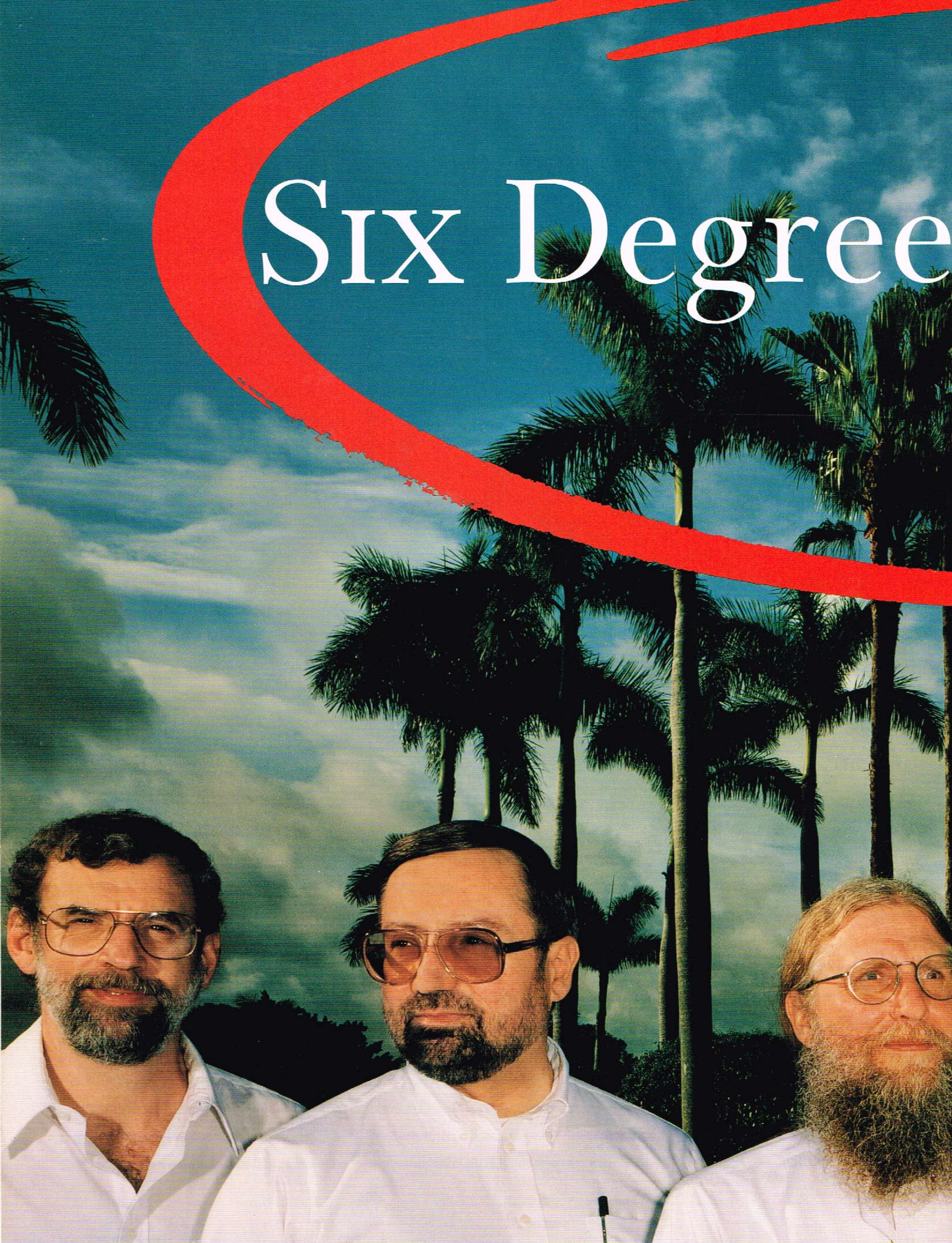
Six Degree



# of Inspiration

Who are these unassuming characters? Six gentlemen asked to assemble in a palm grove one sticky Florida morning for a magazine photo session – and made clearly uncomfortable by the strobes and other trappings of celebrity.

Their reserve around the camera does not reflect careers filled with inspired achievement – ones that earned them IBM's highest honor for technology leadership. Their appointments as IBM Fellows were announced by IBM Chairman Lou Gerstner at the annual Corporate Technical Recognition Event held in Florida (hence the palm trees).

Since the program began in 1963, only 143 individuals have been named IBM Fellows. Five were Nobel Prize winners. It is not an honor conferred lightly.

The 1996 IBM Fellows have much in common – and not just their career achievements – strong convictions, an intense curiosity of what makes things tick, visions of technology's possibilities, and an insistence on balancing work and family. Their backgrounds and interests are diverse. One lived on a commune, one tests the outer limits of his lung capacity in a sport called octapush, and a third comes from a long line of inventors.

They are our colleagues. These are their stories.

Learn *from* Nature

Yutaka Tsukada

Yutaka Tsukada's professional success and wide-ranging hobbies reflect the same central trait: an intense curiosity about the nature of things. Growing up on the northern Japanese island of Hokkaido, he was drawn to the natural world - fish, birds, insects - that he found near his home. As he grew older, he was intrigued equally by astronomy, space travel, airplanes, mechanics and, in general, how things worked.

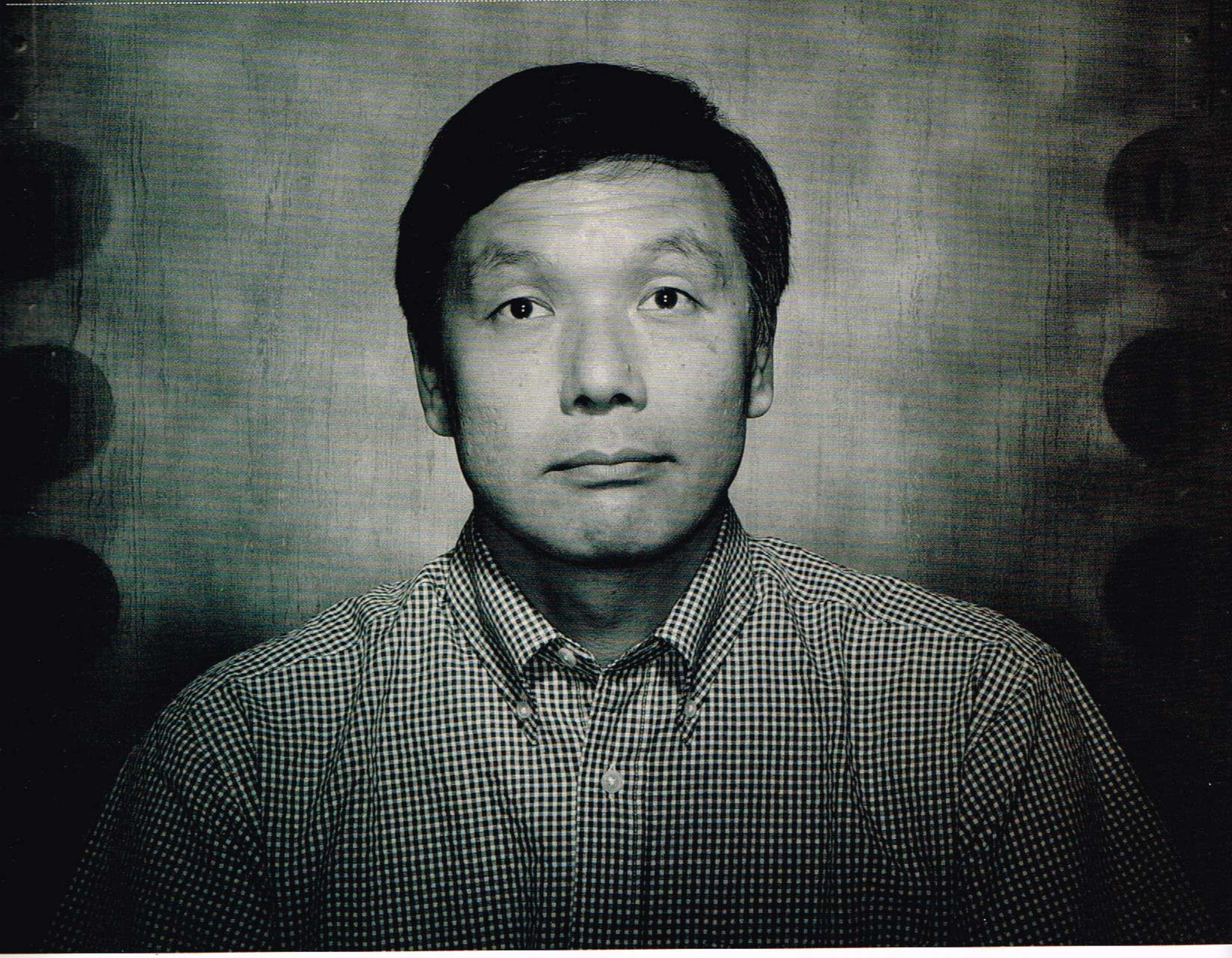
Indeed, the wider he cast his intellectual net, the more he discovered a certain uniformity in "things," a fundamental similarity in the way they functioned and were put together. As Tsukada puts it, a close inquiry of "anything I encountered quickly reached down to the level of electrons and atomic behavior."

In 1970, after studying mechanical engineering at Hokkaido University, he took a job with IBM that involved putting together, or "packaging," computer circuits. Fifteen years later, when the management team at the Electronics Packaging Division in Yasu, Japan, asked for ideas to improve quality, Tsukada had one.

At that time, semiconductor chips were manufactured as modules and later assembled on printed circuit boards, which added extra steps, time and expense. Tsukada's idea was simple: Build the entire electronics package in one process, with the semiconductor chips attached directly to the circuit board.

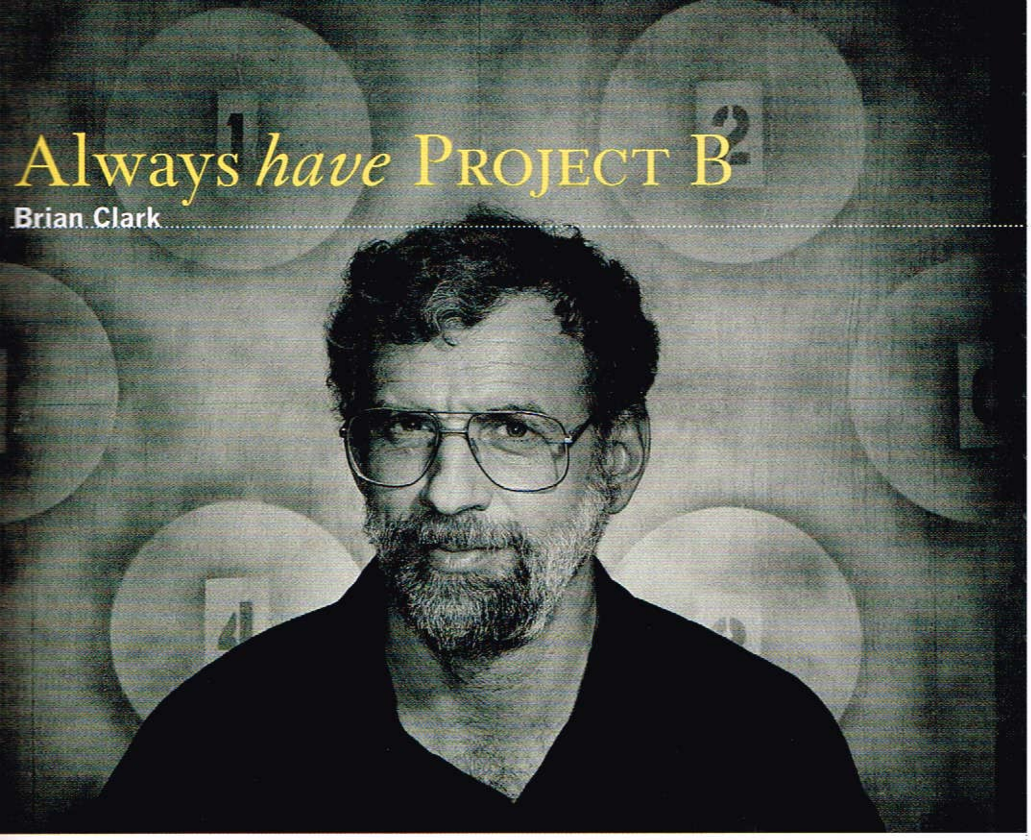
Although the concept took less than a month to develop, overcoming skepticism and developing a new manufacturing process took more time. When the first "ultra-high-density circuit" boards rolled out in 1989, they were a clear success. Cheaper and easier to make, the new boards also held up to five times as many individual semiconductors as their predecessors, allowing far more processing power in the same space. His revolutionary breakthrough in packaging is now present in everything from ThinkPads to RS/6000s.

More and more, Tsukada sees his varied "outside" interests as being inseparable from his work. "The role of the engineer is to link the natural world to the human world, through natural science," he says. "In this sense, the engineer's job is to be interested in everything."



Always *have* Project B

Brian Clark



When Brian Clark needs a break from work, his diversions are rarely traditional. He spent his last vacation exploring shipwrecks in Micronesia. Once a week, he and his diving friends get together for "octapush," or underwater hockey. "It's played in a swimming pool with two teams in snorkels, masks and fins, trying to push a lead puck along the bottom," says Clark.

If Clark's hobbies seem unusual, they don't surprise colleagues, who describe him as among the most innovative and focused authorities on system architecture. During the late 1980s, Clark helped blend the best of two overlapping systems into what became the AS/400, the most successful midrange commercial system ever brought to market. It is an achievement he regards as a career highlight. "After knocking yourself out for three years, it's pretty rewarding to see something succeed."

Most recently, he's been helping port the popular SAP R/3 application to the AS/400 – a task requiring vast technical savvy, long hours and the capacity to go beyond conventional methods. "He'll take the traditional approach to a problem first, but when he hits a wall, he'll find some creative way of getting around it," says Susan Lee, Clark's manager at IBM Rochester. "When I want to show people how to accomplish something, I use him as a model."

Clark still takes on marathon projects, but also carves out as much time as possible with his wife, Susan, and two children: Cameron, 11, and MacKenzie, 8. In addition to octapush and diving, he tries to get back to the family farm every fall to pick apples. It's what he calls "project B" – a hobby so intense or pleasurable that it washes work from his mind. "I'm the kind of person who brings problems home with me," says Clark. "I'll think about them driving home, at dinner, in the middle of the night. Early in my career, a colleague told me to always have a project B, which is whatever you do when everything is going wrong with project A."

Overcome *the* Skeptics

Jim Rymarczyk

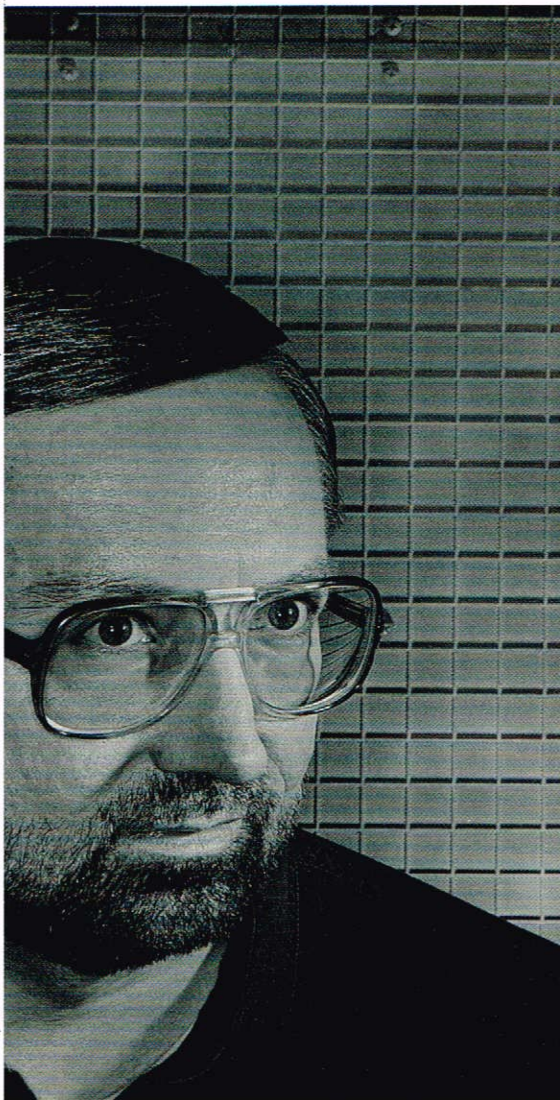
For as long as he can remember, Jim Rymarczyk wanted to know what made things tick. Growing up in Buffalo, N.Y., he spent hours at the library reading about jet engines. Shortly after arriving at MIT in 1965 to study aeronautical engineering, he was drawn into the then-novel world of computer systems.

"My roommate had keys to the department's computer, and we'd spend evenings and weekends playing," Rymarczyk recalls. "It was a hobby that basically turned into an obsession."

The fact that this innate curiosity usually sparked "a desire to make things work better" is something of an understatement. In the early 1990s, as commentators declared the "death of the mainframe," Rymarczyk helped lead the successful redesign of the System/390. There were skeptics, and "a lot of key customers were beginning to believe that the mainframe really was obsolete," Rymarczyk says.

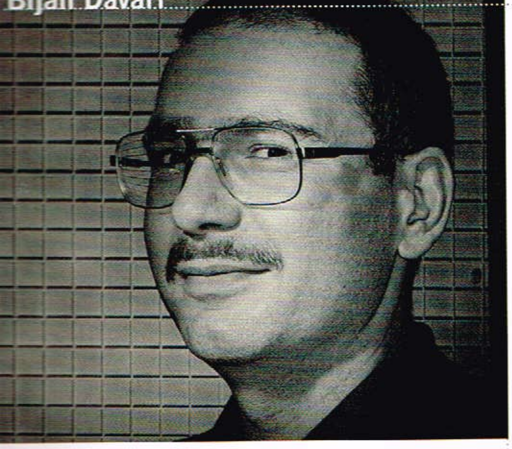
The problem with the System/390 was that it was still using bipolar transistors, instead of the newer, more advanced CMOS variety. Bipolar computers are faster, but CMOS computers can be clustered, providing cost/performance benefits and immense scalablity; highly parallel mainframes can be designed to handle nearly any task.

Rymarczyk organized a team of engineers, researchers and others to analyze all implications of this new approach, solve any potential "show stoppers," and relentlessly demonstrate that the transition to CMOS technology was not only practical, but critical to IBM's future. In the process, he displayed not only broad technical expertise, but a general's ability to organize and motivate hundreds of colleagues in dozens of disparate disciplines. It took four years, but when S/390 Parallel Sysplex rolled out in 1994, the press and the competition were stunned. "I don't think they expected us to do it," Rymarczyk says.



Look Beyond *the* Obvious

Bijan Davari



BIJAN DAVARI'S HEROES, ever since he was a boy, have always been scientists: Isaac Newton, Charles Darwin, Max Planck – "brilliant, radical thinkers who refused to ever assume that the majority is always right." A similar stubbornness animates Davari and helps explain how, in the face of widespread skepticism, the electrical engineer led the development of a smaller, faster and more efficient transistor than most experts thought possible – CMOS-5x. It's the most recent generation of Complementary Metal-Oxide-Semiconductor transistor technology in production. "There were non-believers," says Davari. "But when you're looking for something new, you have to consider that it may not be obvious to everyone."

To colleagues at the Semiconductor Research and Development Center at IBM East Fishkill, this compact, pleasant-looking man seems like a force of nature – bright, hard-charging, bristling with energy, and rarely satisfied with the answer no.

When Davari joined IBM in 1984, he immediately entered the debate over transistor size. No one questioned the need for smaller transistors: More could fit on a chip for more processing power. The problem was, too many transistors on a chip created too much heat. A lower voltage could reduce the heat and improve reliability, but conventional wisdom said cutting voltage meant degrading performance.

Davari and his colleagues didn't agree. In 1988, they demonstrated that when transistor dimensions were shrunk properly, the lower voltage actually improved performance. Even so, it took several years to win industry acceptance of a new voltage standard. In 1994, IBM Microelectronics broke ground with the CMOS-5x, a transistor whose components are half the size of its predecessor's, use 50 percent less juice, perform 70 percent faster, and are easier and cheaper to manufacture.

His team is already working on future CMOS generations. During his fellowship, Davari wants to develop applications that can fully utilize all this new processing power. He takes considerable delight in imagining what the anticipated tenfold decrease in transistor size will mean for users.

"It's going to allow whole systems to be 'integratable' on one silicon chip, and that means applications we can't even imagine today," Davari says. "We're talking about powerful, pocket-sized, personal devices running on tiny batteries for months. They'll be linked wirelessly from anywhere on the globe to an amazingly powerful network of servers. The impact on everyday life will be as significant as the telephone. It's a revolution in information access. Although it sounds like science fiction, it's going to be fact."

Raise Eyebrows

Bruce Lindsay

BRUCE LINDSAY never did fit the IBM stereotype. During the 1970s, the mathematics enthusiast lived on a commune in California. He favored leather jackets and wore his blond hair to his belt with a beard to match. When he arrived at IBM in 1978, Lindsay not only raised eyebrows, but seemed "to relish walking the halls of the company," says Guy Lohman, Lindsay's manager at the Almaden Research Center, "just to get a reaction."

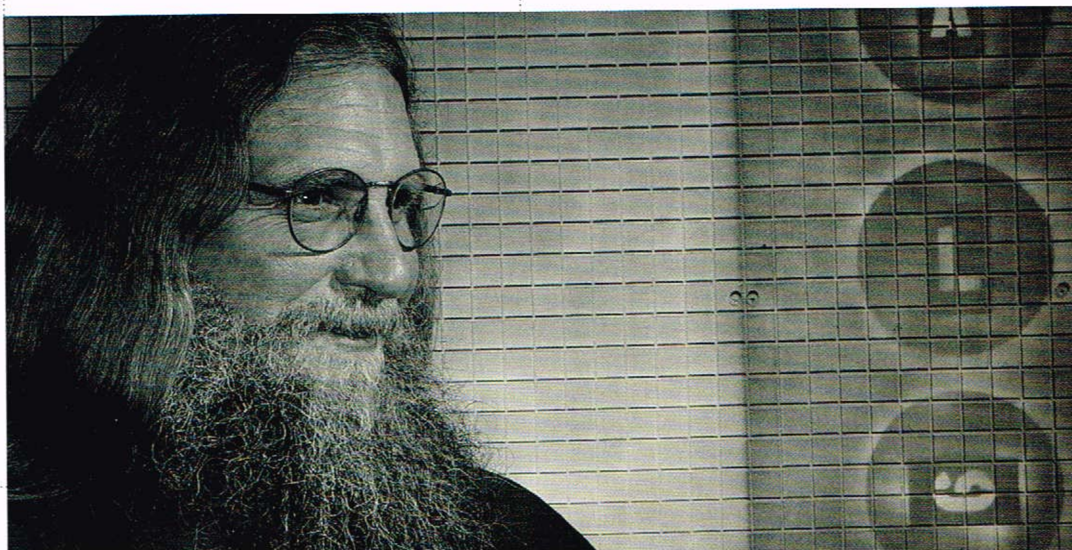
Lindsay's looks no longer make waves, but he's still gaining notoriety. The computer scientist is regarded as a pioneer in extending relational database technology, and has achieved a reputation for his intense work habits and spirited defense of unpopular ideas. "He has the tenacity of a pit bull," Lohman says. "If he believes in something, he'll fight to the death to make it happen."

To Lindsay, the storage and manipulation of data – everything from consumer buying habits to numbers of rain forest species – is revolutionizing the way businesses, governments, and individuals see the world. Data management "has moved from simple record-keeping to exploiting those records to understand the world around us," Lindsay says. "We're going to learn things about the world that some of us may find a little hard to believe."

During the 1980s and early 1990s, Lindsay helped develop programs that allowed analysts to pose increasingly sophisticated questions and "mine" their data for answers – relationships and patterns that no one might have thought to ask for in the first place.

The consequences, Lindsay says, will be staggering, as more links are discovered between seemingly disparate pieces of data. The way we conduct business, set policy, and perceive our own lives will shift in fundamental ways. "We used to be limited not simply because we couldn't get at the information – because we didn't have microscopes and satellites and all the data collection devices – but also because we couldn't store a billion facts and then make sense of them," Lindsay says. "Now, we can."

For all of Lindsay's enthusiasm about databases, he takes care to spend time with his wife, Nancy, and two boys, Robin and Colin. He has hobbies – stamp collecting is one – and on some weekends he'll drive out to nearby Yosemite National Park. And, yes, he still visits the old commune fairly regularly.



Keep *the* Clutter CREATIVE

Ted Selker

IF SCIENTISTS ever isolate the gene for invention, they'll find it running rampant in Ted Selker's family tree. His grandfather developed the shock absorber. His father designed chemical manufacturing processes. And Selker, a gadget aficionado, dreamed up the Trackpoint II, one of the brightest lights in the realm of "user-interface" and a worthy challenger to Selker's nemesis – the mouse. "The mouse requires a user to take more steps," he explains. "It also requires that you keep at least part of your desk clean."

Selker should know. He has what may be the most cluttered office in IBM's Almaden Research Center and perhaps the company: terminals, papers, tools, pieces of keyboards, partly assembled gadgets, and other flotsam of the computer age. Yet in Selker's case, debris does not equal distraction.

His fascination with gadgets started early. At age 2, he toted a lamp around his Spokane, Wash., home, plugging it in as he toddled. At age 5, he had a tool set and a workbench. As he grew older, he built motors, played with electronics, worked at a TV repair shop, and learned not just how things worked, but how they worked with people.

In 1985, Selker came to IBM to work on intelligent agents. But as an early believer of graphical user interfaces, he also came up with an idea for a pointing device set in the keyboard. A mouse not only required more steps, Selker argued, but forced the user to constantly shift between abstract tasks (interacting with the computer screen) and physical ones (finding the mouse on your desk). With the help of Selker's colleague at IBM Yorktown, Joe Rutledge, Trackpoint II had its debut with the ThinkPad 700 in 1992. It was among the more successful rollouts of any IBM personal computer product.

The project added to the list of Selker family inventions and also created a poignant family memory. After struggling to find the right rubber material for the Trackpoint finger cap, Selker realized he had a materials expert close at hand: his father.

"So I hired him," Selker says. With Alan Selker's help, Trackpoint II was completed on time, although the elder Selker died just after roll out. "The last thing that happened in his life was this extraordinary collaboration," Selker says. "I got to work with my dad, to really feel his extreme competence. And he was brilliant. In four days, he solved a problem we'd been working on for three months."