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PHOTOGRAPHS BY TIMOTHY ARCHIBALD

The Invention Factory

Nathan Myhrvold, once Microsoft's designated visionary, is out on his own—aiming to

Invention under the microscope: Myhrvold, who collects antique gadgets, wants to test new ways of stimulating inventors' genius.



assemble a dream team of the world's best inventors to create great new stuff.

Over lunch in his suburban Seattle office, Nathan Myhrvold says he's looking forward to an afternoon meeting with a group of nuclear-fusion experts. "It's a real bitch," he remarks of the problem scientists have had controlling

hydrogen reactions and achieving the ultimate dream of cheap, safe, renewable energy. Such thorny technological conundrums fascinate the bearded, cherubic veteran of Microsoft's inner sanctum. Like dozens of other domains, he says, fusion is ripe for a revolution. "There needs to be a big new idea," Myhrvold muses.

Big ideas are what Myhrvold is all about. Currently the president of a freewheeling outfit called Intellectual Ventures—an umbrella company he formed two years ago to pursue his diverse interests—Myhrvold is fascinated by the very process of thinking up groundbreaking concepts. "I'm interested in how amazing new ideas are generated, and what it takes to bootstrap those ideas and grow them afterwards," he says. To that end, Myhrvold recently disclosed to *Technology Review*, Intellectual Ventures has been working on a secret project for the better part of two years. The ambitious undertaking, which he is tentatively calling the Invention Factory, would bring together perhaps dozens of established and promising inventors to craft both significant innovations and methods to broaden their impact on the market. In fact, Myhrvold says he has been meeting with every significant inventor he can find to attempt to rope people into his still-evolving plan. "I've tried to speak to all of the world's great inventors—but only the living ones," he smirks. "I'm particularly interested in the ones who have made big scores."

Myhrvold's vast personal wealth, estimated in the hundreds of millions of dollars, along with his track record as the founder of Microsoft Research—"the man Bill Gates put in charge of the future," as the *New Yorker* put it in 1997—means that any big idea he puts into action is bound to create a stir in the technology world, especially now that he's not constrained by a specific corporate agenda. Unlike a traditional corporate research lab, Myhrvold's new outfit wouldn't be tied to any particular product or market but would be free to investigate any industry or field in need of new inventions. "We want to create new stuff, either evolutionary or revolutionary stuff," he says.

Either working in Myhrvold's offices in Bellevue, WA, or remaining in their own laboratories, members of this inventors' collective would collaborate on patentable ideas in areas ranging

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from biotechnology to distributed computing, energy, military innovations and even business processes. The venture would be a for-profit business, with revenue coming from the licensing of patents that its inventors produced, and its business model would be built around an unusual way of compensating those who create valuable intellectual capital: individual inventors would split license fees and royalties with the company. Thus inventors would profit in direct proportion to the success of their inventions—although many would also be paid a salary.

Why challenge a system of large-scale corporate research that has worked fairly well for decades? Corporate labs "often produce inventions, but that's not their job," says Edward Jung, Myhrvold's partner at Intellectual Ventures and Microsoft's former chief software architect (a position now held by none other than Bill Gates). "Even though it creates a huge amount of value, invention is usually just a by-product of industrial research. In many ways, it's been given short shrift. Our whole notion is that invention is important enough to say, Let's invent, and create the context for inventing, and get inventive people to do it." Invention Factory members, Jung says, will jump across problem domains in order to spur serendipitous discovery, whereas researchers at labs run by companies such as Microsoft, IBM or Lucent Technologies tend to work in well-defined areas, often spending their entire careers in one narrow field.

To attract some of the world's top inventors to participate, Myhrvold and Jung not only want to compensate them well but also aim to tap into the sheer joy that inventive people draw from their work—an emotion that they believe has largely been missing in corporate labs for a long time. As Myhrvold puts it, "Invention is so exhilarating that most true inventors would do it for free."

FOURTH ERA OF INVENTION

If anyone can bring the Invention Factory to life, it ought to be Myhrvold. His training and experience extend to so many fields that he is as comfortable brainstorming with software designers or nuclear scientists as he is kibitzing with French chefs or science fiction authors. Talking about obstacles in just about any area of technology gets him energized; the pace of his speech quickens and he breaks out into roiling laughter at the slightest provocation.

Myhrvold, 42, joined Microsoft in 1986 after undergraduate and graduate training in mathematics, economics and physics, not to mention postdoctoral work under Stephen Hawking at the University of Cambridge in England and a brief tenure as the president of his own software startup, which was acquired by Microsoft. His subsequent appointment as Microsoft's chief technology officer gave him license to explore dozens of high-tech domains, from interactive television to speech recognition, and in 1991 he convinced the company to start Microsoft Research, which has grown into one of the largest corporate research labs launched in the past half-century.

Yet even the ability to pursue almost any software-related research project wasn't enough to absorb all of Myhrvold's wide-ranging attention. During his final years at Microsoft he began delving into paleontology and other exotic fields, even taking leaves to go digging for dinosaur bones. In fact, the fossil of an ancient reptile now hangs on his office wall, while the Intellectual Ventures lobby is adorned with the head of a dinosaur



Room for growth: Edward Jung, former chief software architect at Microsoft, says most corporate labs give inventors short shrift.

model used in one of the *Jurassic Park* films and a small museum's worth of obsolete gadgets, like a solar-powered telegraph and a giant slide rule for high-precision calculations.

After leaving Microsoft in 2000 with an estimated \$650 million in company stock, Myhrvold had the freedom to think seriously about the conditions that foster invention. He and Jung are founding the Invention Factory on the strength of his theory that the American economy is entering its "fourth stage" of innovation, a time when the long-dominant corporate labs are losing their edge and the truly world-changing inventions may once again come from inventors working alone or in small groups, as they did in the 19th century.

The first stage of innovation, Myhrvold says, was a golden era sparked by 1830s patent law changes that made the process of reviewing and granting patents much more rigorous. This reduced the likelihood that more than one patent would be granted on the same basic idea, making each patent much more valuable, and encouraging a parade of great lone inventors from Samuel Morse and George Westinghouse to Alexander Graham Bell and Thomas Edison. The parade continued into the early part of the 20th century with inventors like the Wright brothers, Bakelite creator Leo Baekeland, Polaroid founder Edwin H. Land and television pioneer Philo T. Farnsworth.

But by that time Myhrvold's second stage, the era of corporate-controlled innovation, was already under way. At the turn of the century, companies such as General Electric, DuPont and AT&T began hiring scientists and engineers by the hundreds in an attempt to come up with more breakthroughs before outsiders could disrupt their monopolies. These companies' labs kept the rights to new inventions to themselves, blanketed their fields with filings and overpowered the lone inventors with legal assaults. By the 1920s, corporations moved to gain a majority share of U.S. patents for the first time (see "Lone Inventors Lag Behind," this page).

This system ultimately produced the transistor and launched the microelectronics and computing industries, but by the 1970s, Myhrvold notes, economic pressures were putting the squeeze on corporate research-and-development budgets. Many corporate labs dating from the early or mid-20th century have now been struggling for years. Often, maintains Myhrvold, the surviving corporate research labs became demoralizing work environments, places where "potentially great inventors are treated as mid-level engineers."

Entrepreneurs seized the mantle from the corporate labs beginning in the late 1970s, when the PC era commenced. This transformation, Myhrvold's third stage of innovation, gave rise to the Silicon Valley model, in which leading university researchers, students and corporate rebels obtain massive infusions of private venture capital to fund what Myhrvold describes as largely development work and marketing efforts. But with the bursting of the dot-com bubble in the spring of 2000, this model too has suffered a decline. "The Silicon Valley model has been fantastic," Myhrvold says, "but it's been stretched to the limit. We've had a lot of talented people with a lot of money pursuing dumb ideas."

Brainstorming for a better model, Myhrvold is setting out to launch the fourth stage of innovation. This new era, he says, has two distinct characteristics never seen before. First, there is still plenty of financing available for truly great

ideas. Second, individual inventors are armed with an unprecedented array of information tools—such as powerful computers that can create 3-D simulations of new products and test their functions—that weren't available even at the corporate labs or the startups of the past. As a result, Myhrvold believes, independent inventors reminiscent of the heroes of the first stage can rise to ascendancy once again. Yet if these inventors focus purely on creation, they'll need assistance and an infrastructure to support them—which is what the Invention Factory is all about. Says Myhrvold, "We think the time is ripe for organized lone inventing to come back."

MAKING GOOD INVENTORS GREAT

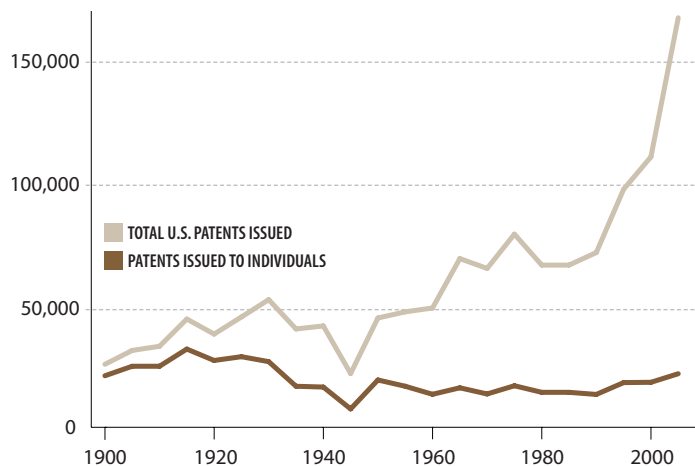
Myhrvold and Jung have been highly secretive about exactly who is involved with the Invention Factory, and their interviews with *Technology Review* mark their first public remarks on the subject. They will say that on the still-in-formation board of advisors is Dean Kamen, the New Hampshire-based inventor who earned recent fame for his Segway personal transporter.

Since Kamen already has his own operation, Dekka Research and Development, which includes an extensive laboratory, he says he'll remain an advisor rather than one of the staff inventors. Even more than creating new ideas, Kamen sees the goal of the Invention Factory as applying existing inventions to unforeseen problems. "There is a large amount of intellectual property developed around specific applications that might have bigger applications in new fields," he says. "Many of the six million [United States-issued] patents solved a need but now could be applied to a different need. Clearly, if there was a way to systematize the application of new intellectual property, it would be tremendous."

So instead of signing up well-entrenched inventors like Kamen, Myhrvold and Jung have been on the lookout for accomplished inventors who don't already run their own large enterprises; they're especially interested in inventors who have proved their mettle by winning patents worth millions of dollars in royalties and license fees. "Dozens of these people have made enormous amounts of money," Myhrvold says. In return for their involvement, these independent inventors would

Lone Inventors Lag Behind

Independent inventors once earned most U.S. patents. But since the 1920s, loners have been outgunned by corporate, government and university labs, which often keep the rights to their employees' inventions.



receive an entire legal and support infrastructure: attorneys to file patent applications, draft licensing agreements and litigate disputes; and an administrative staff that can perform patent searches and other work. In addition, the company would match different inventors together on particular projects in order to maximize the chance of a breakthrough. “A lot of good inventors can be great if paired with a great inventor,” says Jung.

Among the first inventors to pledge their involvement is Leroy Hood, 63, who developed the automated DNA-sequencing machine while at Caltech in the 1980s. In late 1999, after eight years at the University of Washington, Hood left academia to start the private Institute for Systems Biology in Seattle. “He’s got some stock in companies, but has he gotten what he’s worth?” Myhrvold asks. “Probably not.” Hood says he is especially interested in brainstorming new inventions at “the intersection of information technology and biology.” “That is something that can be done uniquely with Ed and Nathan,” he says. “I’m committed to exploring this opportunity.”

Myhrvold cites Ronald A. Katz, a Los Angeles-based inventor who has reportedly made hundreds of millions of dollars by licensing his 25-plus patents on touch-tone telephone menus to companies such as AT&T, WorldCom, the Vanguard Group, American Express, IBM and Microsoft, as another example of the kind of innovator he’s looking for. Brian Rivette, of Ronald A. Katz Technology Licensing, would only confirm that Katz knows Myhrvold.

Even though many of the inventors they want to woo are already well heeled, Myhrvold and Jung think the Invention Factory’s compensation plan, one they say may never have been attempted in the past, will be appealing. At most corporate labs, researchers sign over rights to royalties and licensing fees in return for a steady salary. Invention Factory inventors will also receive modest salaries—after all, says Jung, “you can’t take a future royalty stream to the grocery store”—but they will split licensing revenue or royalties on their inventions with the company (though Jung and Myhrvold won’t specify the percentages).

In attempting to make a business out of inventing, the Invention Factory will refrain from launching Silicon Valley-type startups, Myhrvold adds. Product development and marketing cost too much, he says, and would distract the enterprise from the inventing of new things. “The world has lots of companies to take products to market,” he says. “When you set out to create important inventions as your primary goal, it takes you to a different place.”

“The lone inventor is not something that belongs in the age of dinosaurs. People can do something with their technology without large corporations.”

LUCRATIVE IN THE LONG RUN

Although Myhrvold’s overall concept for the Invention Factory may sound eminently workable, observers who have not been privy to the details of the plan have their doubts. Ronald J. Riley, an independent Michigan inventor of numerous factory assembly-line technologies and the president of the Professional Inventors Alliance, a nonprofit educational group, warns that it would be risky for one organization to try to license patents and protect intellectual property across a variety of industries. “I’m not say-

ing it can’t be done,” Riley says. “But it is difficult because different industries require different sets of skills and different sets of contacts.” In the past, Riley adds, others firms have tried to form patent enforcement funds, in which investors fund patent preparation fees and litigation in return for a share of future profits. “The trouble,” Riley says, “is that the average time frame for making any money from a valuable patent is five to 10 years”—requiring investors with abnormal patience.

Myhrvold could also run into resistance from inventors themselves, who tend to be a fiercely independent folk. “Inventors have big egos, and I’m no exception,” says Riley. “I know inventors who are flat out incapable of working with other people.” Secrecy can be another thorny issue, notes Arthur Molella, director of the Smithsonian Institution’s Lemelson Center for the Study of Invention and Innovation. “A lot of independent inventors have been burned in the past,” he says. “They may be reluctant to share their ideas.”

But a few ventures similar to the Invention Factory in one respect or another have succeeded, at least for a time. Before its demise in 2000, Interval Research, the Silicon Valley lab established by Microsoft cofounder Paul Allen in 1992, spun off companies such as Purple Moon, a children’s gaming company based on the ideas of computer game developer and theorist Brenda Laurel. Battelle, the nonprofit lab in Ohio, and the now struggling Cambridge, MA, consulting firm Arthur D. Little have for years evaluated other companies’ inventions, nurtured them and helped license them to corporations and government agencies—in addition to coming up with their own inventions. “The lone inventor is not something that belongs in the age of dinosaurs,” says Jules Duga, an expert on the economics of research and development with Battelle. “I’m a firm believer that people can do something with their technology without being affiliated with large corporations.”

And a small Boston-area partnership of four inventors called Invent Resources has been in business for nearly a decade, typically working on a contract basis for corporations. “We develop intellectual property and approach companies with our ideas,” says company president Richard Pavele, “or they come to us with a problem, and we come up with a solution.” The partnership, which has so far generated more than 100 patents, from a quiet electric pencil sharpener to a superfast rest room hand dryer to a tornado-warning system, retains all patent rights to its inventions, while its corporate clients typically purchase options on projects they back and then license the innovations that suit their needs.

If Nathan Myhrvold can manage to sign up enough inventors, obtain enough funding and work through all the legal ramifications, his Invention Factory would likely run in a similar fashion—but on a larger scale, and with his inventors scattered across a far greater geographic region. Myhrvold is both enthusiastic and realistic about the challenge. “This wouldn’t have a quick payoff,” he says. “The more powerful the invention, the longer it often takes to have a big impact. So this is not a get-rich-quick scheme; but in the long run it can become unbelievably lucrative. What a great time this is to come up with new ideas!” ■

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Window of opportunity: New tools are giving independent inventors the chance to make a comeback, Myhrvold says.