cipal investigator on the magnet research and development project for ITER. "Japanese work spaces tend to be one big room, without dividers, used by quite a few people." Even the housing built for married couples and families is quite generous by Japanese standards, he says. In addition, the town has opened a two-room international grade school for the children of foreign researchers. Older children, however, have no choice but to attend schools in Tokyo, 2 hours away.

These features—a mixture of amenities and necessities—are the key to hosting successful international collaborations, say Japanese officials, who want Western scientists to feel as comfortable in Naka as they do in San Diego or Munich. "JAERI and the government of Japan know very well that the infrastructure in Japan to receive foreign researchers is still very poor," says Yasuhide Tajima, who now works in the director's office of the ITER San Diego Joint Research site. "If they cannot show an ability to accept and receive Westerners, then the other countries involved won't agree to build [ITER] in Japan."

With the experience gained from ITER and Tristan, the Japanese scientific community believes that its hospitality will soon meet Western standards. And despite the rising cost of big science, it will have a chance to prove it with several new projects in the works. The successor to Tristan, a new accelerator for the study of b-mesons (*Science*, 3 June, p. 1392), will also include international collaborators. And the Super Kamiokande detector being built in a cavern in the small town of Kamioka will also attract several dozen foreign scientists.

Further down the road is the JLC, known as either the Japan Linear Collider or the Joint Linear Collider, depending on where one believes it will be built and which countries will fund it (*Science*, 3 June, p. 1397). KEK is already collaborating with scientists at the Stanford Linear Accelerator Center on joint research and development projects, but after the demise of the Superconducting Super Collider, it's difficult to imagine Japan taking another chance on a big-ticket, U.S.-based accelerator. If the JLC is built on Japanese soil, then Japan will become home for many of the best high-energy physicists in the world, and the JLC will be the mechanism for training a new generation of world-class Japanese physicists.

It will also require taking another step down the road to accommodating the rest of the world. "The JLC will probably be a very big collaboration of many nations," says Takahiko Kondo, the KEK physicist who led the Japanese participation in the SSC. "Somehow we'll have to come up with a completely different way of doing international collaboration."

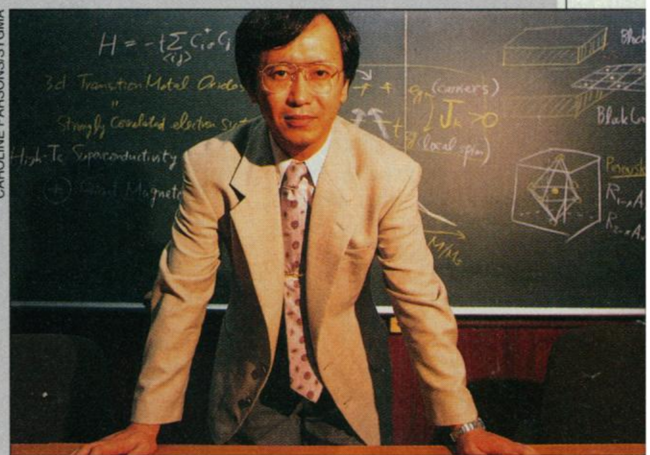
–Gary Taubes

PROFILE

Blazing a Collaborative Trail

Solid-state physicist Yoshinori Tokura knows what it's like to go against the flow. Every Wednesday morning he leaves his wife and two sons at home in the western suburbs of Tokyo and heads east and north by train, in the opposite direction to the city's notorious rush-hour traffic, to Tsukuba science city. But it's not just the commute that sets him apart from the average University of Tokyo professor. As a group leader at the Joint Research Center for Atom Technology (JRCAT) in Tsukuba, Tokura is one of the first national university professors to be part of a major project sponsored by the Ministry of International Trade and Industry (MITI).

At 40, Tokura is the youngest full professor in the university's faculty of science and one of Japan's best solid-state physicists. In most countries that would be enough to secure the resources to run a high-powered academic lab. But funds are scarce, and it's difficult to assemble a large research team in a Japanese university. So for the past year Tokura has worked 2 days a week at JRCAT, where he directs six research scientists and shares in a generous 10-year research budget of $250 million to study nanotechnology and new materials. Asked to explain his professional double life, he laughs: "It's quite exceptional."



CAROLINE PARSONS/SYGMA

Two worlds. Yoshinori Tokura is a full professor at the University of Tokyo and a team leader at MITI's Joint Research Center for Atom Technology.

The son of a journalist, Tokura grew up near Kobe and attended the University of Tokyo, where he earned a Ph.D. in applied physics. Already well regarded as a materials scientist at home, his career took off in 1987 when he spent a year in California as a visiting scientist at IBM's Almaden research center. At Almaden he fell in with high-temperature superconductor gurus Jerry Torrance and Stuart Parkins and was stricken with what he calls "high-Tc fever." Already expert in the electronic properties of organic materials, he quickly became familiar with metal-oxide compounds and collaborated on several prominent papers in the then–red-hot field.

After returning to the University of Tokyo in 1988, Tokura soldiered on, systematically studying these compounds even though interest in the topic had cooled along with dreams of room-temperature superconductors. His work convinced him that he had uncovered "an abundant gold mine" of fascinating new properties in the materials, and JRCAT offered a more conducive atmosphere than the university to pursue this new line of inquiry. Not only does he lead a larger team, but "I don't have to care about money or other pressures" such as teaching and administrative chores, he says. "I can fully enjoy the basic research." Tokura also sees himself as a role model for other university scientists with big ideas but small grants. "There should be another path to grant money besides the Ministry of Education," he says.

At JRCAT Tokura is immersed in the hot field of magnetotransport phenomena, in which metallic oxides show changes in conductivity when subjected to low temperatures and a small magnetic field. His team, for example, has found a manganese oxide compound that shows a 10-orders-of-magnitude jump in conductivity under such conditions. Back at the university, in addition to teaching, he studies the basic physics underlying the transition of metal-oxide materials from a superconducting to an insulating state.

Making the best of such a busy life, Tokura says he uses the long commute "to read scientific papers, or I just take a siesta." And his long hours haven't made him a stranger to his family: In fact, his 12-year-old son says he wants to follow his father's footsteps into physics. The news brings wry laughter from Tokura as he thinks about what it takes to pursue a dream, including the necessity at times to go against the flow.

–A.R.