

A Nanowire Link Between East and West

LJUBLJANA, SLOVENIA—One Saturday morning in the nearly deserted Jožef Stefan Institute (JSI) here in Slovenia's capital city, Dragan Mihailović eagerly shows off some recent fruits of his lab's labors: a vial filled with a black powder resembling soot. Unimpressive at first glance, this substance may just be Slovenian gold. Mihailović intends to position the molybdenum-based powder, which he claims contains the world's first superconducting nanowires, as a rival to carbon nanotubes for applications ranging from light sources in flat-panel displays to friction-reducing oil additives. The description of his nanowires, posted recently in the online edition of *Nanotechnology*, is whetting appetites far beyond Slovenia, a rugged little country east of the Italian Alps and one of the 10 new members of the European Union (E.U.). The novel materials "are very intriguing and interesting," says physicist Alex Zettl of the University of California (UC), Berkeley.

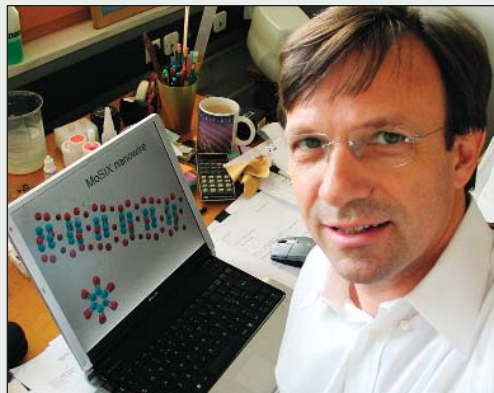
Mihailović, 46, trained abroad, earning a Ph.D. in physics in 1983 at the University of Oxford's renowned Clarendon Laboratory. A big career break came in 1989, when as a Fulbright Fellow he spent a year studying copper-based superconductors and conducting polymers at UC Santa Barbara in the laboratory of physicist Alan Heeger, who won the Nobel Prize in chemistry in 2000 for conductive polymers. Mihailović "is a solid and creative scientist," says Heeger. "He often does not follow mainstream ideas [but] goes off into new and productive directions."

Like most Slovenes, whose attachment to their culture, family, and country runs deep, Mihailović felt compelled to return home. In 1990 he resumed his work at JSI, Slovenia's premier research institute. His 10-person team specializes in materials that exhibit quantum phenomena—such as superconductivity and magnetism—arising from complex interactions between electrons. Thanks to E.U. funds, Mihailović's complex matter department has a femtosecond spectrometer for recording light-induced changes in materials on the order of 10^{-15} seconds. His group also knows how to improvise, having saved roughly \$2 million by adapting a secondhand electron microscope for fine-scale lithography, a technique used to make nanowires into minuscule sensors and transistors. Mihailović, JSI's chief scientist, hopes the institute can further enrich its facilities by winning a share of the structural funds being given to each new E.U. member nation (see main text).

Mihailović is one of the first Slovenian scientists to have launched a spinoff firm. He got a close-up view of the process in Santa Barbara in 1990, when Heeger co-founded UNIAX to develop light-emitting polymer displays. Inspired by the venture—UNIAX introduced the first polymer-based plastic display and was snapped up by DuPont in 2000—Mihailović last year formed a company, MO6, to commercialize his nanowires.

Cruising around Ljubljana in a kingfisher blue Jaguar, Mihailović clearly enjoys the good life in Slovenia. He and many of his compatriots insist they wouldn't live anywhere else—suggesting that science in this newest corner of the E.U. will only grow stronger with closer ties to the West.

—FIONA PROFFITT



High-wire act. Dragan Mihailović and his nanowire structure, depicted on laptop screen.

basic research based strictly on merit. Leaders need to keep two clear but separate goals in mind, says Robert May, president of the U.K.'s Royal Society. "My worry is if you confuse the need for capacity building with the need for a merit-based European Research Council, ... you will doom the possibility of constructing a high-quality ERC," he says. "You cannot run the risk of a new European Research Council becoming a welfare project."

If the new countries were to flounder in a quality-driven competition, one alternative might be to hold a special funding round just for them, says Frank Gannon, executive secretary of the European Molecular Biology Organization in Heidelberg, Germany. Perhaps surprisingly, many in the new member states reject that idea out of hand. "We're aware that we will pay a price in the beginning," says Legocki. "But it would be very bad policy to ask for handicapped criteria. We'll just have to get more competitive." Maimets agrees. "If the quality of science in Estonia is really much worse than in Western Europe, then we'd deserve to lose out," he says. The European Commission isn't in favor of a two-tier system, adds Fabio Fabbi, an EC spokesperson.

Although Framework makes up only 5% of European science funding—national agencies pay the lion's share—the massive program sums up the challenge of weaving the research communities of the member states into a cohesive whole. The process of integration will only get harder with the addition of 10 new states that, of late, have tended to starve their scientific communities. European ministers have pledged to boost R&D spending to 3% of GDP by 2010. Many current E.U. members are nowhere near that number—Spain and Greece spend only 0.96% and 0.67% respectively, and even the prosperous Netherlands manages only 1.94%. With the new countries, the E.U. average edges down from 1.98% to 1.93% (compared to 2.80% in the U.S. and 3.06% in Japan). One advantage of E.U. membership, researchers say, is that the pressure is now on governments to make investment in science a higher priority.

But for all the talk about budgets and competition, perhaps the most precious gift of May Day 2004 is the affirmation that young researchers are free to go wherever they can carve out a niche for themselves, Illnerova says—a chance she never had early in her career. "We're finally part of a large scientific family in Europe again."

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With reporting by Gretchen Vogel in Berlin, Richard Stone in Budapest, and Anna-Karin Berg, Fiona Proffitt, and Theres Redeby in Cambridge, U.K.

worry about what's next. Framework was designed to yoke science to the economic engine of Europe; as such, the program favors applied research and sprawling international lab networks that spread the wealth but create an administrative nightmare. "Framework funding is what scientists call 'funny money,'" says Ronald Plasterk, who directs the Hubrecht Laboratory for developmental biology in Utrecht, the Netherlands. "There's no

clear relation between a project's quality and its chances of getting funding." Once the new countries become fully-fledged E.U. members, politicians may be tempted to slide even more research money their way, De Strooper warns, further diluting Europe's research strengths.

A widespread disaffection with Framework has helped kindle support for the creation of an ERC (*Science*, 2 January, p. 23), a body that would award grants for