelewski co-founded the NanoBusiness Alliance with me in the fall of 2001. He now serves as the organization's Executive Director. His power (see *Thinking Small*, December 2002) lies in his status as the central hub of the nanotech industry: the go-between among scientists, venture capitalists, government officials and executives.

Mark's tireless efforts on three fronts: disseminating nanotech information; reducing business hurdles for nanotech companies; and influencing governmental policy through lobbying, make him one of the most important power brokers. No one understands the worlds of government, public policy and their marriage with science better. If someone's got an



agenda, they've got to pass through his non-profit industry clearinghouse before it will be seen by government officials and industry leaders.

Key Achievement: Increasing awareness and importance of nanotechnology across the nation for policy makers and general public.

6. Chad Mirkin Professor of Chemistry, Northwestern University

This young, dynamic Northwestern researcher is just as likely to be seen in *Esquire* (in a November photo spread selecting him as one of the 40 "Best and Brightest") as in the pages of *Nature* or *Science*. Chad Mirkin is the George B. Rathmann professor of Chemistry and Director of the Institute of Nanotechnology & Center for Nanofabrication and Molecular Self-Assembly. A regular in the *Follow the Money* section of this newsletter, Mirkin has already launched two startups (Nanosphere and NanoInk) and raised more than \$32 million. His research landed him Foresight's 2002 Feynman Prize.

Key Achievement: Simultaneously launching two funded nanotech startups while continuing his research.

7. Stan Williams Director of Quantum Science Research, Hewlett-Packard

With corporate might and scientific research capabilities at his fingertips, Hewlett-Packard's [HPQ] Stan Williams (see *Thinking Small*, June 2002) is outspoken about the naiveté of start-



ups that think they can threaten HP's leadership in molecular electronics. Williams is a Senior HP Fellow and director of Quantum Science Research. HP's role in nanotech R&D can't be underestimated. Williams currently leads HP Labs' nanostructures and quantum effects research, with the intention of providing a foundation for the device technology of the next century. He has remained uncharacteristically quiet over the past several months after his much publicized cautionary comments on nano-hype in the *Wall Street Journal*. The 2000 Feynman Prize co-winner is now putting HP's research dollars to work with the intention of making the hype a reality.

Key Achievement: Leading molecular electronics researcher who adds tempered voice of nanotech enthusiasm.



8. Phaedon Avouris Manager of Nanometer Scale Science and Technology, IBM

Phaedon Avouris heads the nanotech team at the most influential corporate player involved in nanoscale research. At IBM's [IBM] T.J. Watson Research Center, his current research is focused on molecular electronics and carbon nanotubes. His team is part of the reason IBM tops the charts in patents year after year. Avouris is a fellow of the American Physical Society, American Association for the Advancement of Science, New York Academy of Sciences and a winner of the Foresight's 1999 Feynman Prize. IBM's vast resources allow Avouris the ability to partner with or crush startups nearly at will. He has strong opinions on roadmap and future direction of technologies like carbon nanotubes. If he's right, IBM will win big. If Avouris is wrong, he'll have a difficult time back peddling.

Key Achievement: Directing breakthrough nanoscale research for the biggest company in nanotechnology.

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Nanofiber bandages heal wounds, absorb into the body

Researchers at Virginia Commonwealth University recently developed a gauze pad spun out of the same natural fiber in your body which clots blood. Instead of ripping off a normal bandage and damaging skin and disrupting the blood clotting process, the nanobandage acts as a scaffold into which tissue-forming cells can grow and move. The body would treat it simply as part of normal healing, gradually dissolving it as new skin grows over the wound

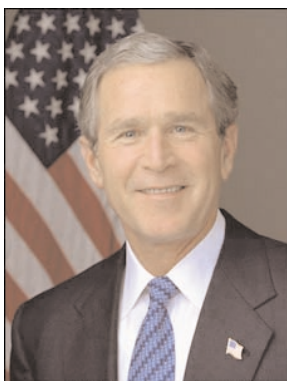
9. George Pataki Governor, New York State

New York Governor George Pataki has been the driving force behind a nanotechnology spending spree in the state: a \$400 million International SEMATECH North center for nanoscale semiconductor research, a \$50 million investment in Albany Nanotech and attracting a \$300 million Tokyo Electron [TOELEPK] research facility to Albany. With Pataki's blessings and many of his senior staff championing nanotech, New York State could become the Silicon Valley of nanotech.

Key Achievement: Making New York State into U.S. nanotech's biggest governmental backer aside from the federal government.



10. George W. Bush President, United States of America



White House photo by Eric Draper

When former President Bill Clinton, the NNI's original backer, vacated his office, the nascent initiative's fate was in limbo. But despite economic uncertainty and a budget crunch, President George W. Bush has followed through and boosted the federal government's investment in nanotech. At stake? Nothing less than global economic and technology competitiveness. Japan will spend nearly \$1 billion on nanotech research in 2003, while the U.S. is slated to spend \$710 million. When the smoke settles in Iraq, look for Bush to start promoting the government's nanotech priority, similar to his State of the Union support for AIDS research, as the international race intensifies.

Key Achievement: Continuing the federal government's commitment to nanoscale science funding to maintain U.S. competitiveness.

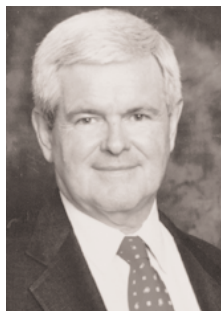
Honorable Mentions

K. Eric Drexler Founder, Foresight Institute

Eric Drexler is the founder and Chairman of the Foresight Institute, a Palo Alto, California-based non-profit educational group focused on preparing society for advanced nanotechnologies. He credits himself with introducing the term "nanotechnology" in the mid-1980s and was the author of the futurist book "Engines of Creation" that caught the science community's imagination. A lightning rod of controversy, Drexler's critics say his futuristic visions of nanotech are science fiction and litter the popular media, detracting from nanotechnology's more practical scientific progress.

Newt Gingrich Former Speaker, U.S. House of Representatives

At a recent event for a new Albany nanotech facility, my fellow panelist Hillary Clinton joked that the only thing Newt Gingrich, George Bush and her husband agree on was the importance of nanotech. Since leaving the House in 1998, Newt has reappeared as one of nanotech's biggest backers on the Hill by serving as the NanoBusiness Alliance's Honorary Co-Chairman (with Steve Jurvetson) and giving speeches on the importance of nanotech.



James Heath Professor of Chemistry, Caltech

Young and aggressive, Heath just moved to Caltech in January from UCLA, where he established a reputation as one of the world's leading molecular electronics researchers. His demonstration of an electronically configurable molecular-based logic circuitry (along with HP's Stan Williams) represented a significant step toward the goal of creating cheaper, smaller and more energy-efficient mo-



lecular computers (see "2002 Year in Review: Top 5 Nanotech Breakthroughs", December 2002). He is also a founding member of the Nanosys Scientific Advisory Board and 2000 Feynman Prize co-winner. Heath gained political power by playing a large role in establishing and serving as interim director of the California NanoSystems Institute (CNSI), a 180,000-sq/ft state of the art nanotech research facility shared by UCLA and UC Santa Barbara.

Steve Jurvetson Partner, Draper Fisher Jurvetson

Steve Jurvetson first rose to venture capital prominence when his investment in Hotmail was acquired by Microsoft [MSFT] for more than \$400 million. Today the Silicon Valley-based VC has become one of nanotech's leading advocates and investors. Many companies I have featured in this newsletter like Imago Scientific, Konarka Technologies, Molecular Imprints, NanoOpto, Nantero and ZettaCore have received funding from his firm.



Sam Stupp Professor of Chemistry, Northwestern University

Quiet and hard working, Sam Stupp has been called the guru of the organic world, widely regarded as one of the top experts in regenerative medicine. Stupp uses nanoscale science to focus on the regeneration of bone, heart and nerve tissue. He has assembled a cadre of powerful Nobel Prize winners and ex-White House officials behind his new nanobiotechnology startup. He is a Board of Trustees professor of Chemistry, Medicine and Materials Science at Northwestern, and a director of its Institute for Bioengineering and Nanoscience in Advanced Medicine. As chairman of the NNI Review Committee, Sam has been a critical behind-the-scenes driver of the government's nanotech strategy. □

